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## STANDARD OPERATING PROCEDURE

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# **SECTIONS 1.0–6.0**

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**1.0 VISION OF THE NHLS**

**2.0 MISSION OF THE NHLS**

**3.0 QUALITY POLICY STATEMENT**

**4.0 CONFIDENTIALITY STATEMENT**

**5.0 INTRODUCTION**

**6.0 PROCEDURE FOR COMPLAINTS**



## 1.0 VISION OF THE NHLS

To provide public health laboratory services in the country, to restructure and transform the laboratory services in order to make them part of a single national public entity and develop policies that will enable it to provide health laboratory services as the preferred provider for the public health sector.

## 2.0 MISSION OF THE NHLS

To provide cost-effective and professional laboratory medicine, through competent, qualified professionals and state-of-the-art technology supported by academic and internationally recognised research, training and product development to maximise healthcare delivery to the nation.

## 3.0 QUALITY POLICY STATEMENT

The management and staff of the NHLS laboratories and departments aspire to realise our vision of providing a quality, affordable and sustainable health laboratory and related public health service by fostering and sustaining a laboratory culture that supports a deep commitment to quality, continuous improvement and good professional practice.

We do this by:

- Maintaining a Quality Management System that continually improves the effectiveness of the service to our customers and ensuring that this is applied throughout the NHLS.
- Our Quality Management System is compliant with the requirements of one of the following:
  - ISO 15189 for Medical laboratories
  - ISO/IEC 17025 for testing and calibration laboratories
  - ISO/IEC 9001 for production departments
  - ISO/IEC 17043 for PT scheme providers
  - Other regulatory authorities
- Requiring that all laboratory staff comply with the Quality Management System and provide training and support for them to do so.
- Requiring that all laboratories set quality objectives that improve the local QMS and that these objectives are reviewed at least once a year.

- Supporting teaching and research to promote the adoption and application of innovative technology.
- Ensuring professional behaviour and ethical standards of business conduct.
- Ensuring that all staff within the organisation is aware of this quality policy.

Our laboratories and departments are committed to providing services in laboratory health and related public health service that are responsive to the needs of our customers and meet their expectations. The full scope of testing and services is documented and available to our customers.

The NHLS goals and objectives are set out in the NHLS strategic plan. These and the quality policy are reviewed regularly for continued effectiveness and best practise within the public health service.

## 4.0 CONFIDENTIALITY STATEMENT

The NHLS ensures protection of personal information by ensuring that all staff members are aware that all business of the organization including patient information is confidential. There is an SOP on confidentiality (GPQ0061) that all staff members are expected to read and acknowledge. Staff members are also expected to sign a confidentiality form attached to this SOP which is available in their personnel files. Access to electronic information is through passwords, staff members are given different access levels depending on their qualifications and job descriptions. Results are delivered to the responsible health care worker in envelopes or appropriate container.

## 5.0 INTRODUCTION

This booklet serves as a guide to the services offered by the National Health Laboratory Services (NHLS). Please contact the laboratory if any additional information is required. Table 1 on pages 17 - 53 shows the contact numbers for laboratories and their hours of operation.

The NHLS is divided in six areas, the National Institute of Communicable Diseases (NICD) and the National Institute for Occupational Health (NIOH). The six areas are:

- Eastern Cape
- Free State and Northwest
- Gauteng
- KwaZulu-Natal
- Limpopo and Mpumalanga
- Western and Northern Cape

## 6.0 PROCEDURE FOR COMPLAINTS

If you have any complaints about our service, please contact your local laboratory at the numbers provided in Table 1 on pages 17 - 53. The laboratory has a complaints procedure number GPQ0059 to follow and address your concern.



# SECTIONS 7.0

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## CONTACT DETAILS AND HOURS OF OPERATIONS



## 7.0 CONTACT DETAILS AND HOURS OF OPERATION

Table 1: Laboratory contact numbers and hours of operation per province and institution.

EASTERN CAPE PROVINCE					
AREA MANAGER	TELEPHONE	MOBILE	FAX		
AREA MANAGER	(043) 700 8701	(082) 893 6875	(086) 535 6519		
BUSINESS MANAGERS Border Ibhayi Mthata	(043) 743 3000 (041) 395 6158 (047) 502 4189	(082) 809 5287 (083) 541 1019			
LAB NAME	TELEPHONE	AFTER HOURS/MOBILE	WEEKDAY HOURS	SATURDAY HOURS	CALL-OUT
Aliwal-North	(051) 634 2398	(079) 893 0966	08h00-17h00		ON CALL
All Saints	(047) 548 1025 (047) 548 4029	(082) 803 8808 (076) 553 5441 (073) 389 6680	08h00-18h00		ON CALL
Bambisana	(039) 253 7524 (074) 139 2343	(083) 743 9683	08h00-17h00		
Bedford Maluti	(039) 256 0547	(082) 725 2446	08h00-17h00	08h00-12h00	
Bhisho	(040) 635 0579 (040) 635 0582	(082) 899 2403 (074) 481 4224 Work sent to East London	08h00-18h00		
Bizana St. Patricks	(039) 251 0550	(082) 899 2264	08h00-06h00		ON CALL

Butterworth	(047) 491 8690	(072) 629 5510	08h00-21h00	08h00-12h00	Sunday and public holidays, ON CALL
Cala	(047) 877 0357	(082) 882 9963	08h00-18h00		
Canzibe	(047) 568 8576	(082) 804 0204	08h00-17h00		ON CALL
Cecilia Makiwane Mdantsane	(043) 708 2218 (043) 708 2477	(082) 906 0081	24hrs		
Cofimvaba	(047) 874 8020	(083) 484 7051 (072) 628 9818 (071) 715 6972	08h00-18h00		ON CALL
Cradock	(048) 881 4343	(083) 437 8202	08h00-17h00		ON CALL
Dora Ngiza	(041) 464 4655	(074) 127 7437 (074) 169 0867	24hrs		
East London Regional Office	(043) 700 8702	(071) 103 8999 (082) 893 6875	08h00-17h00		
Empilisweni	(051) 611 0061	(082) 899 2361 Work sent to Queenstown	08h00-17h00		
Frere East London	(043) 701 6021 (043) 743 3000	(082) 805 7376	24hrs		
Glen Grey	(047) 878 0121	(082) 897 1607 (082) 897 1067 (084) 954 7970 Work sent to East London	08h00-18h00		
Graaff Reinet	(049) 892 5195	(082) 807 0485	08h00-17h00		ON CALL

Grahamstown	(046) 622 5066	(082) 563 0260	08h00-19h00	08h00-12h00	ON CALL
Greenville (Depot)	(039) 251 3553 (039) 251 3009	(076) 353 7836	08h00-17h00		
Hewu	(040) 841 0036 (040) 841 0133	(082) 899 2422 (082) 607 2639 Work sent to Queenstown	08h00-18h00		
Holy Cross	(039) 253 7542	(083) 992 9992	08h00-18h00		ON CALL
Humansdorp	(042) 200 4261	(082) 803 1626	08h00-17h00		ON CALL
Isilimela	(082) 327 2270	(071) 265 6317 (082) 327 2270	08h00-17h00	08h00-12h00	
Livingstone	(041) 453 3816 (041)453 3875	(082) 889 1168	24hrs		
Madwaleni Lab	(047) 576 9010	(079) 510 5618	08h00-19h00	08h00-12h00	ON CALL
Mary Theresa	(039) 255 0628	(082) 899 2297	08h00-03h00		
Mount Ayliff	(039) 254 0951	(082) 872 5834	08h00-03h00		ON CALL
PE	(041) 395 6158 (041) 395 6111	(082) 809 5287	08h00-17h00 24hours TB Lab only	08h00-12h00	
Port Alfred	(046) 624 1047	(082) 902 6435	08h00-17h00		ON CALL
Queenstown	(045) 839 4483	(082) 807 2639	24hrs		
Qumbu	(047) 553 8013	(082) 872 9242	08h00-08h00		
Somerset East	(042) 243 1465	(082) 807 6825	08h00-17h00		ON CALL
SS Gida	(040) 658 0083	(082) 899 2280 Work sent to East London	08h00-17h00		

St Barnabas	(047) 568 7769	(082) 803 8984	08h00-19h00	08h00-12h00	ON CALL
St Elizabeth	(039) 253 1238	(082) 899 2399 (083) 398 1619	24hrs		ON CALL
Tafalofefe	(047) 498 6012	(083) 993 6262 (072) 6295510	08h00-17h00	08h00-12h00	
Taylor Bequest Mount Fletcher	(039) 257 0528	(082) 872 6478 (076) 489 0931	08h00-21h00		ON CALL
Tsolo	(047) 542 6416	(082) 802 0236	08h00-17h00	08h00-12h00	
Uitenhage	(041) 961 0682	(082) 807 2640	24hrs		
Umtata	(047) 502 4189 (047) 502 4922	(083) 541 1019	24hrs		
Victoria	(040) 653 2715	(082) 899 2241 Work sent to East London	08h00-18h00		
Willowvale	(047) 499 1204	(083) 218 9788 (072) 629 5529	07h00-17h00	08h00-12h00	
Zitulele	(047) 575 9551	(072) 628 9820	08h00-20h00	08h00-12h00	

FREE STATE PROVINCE					
AREA MANAGER	TELEPHONE	MOBILE	FAX		
AREA MANAGER	(051) 411 9942	(082) 882 7680	(086) 693 8545		
BUSINESS MANAGER Universitas Free State	(051) 405 9348 (051) 405 0500	(082) 908 4449 (082) 804 1701			
LAB NAME	TELEPHONE	AFTER HOURS/MOBILE	WEEKDAY	SATURDAY HOURS	CALL-OUT
3 Military	(051) 402 1859	(051) 405 3025 (051) 405 3931 (Universitas)	08h00-17h00		
Bethlehem	(058) 303 5586	(082) 801 8279 (083) 566 5469	08h00-17h00	08h00-12h00	ON CALL
Bloem National Stat	(051) 405 2552 (051) 405 2438	(051) 405 3025 (051) 405 3931 (Universitas)	08h00-17h00	08h00-12h00	
Bloemfontein Regional Office	(051) 411 9940	(082) 805 7374 (082) 882 7680	08h00-17h00		
Botshabelo	(051) 534 1610	(082) 809 5520 (079) 849 7135	08h00-17h00	08h00-12h00	ON CALL
Kroonstad	(056) 212 2169	(082) 801 8279 (082) 806 7619	08H00-20H00	08h00-12h00	ON CALL
Manapo	(058) 713 1700	(082) 907 4181 (072) 136 0652	08h00-17h00	08h00-12h00	ON CALL

Pelonomi	(051) 405 9340	(051) 405 9343 (071) 670 3459	24hrs		
Sasolburg	(016) 973 3837	(082) 804 1776 (082) 806 7619	08h00-17h00	08h00-12h00	ON CALL
Universitas (Receiving Office)	(051) 405 3035	(051) 405 3025	24hrs		
Universitas (Chemistry)	(051) 405 2931	(051) 405 2931	24hrs		
Universitas (Haematology)	(051) 405 3887	(051) 405 3887	24hrs		
Universitas (Virology)	(051) 405 3162	(051) 405 3025 (051) 405 3931	08h00-17h00		
Universitas (Human Genetics)	(051) 405 3047		08h00-17h00		
Universitas (Cytology)	(051) 405 3044		08h00-17h00		
Universitas (Histology)	(051) 405 3051		08h00-17h00		
Universitas (Microbiology)	(051) 405 3077 (051) 405 3078	(051) 405 3025 (051) 405 3931	08h00-17h00	07h30-12h00	ON CALL
Universitas (INR Clinic)	(051) 405 3072		07h00-16h00		
Welkom	(057) 396 6200	(057) 396 6200 (082) 807 7843	24hrs		

GAUTENG PROVINCE					
AREA MANAGER	TELEPHONE	MOBILE	FAX		
AREA MANAGER	(011) 489 9650	(082) 605 9756	(086) 662 4894		
BUSINESS MANAGERS Charlotte Maxeke Chris Hani Baragwanath Dr George Mukhari Gauteng North Gauteng South Tshwane Academic	(011) 489 8414 (011) 489 8723 (012) 521 4284 (011) 489 9154 (011) 489 9154 (012) 319 2111	(082) 809 5750 (082) 801 8263 (082) 807 3480 (082) 807 2650 (082) 807 2650			
LAB NAME	TELEPHONE	AFTER HOURS/MOBILE	WEEK DAY HOURS	SATURDAY HOURS	CALL-OUT
Braamfontein - LSS	(011) 489 9053	(082) 801 8263	08h00-18h00	09h00-13h00	
Braamfontein - TB	(011) 489 9347 (011) 489 9352		24hrs		
Braamfontein - Cytology	(011) 489 9401		08h00-17h00	08h00-12h00	
Braamfontein - Immunology	(011) 489 9412		08h00-16h30	No operation	
Braamfontein - Cytogenetics	(011) 489 9234		08h00-16h30	No operation	
Carletonville	(018) 788 6250	(082) 801 7418 (073) 427 2177	08h00-21h00	08h00-12h00	
Chris Hani Baragwanath - LSS	(011) 489 8787 (011) 489 8780 (011) 489 8791	082 395 0525	24hrs		* First contact

Chris Hani Baragwanath - Chemistry	(011) 489 8781	084 781 0584	24hrs		
Chris Hani Baragwanath - Haematology	(011) 489 8749 (011) 489 8747 (011) 489 8751	(072) 370 1552 (071) 670 3569	24hrs		
Chris Hani Baragwanath - Microbiology	(011) 489 8740 (011) 489 8733 (011) 489 8736	(082) 807 4966	08h00-18h00	08h00-12h00	
Chris Hani Baragwanath - Histology	(011) 489 8711 (011) 489 8710 (011) 489 8712	(084) 513 6266 (082) 908 1611	08h00-14h30	08h00-12h00	
Chris Hani Baragwanath - Satellite	(011) 933 9736	(072) 370 1552	24hrs		
CMJAH JhbGen - LSS	(011) 489 8443 (011) 489 8440	(082) 656 6117 (073) 029 3495 (082) 656 1860	24hrs		* First contact
CMJAH JhbGen - Chemical	(011) 489 8453		24hrs		
CMJAH JhbGen - Haematology	(011) 489 8554		24hrs		
CMJAH JhbGen - Microbiology	(011) 489 8425	(082) 807 4966	24hrs		
CMJAH JhbGen - Histology	(011) 489 8469		08h00-16h30	08h00-12h00	

CMJAH JhbGen - Virology	(011) 489 8504		08h00-16h30	08h00-12h00	
Coronation	(011) 470 9060	(082) 808 7533	07h00-17h00	08h00-12h00	
DGM (Medunsa) - LSS	(012) 521 3434 (012) 521 3048 (012) 521 3042	(080) 888 5347 (073) 928 0363 (073) 268 9493	24hrs		* First contact
DGM-Chemical Pathology	(012) 521 4062 (012) 521 3569 (012) 521 3628	(082) 671 7532 (073) 223 5899 (072) 553 5213	24hrs		
DGM-Haematology	(012) 521 5807	(082) 671 7847	24hrs		
DGM-Histology	(012) 521 5850	(082) 884 9106	08h00-17h00	08h00-12h00	
DGM-Microbiology	(012) 521 4790	(082) 671 7768	24hrs		
DGM-Cytology	(012) 521 5856	(082) 884 9106	08h00-17h00	08h00-12h00	
DGM-Virology	(012) 521 4217 / 5629	(082) 671 7665 (084) 393 7257	08h00-17h00	08h00-12h00	
DGMC	(011) 356 6003	(082) 374 4072 (072) 486 9217	08h00-17h00		
Discoverers	(011) 672 8207	(082) 516 2704	08h00-17h00	08h00-12h00	
Edenvale	(011) 882 4000 / 1	(082) 447 1729	08h00-18h00	08h00-12h00	
Far East Rand	(011) 813 2136	(072) 620 1391	08h00-22h00	08h00-12h00	ON CALL
Bertha Gxowa (Germiston)	(011) 873 0000 / 1	(072) 622 8559	08h00-21h00	08h00-12h00	
Helen Joseph	(011) 489 0402 (011) 489 0403 (011) 489 0404/0431/1658	(082) 808 7533 (072) 288 1402	24 hours		

Jubilee	(012) 717 8787	(082) 901 1809			
Kalafong	(012) 373 6838	(082) 908 8895	24hrs		
Kalafong LSS	(012) 318 6847 (012) 318 6836		24hrs		
Kalafong Chemistry	(012) 318 6837		24hrs		
Kalafong Haematology	(012) 318 6848		24hrs		
Kopanong	(016) 428 1106/ 1074		08h00-22h00		
Leratong	(011) 410 6344/ 44	(082) 808 7552 (072) 874 1739	24 hours		
Mamelodi	(012) 801 1407	(082) 808 5809	07h00-19h00	08h00-12h00	
Natalspruit	(011) 909 1105	(072) 616 8936	24hrs		
Pholosong	(011) 738 9974	(082) 808 5906	24hrs		
Pta-West	(012) 386 2866	(082) 803 4520	08h00-17h00	08h00-12h00	
Sandringham	(011) 386 6134 (011) 885 5354	(082) 940 4812 (082) 906 8833	24hrs		
Sebokeng	(016) 988 1417 (016) 988 1438	(083) 631 5742	24 hours		
Sizwe	(011) 882 4000		08h00-16h30		Depot Lab
Southrand	(011) 681 2065 / 60 / 76	N/A	08h00-16h30	ON CALL	
Tembisa	(011) 920 1126	(072) 623 4727	24hrs		
Thambo Memorial	(011) 917 9605 / 6	(072) 616 8965	24hrs		

Tshwane - LSS	(012) 354 3856 / 3847	(082) 803 4520 (082) 884 5261	24hrs		* First contact
Tshwane - Chemical Pathology	(012) 354 3871		24hrs		
Tshwane - Haematology	(012) 354 3854	(082) 887 9031	24hrs		
Tshwane - TB	(012) 354 3880	(082) 880 3631	24hrs		
Tshwane - Microbiology	(012) 319 2123	(082) 880 3631	24hrs		
Tshwane - Virology	(012) 319 2350	(082) 887 8939	07h00-16h30		
Tshwane - Immunology	(012) 319 3124		07h00-16h30		
Tshwane - Histology	(012) 319 2111	(082) 887 9016	07h30-16h15		
Tshwane - Cytology	(012) 319 2675		07h30-16h15		
Vereeniging	(016) 428 4005 (082) 657 6921	Depends on person on call (Roster)	08h00-22h00	09h00-13h00	ON CALL
Witkoppen	(011) 489 0402 (011) 705 2438	(082) 808 7533	08h00-17h00		
Yusuf Dadoo	(011) 489 2402 (011) 660 7388 / 9	(072) 616 8961	08h00-21h00	08h00-12h00	ON CALL

KZN PROVINCE					
AREA MANAGER	TELEPHONE	MOBILE	FAX		
AREA MANAGER	(031) 327 6718	(083) 468 0552	(086) 774 7405		
BUSINESS MANAGERS					
EThekweni North	(013) 327 6746	(083) 557 9628			
EThekweni South	(031) 327 6780	(083) 375 3223			
Inkosi Albert Lithuli	(031) 240 2809	(082) 902 7163			
Inlands	(034) 312 6338	(082) 902 7163			
King Edward	(031) 240 2809	(082) 902 7163			
Midland	(033) 342 2876				
Umkhanyekude/Zululand	(034) 980 0283	(082) 324 4564			
LAB NAME	TELEPHONE	AFTER HOURS/MOBILE	WEEK DAY HOURS	SATURDAY HOURS	CALL-OUT
Addington	(031) 327 2463 / 78 / 79 (031) 327 2475	(083) 787 2732	24hrs		
Appelsbosch	(032) 294 8006	(073) 655 0495	07h30-17h00		ON CALL
Benedictine	(035) 831 7083 / 3279	(073) 800 7089	24hrs		
Bethesda	(035) 595 1161	(079) 597 5946	24hrs		
Catherine Booth	(035) 474 8408 / 9849	(073) 339 4470 (071) 073 2258	08h30-20h30		ON CALL
Ceza	(035) 832 5126	(073) 499 3155	08h00-17h00	08h00-12h00	ON CALL
Christ The King Ixopo	(039) 834 7521	(072) 589 5068	08h00-17h00		ON CALL
Church of Scotland	(033) 493 0968 / 1124	(082) 741 7148	24hrs		ON CALL Weekends

Clairwood	(031) 451 5004	(083) 444 7069 (082) 741 7148	07h30-16h00		ON CALL
Don McKenzie	(031) 401 6943 (031) 777 1155 (031) 124 26077	(082) 896 7751 (073) 674 9756	07h00-16h00		
Dumbe	(034) 995 1441 (034) 995 8549	(073) 529 8913 (073) 5298 913	08h00-17h00		ON CALL
Dundee	Lab direct (034) 212 1052 Hosp (034) 297 7449	(076) 537 9459	24hrs		ON CALL for Weekends
Durban Chest Prince Cyril Zulu	(031) 311 3622 (031) 242 6112	(083) 765 1723 (072) 639 4847	07h30-16h00		
Edendale	(033) 398 3302	(083) 262 6775	24hrs		
Ekhombe	(035) 834 8055	(079) 158 8957	08h00-17h00		ON CALL
Emmaus	(036) 488 1698 (036) 488 1570	(082) 061 8473 (079) 884 8124	07h30-00h30		ON CALL
Eshowe	(035) 474 2052 (035) 473 4500	(072) 572 9857	24hrs		
Estcourt	(036) 432 7034 (036) 342 7034	(076) 691 9892	08h00-17h00		ON CALL for Weekends
FOSA Centre	(031) 577 1215 (031) 503 2700	(072) 453 5862 (083) 717 9165	07h30-16h00		
GJ Crooks (SCOTTBURGH)	(039) 978 7040 (039) 978 7000	(084) 264 1752	08h00-19h00		ON CALL
Greys	(033) 345 2070	(082) 559 7007	24hrs		
Greytown	(033) 413 2056	(083) 720 1494	07h30-17h00		ON CALL

Hlabisa	(035) 838 1387 (035)	(072) 501 9017	08h00-17h00		
Hlengisizwe	(031) 401 6943 (031)	(082) 896 7751 (082) 868	Closed at present		
Hluhluwe RO	(035) 562 1315	(082) 324 4564	07h30-16h00		
IALCH (First Contact)		(083) 743 9683	24hrs		
IALCH - Management & Admin	(031) 240 2809	(082) 562 9993 (083)	07h30-16h00		ON CALL
IALCH - Chemical Pathology	(031) 240 2570	(073) 492 1892	24hrs		
IALCH - Cytology	(031) 240 2627	(083) 959 9780	07h30-16h00		ON CALL
IALCH - Haematology	(031) 240 2682	(072) 676 7016	24hrs		
IALCH - Microbiology	(031) 240 2770	(083) 384 4848	24hrs		
IALCH - Virology	(031) 240 2800	(083) 451 9767	24hrs		
IALCH - Anatomical	(031) 240 2724	(083) 560 1324	07h45-16h15		ON CALL
Imbalenhle	(033) 398 3302	(083) 262 6775	08h00-17h00		ON CALL
Inanda	(031) 510 9866	(076) 912 4473	07h30-16h00		
Itshelejuba	(034) 413 1973	(083) 231 0876	08h00-17h00	08h00-12h00	ON CALL
King Edward VIII - Lab Support	(031) 205 6812	(083) 696 1996	24hrs		*FIRST CONTAC
King Edward VIII - Chemical	(031) 205 6810	(084) 247 1939	24hrs		

King Edward VIII - Haematology	(031) 205 6564	(073) 488 7147	24hrs		
King Edward VIII - Microbiology	(031) 360 3189	(083) 473 2545	24hrs		
King George V	(031) 242 6077 / 33 / 6112	(072) 639 4847	24hrs		
Kokstad RO	(039) 797 8147 (039) 727 4007	(073) 443 0923	08h00-17h00		ON CALL
KwaDabeka	(031) 401 6293 (031) 707 4663	(082) 896 7751 (071) 350 2657	07h00-16h00		
KwaMashu	(031) 503 2700	(083) 717 9165 (082) 973 2867	24hrs		* they run both sites
KwaMashu New	(031) 503 2700	(084) 717 9165 (082) 973 2867	24hrs		* they run both sites
KwaMsane	(035) 838 1387	(072) 501 9017	09h00-18h00		
Ladysmith	(036) 637 2111 ext 427	(083) 646 8405	24hrs		
Lower Umfolozi Empangeni	(035) 907 5684 (035) 907 7146	(082) 467 7793 (082) 315 5806	07h30-16h00		
Madadeni	(034) 328 8124	(072) 761 5588	24hrs		
Mahatma Gandhi	(031) 539 6290	(082) 923 0910 (072) 901 1188	24hrs		
Manguzi	(035) 592 0209	(073) 877 2335	24hrs		ON CALL for Weekends
Mbongolwane	(035) 476 6242	(078) 989 5166	08h00-17h00	08h00-12h00	ON CALL
Midlands RO	(033) 342 2876	(082) 676 4808	07h30-16h00		

Montobello	(033) 506 0203	(083) 399 6600	07h30-16h00		ON CALL
Mosvold Ngwavuma	(035) 591 0502	(082) 427 5419	24 hrs		ON CALL for Weekends
Mpophomeni	(033) 238 0026		Is a Depo		
Mseleni	(035) 574 1004	(079) 839 9716	24 hrs		ON CALL for Weekends
Murchison	(039) 687 7950	(083) 743 2629	07h30-16h00		ON CALL
Newcastle	(034) 328 0018 / 54	(072) 457 8560	08h00-24h00		ON CALL
Newcastle RO	(034) 312 6338	(082) 902 7165	07h30-16h00		
Ngwelezana Empangeni	(035) 794 2941	(076) 235 2751	24hrs		
Niemeyer	(072) 761 5588	(072) 761 5588	07h00-16h00		
Nkandla	(035) 833 5042	(074) 920 4063 (083)	08h00-17h00	08h00-12h00	ON CALL
Nkonjeni Mahlabathini	(035) 873 0571	(074) 189 8768	24hrs		
Northdale	(033) 387 9035	(072) 621 6049	24hrs		
Nqutu Charles Johnson	(034) 271 0665	(083) 773 4888	24hrs		ON CALL for Weekends
Osindisweni Lab	(032) 541 9200 / 36	(083) 524 7561 (084)	08h00-16h30		ON CALL
Osindisweni Microscopy Centre - Tongaat	(032) 541 9200	(084) 444 2570 (083)	08h00-17h00		
Pholela	(033) 398 3302	(083) 262 6775	07h30-16h00		

Pinetown - KDH	(031) 311 6836		08h00-17h00		
Port Shepstone	(039) 688 6114 / 3	(083) 743 2629	24hrs		
Prince Mshiyeni Umlazi	(031) 906 2803	(082) 679 1834	24hrs		
Prince Street	(031) 327 6743	(083) 231 3684	07h30-16h00		ON CALL
Richmond	(033) 398 3302	(083) 262 6775	07h30-16h00		
Rietvlei	(039) 260 0017	(082) 560 6390	08h00-17h00		ON CALL
RK Khan	(031) 401 6943 (031) 403 3235	(082) 896 7751 (082) 868 0833	24hrs		
St Andrews	(039) 433 1955 ext 269	(073) 490 0413 (081) 049 8462	24hrs		
St Apollinaris	(039) 833 8000	(082) 850 0885	07h30-16h30		ON CALL
St Marys	(035) 450 8231	(083) 634 9496	08h00-17h00		ON CALL
Stanger	(032) 552 2553	(082) 399 9910	24hrs		
Sundumbili	(032) 454 7500 (032) 437 6143 / 4	(072) 013 1947	07h30-16h30		ON CALL
Taylor Bequest (Matatiele)	(039) 257 0528	(076) 489 0931 (082) 872 6478 (072) 519 2646	08h00-17h00		
Tongaat	(032) 944 5054	(072) 492 3904	07h45-16h15		ON CALL
Umphumulo	(032) 481 4100 - Office Ext: 4236 and Main Lab Ext: 4150	(083) 404 6550	24hrs		
Untunjambili	(033) 444 0818	(082) 646 6968 (072) 026 8312	08h00-18h00		ON CALL

Usher Memorial / KOKSTAD	(039) 797 8147	(073) 443 0923	08h00-17h00		ON CALL
Vryheid	(034) 989 5946 (034) 982 2111	(082) 899 4947	24hrs		
Vryheid RO	(034) 980 0283	(082) 324 4564 (073) 576 3524	07h30-16h00		
Wentworth	(031) 468 2904 (031) 460 5000	(083) 784 3360	24hrs		

LIMPOPO PROVINCE					
AREA MANAGER	TELEPHONE	MOBILE	FAX		
AREA MANAGER	(015) 296 3780	(082) 904 4416	(086) 620 3431		
BUSINESS MANAGERS Limpopo East	(015) 296 3780 (015) 296 3780				
LAB NAME	TELEPHONE	AFTER HOURS/MOBILE	WEEK DAY HOURS	SATURDAY HOURS	CALL-OUT
Botlokwa	(015) 527 8030	(082) 908 4476	08h00-17h00		ON CALL
CN Phatudi	(015) 355 4935	(082) 907 5191	08h00-17h00	08h00-12h00	ON CALL
Dilokong	(013) 214 8310	(082) 809 1317	08h00-17h00	08h00-12h00	ON CALL
Donald Fraser	(015) 963 6369 (015) 963 6453	(082) 906 8802	08h00-19h00	08h00-12h00	ON CALL
Elim	(015) 556 3250	(082) 906 8774	08h00-17h00	08h00-12h00	ON CALL
Ellisras	(014) 763 2254	(082) 801 8266	08h00-17h00	08h00-12h00	ON CALL
Ga-Kgapane	(015) 328 3811	(082) 909 3201	08h00-17h00	08h00-12h00	ON CALL
George Masebe	(015) 425 0055	(082) 908 4439	08h00-17h00	08h00-12h00	ON CALL
Giyani	(015) 812 1360	(082) 807 5677	08h00-17h00	08h00-12h00	ON CALL
Groblerdsdal	(013) 262 5245	(082) 881 9670	08h00-17h00		
Helen Franz	(015) 5050 102	(082) 809 5971	08h00-17h00	08h00-12h00	ON CALL
Jane Furse	(013) 265 9514	(082) 880 0887	24hrs		
Lebowakgomo	(015) 632 5347	(082) 802 4294	24hrs		

Letaba	(015) 303 8513	(082) 908 4463	24hrs		
Louis Trichardt	(015) 516 6880	(082) 806 6927	08h00-17h00	08h00-12h00	ON CALL
Malamulele	(015) 851 0068	(082) 907 5190	08h00-17h00	08h00-12h00	ON CALL
Mankweng	(015) 267 6530	(082) 908 4472	24hrs		
Matlala	(013) 264 5109	(083) 633 6879	08h00-17h00	08h00-12h00	ON CALL
Mecklenburg	(015) 619 0435	(082) 908 4778	08h00-17h00	08h00-12h00	ON CALL
Mokopane	(015) 483 4077	(082) 803 1316	08h00-19h00	08h00-12h00	ON CALL
Mussina	(015) 534 0151	(082) 201 2620	08h00-17h00	08h00-12h00	ON CALL
Namakgale	(015) 769 2359	(082) 809 5972	07h00-17h00	08h00-12h00	ON CALL
Nylstroom	(014) 717 4435	(082) 801 8265	08h00-17h00	08h00-12h00	ON CALL
Philadelphia	(013) 983 0358	(082) 801 2731	08h00-18h00		ON CALL
Polokwane	(015) 297 1099	(082) 801 8262	24hrs		
Polokwane Regional Office	(015) 296 3780	(082) 904 4416	07h30-16h30		
Potgietersrus	(015) 491 2370	(082) 803 2920	08h00-17h00	08h00-12h00	ON CALL
Sekororo	(015) 303 2143	(082) 909 3231	08h00-17h00	08h00-12h00	ON CALL
Seshego	(015) 223 6519	(082) 801 9108	08h00-17h00	08h00-12h00	ON CALL
Siloam	(015) 973 0453	(082) 806 6896	08h00-17h00	08h00-12h00	ON CALL
St Ritas	(082) 906 8745 - No Landline	(082) 906 8745	08h00-17h00	08h00-12h00	ON CALL
Thabazimbi	(014) 777 2174	(082) 907 6904	08h00-17h00	08h00-12h00	ON CALL

Tshilidzini	(015) 964 2238	(082) 908 7225	08h00-17h00	08h00-12h00	ON CALL
Tzaneen	(015) 307 1465	(082) 801 1829	08h00-17h00	08h00-12h00	ON CALL
Warmbaths	(014) 736 2374	(082) 801 826	08h00-17h00	08h00-12h00	ON CALL
WF Knobel	(015) 221 1569	(083) 630 5793	08h00-17h00	08h00-12h00	ON CALL
Witpoort	(014) 769 0197	(083) 680 0141	08h00-17h00		ON CALL
Zebediela	(015) 662 1198	(082) 802 0836	08h00-17h00	08h00-12h00	ON CALL

MPUMALANGA PROVINCE					
AREA MANAGER	TELEPHONE	MOBILE	FAX		
AREA MANAGER	(015) 296 3780	(082) 904 4416	(086) 620 3431		
BUSINESS MANAGER	(015) 296 3780				
LAB NAME	TELEPHONE	AFTER HOURS/MOBILE	WEEK DAY HOURS	SATURDAY HOURS	CALL-OUT
Barberton	(013) 712 2763	(082) 807 2629	08h00-17h00	08H00-12H00	ON CALL
Bethal	(017) 647 2533	(083) 528 5224	08h00-17h00		
Delmas	(013) 665 1059		08h00-17h00		
Embhuleni	(017) 883 1504	(082) 882 4679	08h00-17h00	08H00-12H00	ON CALL
Ermelo	(017) 811 3305 / 3402	(082) 801 7415	24hrs		
Evander	(017) 632 2075	(082) 807 7198	08h00-17h00	08H00-12H00	ON CALL
Kabokweni Themba	(013) 796 0236	(082) 808 2842	08h00-17h00	08H00-12H00	ON CALL
KwaMhlanga	(013) 947 2557	(082) 825 1708	08h00-17h00	08H00-12H00	ON CALL
Lydenburg	(013) 235 4487		07h30-16h00		
Mapulaneng	(013) 799 0202	(082) 804 9956	07h00-17h00	08H00-12H00	ON CALL
Matikwana	(013) 708 7010	(083) 629 8574	08h00-17h00	08H00-12H00	ON CALL
Middelburg	(013) 282 5443	(082) 807 7360	08h00-17h00	08H00-12H00	ON CALL
Mmamethlake	(012) 721 3867	(082) 900 2157	08h00-22h00	08H00-12H00	ON CALL
Nelspruit	(013) 741 1014 / 15 (013) 741 4780	(082) 808 2862	24hrs		

Nelspruit Regional Office	(013) 752 2053	(073) 575 6270 (082)	08H00-17H00		
Piet Retief	(017) 824 1314	(082) 809 2088	07h00-17h00	08H00-12H00	ON CALL
Shongwe	(013) 781 0632	(083) 645 9094	07h00-17h00	08H00-12H00	ON CALL
Standerton	(017) 712 4011	(082) 807 8939	08h00-17h00	08H00-12H00	ON CALL
Tintswalo Acornhoek	(013) 795 5151	(082) 881 1671	08h00-17h00	08H00-12H00	ON CALL
Tonga	(013) 780 3630 / 21	(082) 908 5213	08h00-17h00	08H00-12H00	ON CALL
Volksrust	(017) 735 1994		08h00-17h00		
Witbank	(013) 656 6646 / 6691	(082) 807 6941	24hrs		

NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES (NICD)					
	TELEPHONE	MOBILE	FAX		
DIRECTOR	(011) 386 6137				
LAB NAME	TELEPHONE	AFTER HOURS/MOBILE	WEEK DAY HOURS	SATURDAY HOURS	CALL-OUT
Centre for Emerging and Zoonotic Diseases Clinical Advice Hotline	(082) 883 9920				
Centre for Enteric Diseases					
CED Bacteriology	(011) 386 6235 (011) 555 0348 (011) 555 0334 (011) 555 0360				
CED Virology	(011) 555 0370				
Centre for Opportunistic, Tropical and Hospital Infections	(011) 555 0304 (011) 555 0311				
Centre for Respiratory Diseases and Meningitis	(011) 555 0488 (011) 386 6373				
Centre for STI	(011) 555 0461				
Centre for Tuberculosis	(011) 885 5321 (011) 885 5315				

Centre for Vaccines and Immunology	(011) 386 6330				
Electron Microscope Laboratory	(011) 386 6424 (011) 386 6376				
Public Health, Surveillance and Response	+27 11 386 6337 +27 11 555 0392 +27 11 555 0542 +27 11 555 0541	(082) 807 6770 (082) 940 4780 (079) 871 7278 (082) 607 4591			24/7 Doctor on call Outbreak

NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH (NIOH)					
	<b>TELEPHONE</b>	<b>MOBILE</b>	<b>FAX</b>		
DIRECTOR	(011) 712 6413				
<b>LAB NAME</b>	<b>TELEPHONE</b>	<b>AFTER HOURS/MOBILE</b>	<b>WEEK DAY HOURS</b>	<b>SATURDAY HOURS</b>	<b>CALL-OUT</b>
Analytical Services Section	(011) 712 6535/ 6440		08h00-16h00		
Biobank	(011) 712 6507		08h00-16h00		
Epidemiology Section	(011) 712 6436		08h00-16h00		
HIV/TB Department	(011) 712 6516		08h00-16h00		
IT Department	(011) 712 6512		08h00-16h00		
Reception/Switchboard	(011) 712 6400/ 6413		08h00-16h00		

	<b>TELEPHONE</b>	<b>MOBILE</b>	<b>FAX</b>		
DIRECTOR	(011) 712 6413				
<b>LAB NAME</b>	<b>TELEPHONE</b>	<b>AFTER HOURS/MOBILE</b>	<b>WEEK DAY HOURS</b>	<b>SATURDAY HOURS</b>	<b>CALL-OUT</b>
Analytical Services Section	(011) 712 6535/ 6440		08h00-16h00		
Biobank	(011) 712 6507		08h00-16h00		
Epidemiology Section	(011) 712 6436		08h00-16h00		
HIV/TB Department	(011) 712 6516		08h00-16h00		
IT Department	(011) 712 6512		08h00-16h00		
Reception/Switchboard	(011) 712 6400/ 6413		08h00-16h00		

NORTH WEST PROVINCE					
AREA MANAGER	TELEPHONE	MOBILE	FAX		
AREA MANAGER	(051) 411 9942	(082) 882 7680	(086) 693 8545		
BUSINESS MANAGER	(018) 293 3512				
LAB NAME	TELEPHONE	AFTER HOURS/MOBILE	WEEK DAY HOURS	SATURDAY HOURS	CALL-OUT
Brits	(012) 252 2848	(082) 887 2197	07h30-06h00	08h00-12h00	ON CALL
Ganyesa	(053) 998 3666	(082) 803 8825 (073)	08H00-17H00	08h00-12h00	ON CALL
Gelukspan	(018) 336 1153	(083) 941 1334 (073)	08h00-17H00	08h00-12h00	ON CALL
Klerksdorp	(018) 465 4772	(072) 460 8746	08h00-17h00		
Lehurutshe	(018) 363 4148	(082) 882 5251	08h00-22h00	08h00-12h00	ON CALL
Mafikeng	(018) 383 3936	(082) 882 5231	24hrs		
Moses Kotane	(014) 556 3992	(082) 803 4792	24hrs		
Potchefstroom	(018) 297 5525	(082) 881 1313	24hrs		
Rustenburg	(014) 592 2972 / 7548	(082) 804 3043	24hrs		
Swartruggens	(014) 544 0802	(082) 801 7419	08h00-17h00	08h00-12h00	ON CALL
Taung	(053) 994 1030	(083) 292 6115 (082)	08h00-00h00	08h00-12h00	ON CALL
Thusong	(018) 338 1612	(082) 882 5176 (072)	08h00-17h00	08h00-12h00	ON CALL

Tshepong	(018) 465 4088	(072) 460 8746	24hrs		
Tshepong TB Lab	(018) 465 7860	(072) 460 8746	24hrs		
Vryburg Huhudi	(053) 927 2001	(082) 803 8825	24hrs		
Wolmeransstad	(018) 596 1708	(083) 653 5065	07h30-16h30	08h00-12h00	ON CALL

NORTHERN CAPE PROVINCE					
AREA MANAGER	TELEPHONE	MOBILE	FAX		
AREA MANAGER	(021) 417 9377	(082) 322 0950			
BUSINESS MANAGER	(053) 831 3969	(082) 905 7016			
LAB NAME	TELEPHONE	AFTER HOURS/MOBILE	WEEK DAY HOURS	SATURDAY HOURS	CALL-OUT
De Aar	(053) 631 0669	(082) 809 5859	08h00-19h00	08h00-12h00	ON CALL
Kimberley	(053) 833 1641/ 2	(082) 889 8974	24hrs	24hrs	
Springbok	(027) 712 3742	(082) 807 3566	08h00-18h00		ON CALL
Tshwaragano	(053) 774 0692	(082) 803 9149	08h00-00h00		ON CALL
Upington	(054) 339 0950	(082) 804 9887	08h00-00h00	08h00-12h00	

WESTERN CAPE PROVINCE					
AREA MANAGER	TELEPHONE	MOBILE	FAX		
AREA MANAGER	(021) 417 9377	(082) 322 0950			
BUSINESS MANAGERS Groote Schuur Tygerburg	(021) 404 5280 (021) 938 4456	(082) 808 2800 (082) 808 7554			
LAB NAME	TELEPHONE	AFTER HOURS/MOBILE	WEEK DAY HOURS	SATURDAY HOURS	CALL-OUT
Beaufort West	(023) 415 1447	(082) 809 5322	08h00-17h00	ON CALL	ON CALL
George	(044) 874 2022	(082) 809 5274	24hrs		
Greenpoint	(021) 417 9300/ 9366 / 9367	(021) 417 9300/ 9366 / 9367	24hrs		
Groote Schuur - Anatomical Pathology (Cytology)	(021) 404 3000	(072) 620 8356 (registrar on call)			
Groote Schuur - Anatomical Pathology (Histology)		(072) 620 6537 (registrar on call)	24hrs		
Groote Schuur - Chemical	(021) 404 4129/ 4135		08h00-17h00		
Groote Schuur - Inherited Metabolic Diseases (Molecular)	(021) 404 4129/ 4449 (021) 406 6219		08h00-17h00		
Groote Schuur - Inherited Metabolic Diseases (Enzymatic)	(021) 404 4129/ 4135 (021) 406 6392/ 6102		24hrs		

Groote Schuur - Haematology	(021) 404 4129	(082) 879 6378	08h00-17h00		
Groote Schuur - Haematology	(021) 404 4129/ 4449	(083) 879 6378	24hrs		
Groote Schuur - Virology	(021) 404 4129	(072) 040 7261 (technologist on	24hrs		
Groote Schuur - Microbiology	(021) 404 4129	(082) 907 5282	24hrs		
Groote Schuur - Tissue Immunology	(021) 404 4129/ 4502	(021) 404 4129	07h00-16h00		ON CALL
Groote Schuur - Immunology	(021) 404 4129/ 4537	(021) 404 4129	08h00-17h00		
Groote Schuur - Human Genetics (Cytogenetics)	(021) 404 4129/ 4509	(021) 404 4129	08h00-17h00		
Groote Schuur - Human Genetics (Molecular)	(021) 404 4129/ 4550/ 4449	(021) 404 4129	08h00-17h00		
Hermanus	(028) 312 1005	(082) 328 1592	08h00-17h00	10h00-13h00	
Karl Bremer	(021) 949 6141	(021) 949 6141	08h00-24h00		
Cape Khayelitsha	(021) 361 0038/ 75		24hrs		
Knysna	(044) 382 0991	(083) 809 5274	08h00-17h00		
Mitchells Plain	(021) 371 7921 (021) 377 4780	(082) 772 9521	24hrs		
Mosselbay	(044) 873 0329 (044) 690 3745	(082) 809 5274	08h00-17h00		

Oudtshoorn	(044) 279 1104	(082) 809 5989	08h00-17h00	09h00-13h00	ON CALL
Paarl	(021) 860 2719 / 2720 / 2721	(082) 807 5626 (20h00-09h00)	24hrs		
Red Cross - Anatomical Pathology	(021) 658 5209	(072) 622 6672 (pathologist on call)	07h00-17h00		
Red Cross - Chemical Pathology	(021) 658 5224/ 6		24hrs		
Red Cross - Haematology	(021) 658 5203/ 4		24 hrs		
Helderberg (Somerset West)	(021) 852 3623	(082) 809 5662	08h00-17h00		
Tygerberg Results	(021) 938-4330/ 4904/ 4931	(021) 938 4934	24hrs	24 hrs	
Tygerberg Laboratory Support	(021) 938 4934	(021) 938 4934	24hrs	24hrs	
Tygerberg Anatomical Pathology (Histology)	(021) 938 4036 Routine	(012) 938 6666 Radio Room	05h00-17h00	08h00-12h00	24h ON CALL
Tygerberg Anatomical Pathology (Cytology)	(021) 938 4040/ 4202	(021) 938 4911 (021) 938 6666 Radio Room	07h30-16h00	Call hospital and ask for Cytopathologist	24h ON CALL
Tygerberg Chemical Pathology	(021) 938 4936 Routine	(021) 938 4936	24hrs	24hrs	
Tygerberg Haematology (routine)	(021) 938 5687/ 5750	(021) 938 5750, x5687 (021) 938 6666 Radio Room & bleep number 3734	24hrs	24hrs	

Tygerberg Haematology (blood grouping)	(021) 938 6081/ 2	(021) 938 5750, x5687 (021) 938 6666 Radio room & bleep number 3734	24hrs	24hrs	
Tygerberg Haematology (bone marrow)	(021) 938 4122	(021) 938 5750, x5687 (021) 938 6666 Radio room & bleep number 3734	24hrs	24hrs	
Tygerberg Haematology (coagulation)	(021) 938 4615	(021) 938 5750, x5687 (021) 938 6666 Radio room & bleep number 3734			
Tygerberg Microbiology	(021) 938 4006/ 4026/ 4007	(076) 134 6592 (021) 9388 6666 Radio room & bleep number 0682	07h00-16h00 16h00-24h00 1 Med Tech	07h30-13h00 13h00-24h00 1 Med Tech	24h00-07h30
Tygerberg Immunology	(021 ) 938 4018/ 4001	(021) 938 4001, x5278 (021) 938 6666 Radio room	08h00-17h00	08h00-13h00	N/A
Tygerberg Virology	(021) 938 9557	(021) 938 6666 (Request registrar/ pathologist on call)	07h00-16h00	07h30-12h00	24h ON CALL
Tygerberg Genetics (Molecular)	(021) 938 9089/ 9164	Answering service	06h00-15h00		
West Coast Distric (Vredenburg)	(022) 713 4468 (022) 709 7295	(083) 631 5738	08h00-18h00		ON CALL
Vredendal	(027) 213 3924	(083) 625 6310	08h00-17h00		ON CALL

Worcester	(023) 348 4801/ 2/ 4/ 6	(082) 801 2208 (073) 746 2673	24hrs		
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CORRECTIONAL SERVICES					
LAB NAME	TELEPHONE	AFTER HOURS/MOBILE	WEEK DAY HOURS	SATURDAY HOURS	CALL-OUT
Barberton Prison	(013) 752 4398		07h00-17h00		
Durbanville Westville Prison	(016) 370 2273/ 4	(082) 821 9518	07h00-17h00		
Groenpount Prison		(082) 377 6786	07h00-17h00		
Pollsmor Prison	(021) 700 1111	(079) 318 8244	07h00-17h00		
St Albans Prison	(041) 398 1177	(071) 963 0708	07h00-17h00		
SunCity Prison	(011) 942 2928		07h00-17h00		
Tshwane Prison		(082) 809 3727	07h00-17h00		



# SECTIONS 8.0

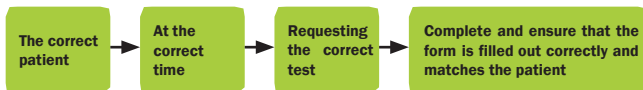
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## PROCESS FLOW

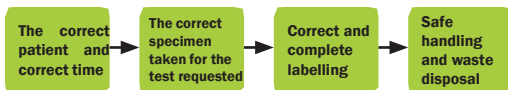


## 8.0 PROCESS FLOW

Step 1. **Requesting Clinician ensures:**



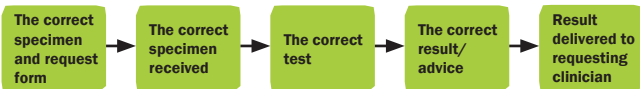
Step 2. **Phlebotomist, Nurse or Clinician collecting the specimen checks and ensures** (double checking the request form and specimen label against the patient wrist band or asking patient for their name):



Step 3. **Person undertaking logistics stage** (messenger, courier, transport) **ensures:**

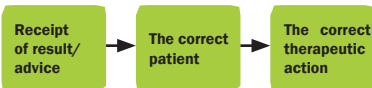


Step 4. **Laboratory checks and ensures:**



**NOTE: The laboratory may reject an inappropriately collected, labeled specimen or inappropriate specimen type**

Step 5. **Responsible clinician/nurse checks and ensures:**





# SECTIONS 9.0

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## QUICK REFERENCE FOR CLINICAL SPECIMENS



## 9.0 QUICK REFERENCE FOR CLINICAL SPECIMENS

Proper preparation of the patient, good specimen collection, correct handling of a clinical specimen and accurate completion of request form are essential for the production of valid results by the laboratory.

*Guidance on specimen containers required for individual tests in chemical pathology, clinical microbiology, serology, virology, infection control, haematology, cytogenetics and anatomical histopathology, NICD, NIOH and public health laboratories is available as per the relevant section in the handbook.*

**Table 2: Quick Reference Guide**

TASK	EXTRA INFORMATION
Completing a request form	Enter all relevant details on the request form. If you use a patient specific label ensure that you add any necessary additional information e.g., Clinical details. See Section 11 on page 63 for additional guidance. The request form must be completed according to the local agreements.
Confirm the identity of the patient	Identify the patient by checking the request form against the patient's wristband ( <b>for in-patient</b> ) or asking the patient for their full name and date of birth ( <b>for out-patient</b> ). DO NOT rely on other information around the bedside as this can be out of date if a patient has just been moved.
Check if the patient is appropriately prepared	Inform the patient of the specimen collection procedure and prepare them for the process. Certain laboratory tests require specific patient preparations, e.g. Fasting, counseling. Information on laboratory tests requiring specific patient preparation can be obtained in Table 4 or by contacting the laboratory. Always put on protective equipment.
Minimise the risk of poor sampling	Poor sampling will influence the result of any tests performed on that sample. Please refer to the relevant sections for sampling guidelines.
Minimise the risk of sample mix-up	Samples and request forms from a patient must be collected, labeled and packaged <b>one at a time and where possible, in the presence of the patient, after confirming their identity</b> . Label the specimen container yourself at the bed side immediately after collection in the presence of the patient.

Ensure that environmental and storage conditions are fulfilled to protect specimens from deterioration	<p><b>Specimens should be transported to the laboratory as soon as possible after collection.</b></p> <p>Delay may result in deterioration of the specimen and invalidate the results of any tests carried out.</p> <p>If delay in specimen transportation is likely and you are uncertain what to do, please contact the laboratory to seek advice on the most appropriate way to store the specimen.</p>
Ensure safe disposal of all materials used in specimen collection	<p>Discard all collection material in appropriate biohazard containers.</p> <p>Used needles should always be discarded directly into an approved sharps container, without being re-sheathed.</p> <p>All other non-sharp disposables should be placed in clinical waste containers.</p>
Ensure that high risk specimens are identified and processed correctly	<p>All specimens received in the laboratory are treated as potentially hazardous and "standard precautions" are applied.</p> <p><b>However, if a specimen is suspected or known to present an infectious hazard, the person requesting the specimen has the responsibility to ensure that the form and containers are appropriately labeled as such.</b> Especially:</p> <ul style="list-style-type: none"> <li>Any specimens from patients infected or potentially infected with the infections such as: Lassa Fever, Marburg; Ebola; CCHF and Rift Valley Fever.</li> <li>If the specimen is a blood culture and patient is suspected to be infected with infections such as: Brucellosis, Typhoid; Plague; Anthrax</li> </ul>
Ensure that all spillages and breakages are dealt with promptly and correctly	<p>Ensure that staff do not become infected by leaking or broken specimens, by culture spillage or contaminated by spilled chemicals.</p> <p>Contact the laboratory or your senior member of staff for advice on any aspect of dealing with spillages and breakages of clinical pathology specimens.</p>

Adapted from University Hospital Birmingham, Clinical Laboratory Services Laboratory Handbook. Issued 10th June 2010.





# SECTIONS 10.0

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## REPORTING OF RESULTS



## 10.0 REPORTING OF RESULTS

- Test results are available within specified TAT via:
  - Hard copies
  - SMS (for selected results)
  - Web-based system for authorized users
  - Telephonic enquiries
  - Provisional results will be available as appropriate
- Reports will include interpretation and reference ranges as appropriate.
- Amended results will be indicated on the report and the clinician informed.
- Delayed reporting: any delays in TAT of results due to temporary laboratory service interruption will be communicated to the client.
- Tests performed by non-NHLS laboratories will be stated as such on the report (including their reference range and remarks and comments).

See Section 27 on page 334 for distribution of results.



# SECTIONS 11.0

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## REQUISITION FORMS



## 11.0 REQUISITION FORM

NHLS provides request forms to be completed out for all specimens.

*Please complete them in full so that the laboratory will be able to process specimens correctly.*

There are different request forms for:

- Primary Health Care
- District Hospitals
- Regional, Provincial and National Hospitals
- Cytology

*Please use the correct one at all times so that the laboratory can process the specimens appropriately.*

***Examples of the forms are shown in Figures 1 - 4 on pages 72- 83.***

The following information is essential for sample processing:

- **Patient name/surname, gender, age/date of birth, hospital or clinic number and ID number/passport number:** To ensure that the laboratory data is matched to the correct patient and that appropriate age and gender adjusted reference intervals are supplied.
- **Patient's location (hospital ward/clinic):** To ensure that the laboratory reports are sent to the appropriate location.
- **Collection date and time:** Gives indication of the time interval between collection and receipt/processing of the specimen.
- **The doctors/sisters full name and contact details:** So that he/she can be contacted if need arises.
- **The name of the person collecting the specimens:** Information is needed if the person collecting the specimens is not the same as the one in above.
- **The investigation required:** So that the correct test can be done.
- **Type of specimen including collection site (where necessary):** For Microbiology, be specific on the type of specimens e.g. sputum, gastric aspirate, type of urine as well as type of swab, NOT Pus swab.
- **Clinical diagnosis of the patient:** Assist with correct processing of the specimen and with interpretation of the result.

### Baby's Specimens

In cases where the specimen belongs to a baby and the mother's hospital number is used, clearly state that this is the baby's sample. In the event of multiple births, please indicate clearly if the sample is from Twin A/1, Twin B/2, etc.

***SHOULD YOU REQUIRE SPECIMENS TO BE TREATED URGENT, PLEASE INDICATE "URGENT" OR "STAT" ON THE FORM.***

## 11.1 Figure 1: Primary Healthcare Form



NATIONAL HEALTH LABORATORY SERVICE

### PRIMARY HEALTH CARE

Including: National Priority Programme tests

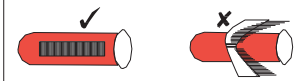
NRF0101

From ABCD1234 - ABCD1334

#### INSTRUCTIONS TO COMPLETE THIS FORM

- 1 This NHLS request form indicates the State prices (2014) for tests, to the nearest Rand. (These are NOT private prices).
- 2 When completing the form, ensure that writing is legible, and all ticks are placed clearly in the tick boxes.
- 3 Please label all specimens with one of the peel-off pre-printed labels, *in addition* to the patient identification label.
- 4 Use the correct specimen tubes, according to the specimen key next to each test.
- 5 If TB or CCMT tests are requested, the Data Collection questions must be completed.

APPLY BAR CODE LENGTHWISE DO NOT WRAP AROUND



#### Specimen Key

Yellow (or red) with gel	Y
Red without gel	R
Green (heparin)	G
Grey (fluoride)	Grey
Purple (EDTA)	P
Blue (citrate)	B
Black (citrate)	BL
White (Plasma Preparation Tube)	W

Results: <http://196.7.68.30:8080/trakcarelab/default.html> <https://labresults.nhls.ac.za> Hotline: 0860 RESULT (737858)

In the event of a dispute concerning this document, the electronic version stored on Q-Pulse will be deemed to be the correct version  
National Health Laboratory Service- All rights reserved



PLEASE TEAR HERE PLEASE TEAR HERE PLEASE TEAR HERE PLEASE TEAR HERE PLEASE TEAR HERE



Practice number 5200296

NATIONAL PRIORITY PROGRAMME

NHLS LAB NUMBER BARCODE

AAAA0001P



TB TESTS		TB DATA COLLECTION - DETAILS MUST BE COMPLETED	
<b>SUSPECTED TB (PRE-TREATMENT):</b> <input type="checkbox"/> TB GeneXpert R 173 <input type="checkbox"/> TB Microscopy R 24 <input type="checkbox"/> TB Culture > R 96 <input type="checkbox"/> Line Probe R 176		<b>SUSPECTED TB (PRE-TREATMENT):</b> DS: drug sensitive DR: drug resistant <b>Tick all that apply ✓</b> <input type="checkbox"/> Suspected <b>DS-TB</b> (not on treatment) <input type="checkbox"/> Suspected <b>DR-TB</b> (not on treatment) <input type="checkbox"/> Previously treated for <b>DS-TB</b> <input type="checkbox"/> Previously treated for <b>DR-TB</b>	
<b>ON TREATMENT (MONITORING)</b> <input type="checkbox"/> TB Microscopy R 24 <input type="checkbox"/> TB Culture > R 96 <b>FOLLOW UP:</b> <input type="checkbox"/> TB GeneXpert R 173 <b>DRUG SUSCEPTIBILITY TESTING:</b> 1st line (rifampicin and isoniazid) R 176 2nd line (amikacin, ofloxacin) R 71		<b>ON TREATMENT (MONITORING):</b> <b>Number of Months on Treatment</b> <input type="checkbox"/> <b>DS-TB</b> (on treatment) <input type="checkbox"/> 0-2months <input type="checkbox"/> 2-6months <input type="checkbox"/> > 6months <input type="checkbox"/> <b>DR-TB</b> (on treatment) <input type="checkbox"/> 0-2months <input type="checkbox"/> 2-6months <input type="checkbox"/> > 6months <input type="checkbox"/> <b>DS-TB</b> failing treatment or persistently smear-positive <input type="checkbox"/> 0-2months <input type="checkbox"/> 2-6months <input type="checkbox"/> > 6months <b>PATIENT'S HIV STATUS:</b> [Pos] <input type="checkbox"/> [Neg] <input type="checkbox"/> [Unknown] <input type="checkbox"/>	
HIV - SPECIFIC TESTS		HIV DATA COLLECTION - MUST BE COMPLETED	
P <input type="checkbox"/> CD4 (PLG) R 60	<b>If ordering CD4, please tick one category:</b> <b>A1</b> <input type="checkbox"/> First ever CD4 <b>A2</b> <input type="checkbox"/> CD4 taken previously, not yet in ART care <b>A3</b> <input type="checkbox"/> In ART care (please mark current drugs)		<b>Months on ARV treatment:</b> <b>C1</b> <input type="checkbox"/> Baseline / work-up <b>C2</b> <input type="checkbox"/> 6 months <b>C3</b> <input type="checkbox"/> 12 months <b>C4</b> <input type="checkbox"/> 24 months <b>C5</b> <input type="checkbox"/> 36 months <b>C6</b> <input type="checkbox"/> Other <b>Currently off ART due to:</b> <b>D1</b> <input type="checkbox"/> Adverse event <b>D2</b> <input type="checkbox"/> Non-adherence <b>D3</b> <input type="checkbox"/> Toxicity <b>D4</b> <input type="checkbox"/> Other
W <input type="checkbox"/> HIV Viral Load R 306	<b>If ordering HIV viral load, please tick one category:</b> <b>B1</b> <input type="checkbox"/> First ever viral load (paediatric) <b>B2</b> <input type="checkbox"/> Routine monitoring <b>B3</b> <input type="checkbox"/> Other (e.g., illness, virological failure)		<b>Current ARV drugs:</b> <input type="checkbox"/> FDC (Fixed dose combination) <input type="checkbox"/> AZT <input type="checkbox"/> 3TC <input type="checkbox"/> EFV <input type="checkbox"/> ABC <input type="checkbox"/> ddI <input type="checkbox"/> NVP <input type="checkbox"/> TDF <input type="checkbox"/> d4T <input type="checkbox"/> LPV/r <input type="checkbox"/> Other ARVs: _____
P <input type="checkbox"/> HIV PCR R 342	<b>If ordering HIV PCR, please answer:</b> Has mother received PMTCT? Yes <input type="checkbox"/> No <input type="checkbox"/> Has infant received PMTCT? Yes <input type="checkbox"/> No <input type="checkbox"/> Infant Breastfed in past 6 weeks? Yes <input type="checkbox"/> No <input type="checkbox"/>		<b>Previous ARV drugs:</b> <input type="checkbox"/> FDC (Fixed dose combination) <input type="checkbox"/> AZT <input type="checkbox"/> 3TC <input type="checkbox"/> EFV <input type="checkbox"/> ABC <input type="checkbox"/> ddI <input type="checkbox"/> NVP <input type="checkbox"/> TDF <input type="checkbox"/> d4T <input type="checkbox"/> LPV/r <input type="checkbox"/> Other ARVs: _____
P <input type="checkbox"/> HIV Serology R 50	<b>If ordering HIV Serology, please supply:</b> Clinic's HIV Rapid result (if Available): _____		
P <input type="checkbox"/> HIV Drug Resistance R 1872	<b>If ordering HIVDR, please tick one category and supply results:</b> <input type="checkbox"/> Baseline testing    HIV Viral Load Previous: _____ Date: _____ <input type="checkbox"/> 1st line failure    HIV Viral Load Latest: _____ Date: _____ <input type="checkbox"/> 2nd line failure    Latest CD4: _____ <input type="checkbox"/> 3rd line failure    Date: _____ <b>Please tick current and previous ARV drugs</b> According to National ARV guidelines virological failure is defined with 2 consecutive viral loads > 1000 cpi/ml at least 2 months apart.		

NHP 011



## 11.2 Figure 2: District Hospital Form



NATIONAL HEALTH LABORATORY SERVICE

### DISTRICT HOSPITAL

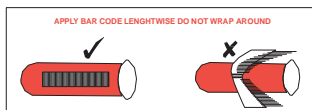
Including: National Priority Programme tests

NRF0201

From ABCD1234 - ABCD1334

#### INSTRUCTIONS TO COMPLETE THIS FORM

- 1 This NHLS request form indicates the State prices (2014) for tests, to the nearest Rand. (These are NOT private prices).
- 2 When completing the form, ensure that writing is legible, and all ticks are placed clearly in the tick boxes.
- 3 Please label all specimens with one of the peel-off pre-printed labels, *in addition* to the patient identification label.
- 4 Use the correct specimen tubes, according to the specimen key next to each test.
- 5 If TB or CCMT tests are requested, the Data Collection questions must be completed.



#### Specimen Key

Yellow (or red) with gel	Y
Red without gel	R
Green (heparin)	G
Grey (fluoride)	Grey
Purple (EDTA)	P
Blue (citrate)	B
Black (citrate)	BL
White (Plasma Preparation Tube)	W

Results: <http://196.7.68.30:8080/trakcarelab/default.html> <https://labresults.nhls.ac.za> Hotline: 0860 RESULT (737858)

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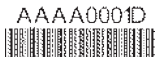


Practice number 5200296

DISTRICT HOSPITALS

MARK IF URGENT ☐

NHLS LAB NUMBER BARCODE



L O C	ONE / CLINIC / HOSP		SPECIMEN	
	WARD		ANATOMICAL SITE <b>E</b>	
	ASK APPROV. CODE		COLLECTION DATE <b>C</b>	
	COPY REPORT TO		TIME	
P A T I E N T	PATIENT ID NO		ID / Passport	
	HOSPITAL NUMBER		ICD10 DIAGNOSIS CODES	
	SURNAME		CLINICAL INFORMATION	
	FIRST NAME		MEDICATION	
H E A L T H C A R E	DATE OF BIRTH		AUTHORISATION NO	
	AGE		MEDICAL AID	
	SEX <b>M F</b>		MEDICAL AID NO	
	TITLE		DEP CODE	
PATIENT ADDRESS		MEMBER NAME		
PATIENT TEL NO		MEMBER ID NO		
CLINICIAN / HCW NAME		MEMBER ADDRESS		
IPSCA / SANC NO		MEMBER TEL NO		
PRACTICE NO		EMPLOYER		
CONTACT NO		MEMBERS SIGNATURE		
EMAIL ADDRESS		I consent to tests and take responsibility for payment of this account		
CLINICIAN'S SIGNATURE				

HAEMATOLOGY		CHEMICAL PATHOLOGY		SEROLOGY	
P <input type="checkbox"/> Full blood count	R 52	Y <input type="checkbox"/> Sodium	R 27	Grey <input type="checkbox"/> Glucose - fasting	R 27
P <input type="checkbox"/> Differential count	R 29	Y <input type="checkbox"/> Potassium	R 27	P <input type="checkbox"/> Glycated haemoglobin	R 77
P <input type="checkbox"/> Haemoglobin	R 16	Y <input type="checkbox"/> Creatinine	R 27	Y <input type="checkbox"/> TSH	R 128
P <input type="checkbox"/> White cell count	R 16	Y <input type="checkbox"/> ALT	R 41	Y <input type="checkbox"/> Free T4	R 113
P <input type="checkbox"/> Platelet count	R 19	Y <input type="checkbox"/> ALP	R 38	Y <input type="checkbox"/> PSA	R 117
B <input type="checkbox"/> INR	R 43	Y <input type="checkbox"/> Cholesterol	R 41	Urine <input type="checkbox"/> U protein:creat ratio	R 51
P <input type="checkbox"/> Rhesus factor	R 31	Y <input type="checkbox"/> Triglyceride	R 60	Urine <input type="checkbox"/> U albumin:creat ratio	R 53
P <input type="checkbox"/> Direct Coombs	R 31	Y <input type="checkbox"/> HDL cholesterol	R 52	Fluid <input type="checkbox"/> Fluid ADA	R 41
P <input type="checkbox"/> Malaria	> R 46	Y <input type="checkbox"/> C-reactive protein	R 66	Fluid <input type="checkbox"/> Fluid protein	R 23
<b>MICROBIOLOGY TESTS</b> <input type="checkbox"/> MC & S <input type="checkbox"/> Blood culture <input type="checkbox"/> Fungal microscopy & culture <input type="checkbox"/> Parasites Cryptococcal <input type="checkbox"/> antigen CSF cell count, <input type="checkbox"/> MC & S		<b>OTHER TESTS</b>  			

IMPUNITY\_00000101

NHP0201

FOR LABORATORY USE ONLY		
Yellow / Red with gel	Purple	Received
Red without gel	Grey	
White (PPT)	Blue	
Blood culture	Black	
Sterile screwtop tube	Green	Labelled
Specimen container	2BS	
Other		

NHLS LAB NUMBER

NHLS LAB NUMBER

PLEASE TEAR HERE PLEASE TEAR HERE PLEASE TEAR HERE PLEASE TEAR HERE PLEASE TEAR HERE



Practice number 5200296

NATIONAL PRIORITY PROGRAMME

NHLS LAB NUMBER BARCODE



TB TESTS		TB DATA COLLECTION - DETAILS MUST BE COMPLETED	
<b>SUSPECTED TB (PRE-TREATMENT):</b> <input type="checkbox"/> TB GeneXpert R 173 <input type="checkbox"/> TB Microscopy R 24 <input type="checkbox"/> TB Culture > R 96 <input type="checkbox"/> Line Probe R 176		<b>SUSPECTED TB (PRE-TREATMENT):</b> <b>DS: drug sensitive DR: drug resistant</b> <i>*Tick all that apply ✓</i> <input type="checkbox"/> Suspected <b>DS-TB</b> (not on treatment) <input type="checkbox"/> Suspected <b>DR-TB</b> (not on treatment) <input type="checkbox"/> Previously treated for <b>DS-TB</b> <input type="checkbox"/> Previously treated for <b>DR-TB</b>	
<b>ON TREATMENT (MONITORING):</b> <input type="checkbox"/> TB Microscopy R 24 <input type="checkbox"/> TB Culture > R 96 <b>FOLLOW UP:</b> <input type="checkbox"/> TB GeneXpert R 173 <b>DRUG SUSCEPTIBILITY TESTING:</b> 1st line (rifampicin and isoniazid) R 176 2nd line (amikacin, ofloxacin) R 71		<b>ON TREATMENT (MONITORING):</b> <b>Number of Months on Treatment</b> <input type="checkbox"/> <b>DS-TB</b> (on treatment) <input type="checkbox"/> 0-2months <input type="checkbox"/> 2-6months <input type="checkbox"/> > 6months <input type="checkbox"/> <b>DR-TB</b> (on treatment) <input type="checkbox"/> 0-2months <input type="checkbox"/> 2-6months <input type="checkbox"/> > 6months <input type="checkbox"/> <b>DS-TB</b> failing treatment or persistently smear-positive <input type="checkbox"/> 0-2months <input type="checkbox"/> 2-6months <input type="checkbox"/> > 6months	
		<b>COMMENTS:</b>  <b>PATIENT'S HIV STATUS:</b> Pos <input type="checkbox"/> Neg <input type="checkbox"/> Unknown <input type="checkbox"/>	
HIV - SPECIFIC TESTS		HIV DATA COLLECTION - MUST BE COMPLETED	
<b>P</b> <input type="checkbox"/> CD4 (PLG) R 60		<b>If ordering CD4, please tick one category:</b> <b>A1</b> <input type="checkbox"/> First ever CD4 <b>A2</b> <input type="checkbox"/> CD4 taken previously, not yet in ART care <b>A3</b> <input type="checkbox"/> In ART care (please mark current drugs)	
<b>W</b> <input type="checkbox"/> HIV Viral Load R 306		<b>If ordering HIV viral load, please tick one category:</b> <b>B1</b> <input type="checkbox"/> First ever viral load (paediatric) <b>B2</b> <input type="checkbox"/> Routine monitoring <b>B3</b> <input type="checkbox"/> Other (e.g., illness, virological failure)	
<b>P</b> <input type="checkbox"/> HIV PCR R 342		<b>If ordering HIV PCR, please answer:</b> Has mother received PMTCT? Yes <input type="checkbox"/> No <input type="checkbox"/> Has infant received PMTCT? Yes <input type="checkbox"/> No <input type="checkbox"/> Infant Breastfed in past 6 weeks? Yes <input type="checkbox"/> No <input type="checkbox"/>	
<b>P</b> <input type="checkbox"/> HIV Serology R 50		<b>If ordering HIV Serology, please supply:</b> Clinician's HIV Rapid result (if Available): _____ <b>If ordering HIVDR, please tick one category and supply results:</b> Baseline testing HIV Viral Load Previous: _____ Date _____ HIV Viral Load Latest: _____ Date _____ <input type="checkbox"/> 1st line failure Date: _____ <input type="checkbox"/> 2nd line failure Latest CD4: _____ <input type="checkbox"/> 3rd line failure Date: _____	
<b>P</b> <input type="checkbox"/> HIV Drug Resistance R 1872 <div style="border: 1px solid orange; padding: 5px; margin-top: 5px;">             HIV drug resistance genotype testing <b>will not be done</b> if the HIV status, results and treatment questions are not completed.              The DOH has approved HIV drug resistance genotype testing <b>only</b> for certain categories.           </div>		<b>Currently off ART due to:</b> <b>D1</b> <input type="checkbox"/> Adverse event <b>D2</b> <input type="checkbox"/> Non-adherence <b>D3</b> <input type="checkbox"/> Toxicity <b>D4</b> <input type="checkbox"/> Other <b>Current ARV drugs:</b> <input type="checkbox"/> FDC (Fixed dose combination) <input type="checkbox"/> AZT <input type="checkbox"/> 3TC <input type="checkbox"/> EFV <input type="checkbox"/> ABC <input type="checkbox"/> ddI <input type="checkbox"/> NVP <input type="checkbox"/> TDF <input type="checkbox"/> d4T <input type="checkbox"/> LPV/r Other ARVs: _____ <b>Previous ARV drugs:</b> <input type="checkbox"/> FDC (Fixed dose combination) <input type="checkbox"/> AZT <input type="checkbox"/> 3TC <input type="checkbox"/> EFV <input type="checkbox"/> ABC <input type="checkbox"/> ddI <input type="checkbox"/> NVP <input type="checkbox"/> TDF <input type="checkbox"/> d4T <input type="checkbox"/> LPV/r Other ARVs: _____	

According to National ARV guidelines virological failure is defined with 2 consecutive viral loads > 1000 cpi/ml at least 2 months apart.



# 11.3 Figure 3: Regional, Provincial and National Hospitals Form



## NATIONAL HEALTH LABORATORY SERVICE

NATIONAL HEALTH LABORATORY SERVICE

REGIONAL, PROVINCIAL & NATIONAL HOSPITALS

Including: National Priority Programme tests

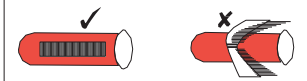
NRF0301

From ABCD1234 - ABCD1334

### INSTRUCTIONS TO COMPLETE THIS FORM

- 1 This NHLS request form indicates the State prices (2014) for tests, to the nearest Rand. (These are NOT private prices).
- 2 When completing the form, ensure that writing is legible, and all ticks are placed clearly in the tick boxes.
- 3 Please label all specimens with one of the peel-off pre-printed labels, *in addition* to the patient identification label.
- 4 Use the correct specimen tubes, according to the specimen key next to each test.
- 5 If TB or CCMT tests are requested, the Data Collection questions must be completed.

APPLY BAR CODE LENGTHWISE DO NOT WRAP AROUND



### Specimen Key

Yellow (or red) with gel	Y
Red without gel	R
Green (heparin)	G
Grey (fluoride)	Grey
Purple (EDTA)	P
Blue (citrate)	B
Black (citrate)	BL
White (Plasma Preparation Tube)	W

results: <http://196.7.68.30:8080/trakcarelab/default.html> <https://labresults.nhls.ac.za> Hotline: 0860 RESULT (737858)

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Practice number 5200296

HOSPITALS: REGIONAL AND ABOVE

MARK IF URGENT ☐

NHLS LAB NUMBER BARCODE



<b>L O C</b>	CHC / CLINIC / HOSP		<b>S P E C</b>	SPECIMEN		
	WARD			ANATOMICAL SITE		
	HQ APPROV CODE			COLLECTION DATE	TIME	
	COPY REPORT TO			COLLECTED BY		
<b>P A T I E N T</b>	PATIENT ID NO		<b>C L I N</b>	CLINICAL INFORMATION	ICD10 DIAGNOSIS CODES	
	HOSPITAL NUMBER					
	SURNAME					
	FIRST NAME			SEX	M	F
	DATE OF BIRTH	DD / MM / YYYY		AGE		
	RACE			TITLE		
<b>H C W</b>	PATIENT ADDRESS		<b>P R I V A T E</b>	MEDICATION	Warfarin    Heparin	
	PATIENT TEL NO	H    W    C		AUTHORISATION NO	FEE CLASS	
	CLINICIAN / HCW NAME			MEDICAL AID	PLAN	
	CLINICIAN / HCW NAME			MEDICAL AID NO	DEP CODE	
<b>A C C O U N T</b>	CLINICIAN / HCW NAME		<b>A C C O U N T</b>	MEMBER NAME		
	MPESA / SANC NO			MEMBER ID NO		
	PRACTICE NO			MEMBER ADDRESS		
	CONTACT NO			MEMBER TEL NO		
	EMAIL ADDRESS			EMPLOYER		
	CLINICIAN'S SIGNATURE			MEMBER'S SIGNATURE		

HAEMATOLOGY				CHEMICAL PATHOLOGY				SEROLOGY							
P	<input type="checkbox"/>	Full blood count	R 52	Y	<input type="checkbox"/>	Sodium	R 27	Y	<input type="checkbox"/>	Total bilirubin	R 32	Y	<input type="checkbox"/>	HIV serology	R 50
P	<input type="checkbox"/>	Differential count	R 29	Y	<input type="checkbox"/>	Potassium	R 27	Y	<input type="checkbox"/>	Conjugated bilirubin	R 36	Y	<input type="checkbox"/>	Syphilis serology	> R 18
P	<input type="checkbox"/>	Haemoglobin	R 16	Y	<input type="checkbox"/>	Chloride	R 20	Y	<input type="checkbox"/>	ALT	R 41	Y	<input type="checkbox"/>	Hepatitis B Surface Ag	R 113
P	<input type="checkbox"/>	White cell count	R 16	Y	<input type="checkbox"/>	Bicarbonate	R 38	Y	<input type="checkbox"/>	AST	R 41	Y	<input type="checkbox"/>	Hepatitis B Core Ab	R 113
P	<input type="checkbox"/>	Platelet count	R 19	Y	<input type="checkbox"/>	Urea	R 27	Y	<input type="checkbox"/>	ALP	R 39	Y	<input type="checkbox"/>		
B	<input type="checkbox"/>	INR	R 43	Y	<input type="checkbox"/>	Creatinine	R 27	Y	<input type="checkbox"/>	GGT	R 41				
P	<input type="checkbox"/>	PTT	R 47	Y	<input type="checkbox"/>	Corrected Calcium	R 63	Y	<input type="checkbox"/>	Cholesterol	R 41				
P	<input type="checkbox"/>	ESR	R 26	Y	<input type="checkbox"/>	Magnesium	R 27	Y	<input type="checkbox"/>	Triglyceride	R 60				
				Y	<input type="checkbox"/>	Inorganic phosphate	R 27	Y	<input type="checkbox"/>	C-reactive protein	R 66				
				Y	<input type="checkbox"/>	Uric Acid	R 29	Grey	<input type="checkbox"/>	TSH	R 158				
				Y	<input type="checkbox"/>	Total protein	R 23	Grey	<input type="checkbox"/>	Glucose - random	R 27				
				Y	<input type="checkbox"/>	Albumin	R 36	P	<input type="checkbox"/>	Glucose - fasting	R 27				
									<input type="checkbox"/>	Glucose - haemoglobin	R 77				

MICROBIOLOGY TESTS		OTHER TESTS	
<input type="checkbox"/>	MC & S	<input type="checkbox"/>	Parasites
<input type="checkbox"/>	Blood culture	<input type="checkbox"/>	Cryptococcal antigen
<input type="checkbox"/>	Fungal microscopy & culture	<input type="checkbox"/>	CSF cell count, MC & S

**For all TB and HIV - specific tests: TURN OVER FORM**

FOR LABORATORY USE ONLY		
Yellow / Red with gel	Purple	Received
Red without gel	Grey	
White (PPT)	Blue	
Blood culture	Black	
Sterile screwtop tube	Green	Labeled
Specimen container	DBS	
Other		

NHLS LAB NUMBER

NHLS LAB NUMBER

PLEASE TEAR HERE PLEASE TEAR HERE PLEASE TEAR HERE PLEASE TEAR HERE PLEASE TEAR HERE



Practice number 5200296

NATIONAL PRIORITY PROGRAMME

NHLS LAB NUMBER BARCODE

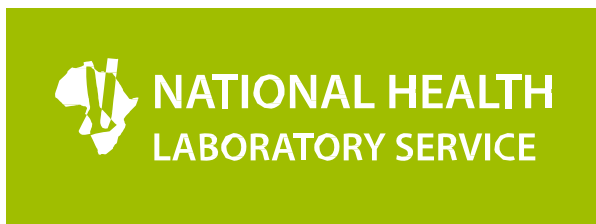
AAAA0001P



TB TESTS		TB DATA COLLECTION - DETAILS MUST BE COMPLETED	
<b>SUSPECTED TB (PRE-TREATMENT):</b> <input type="checkbox"/> TB GeneXpert R 173 <input type="checkbox"/> TB Microscopy R 24 <input type="checkbox"/> TB Culture > R 96 <input type="checkbox"/> Line Probe R 176		<b>SUSPECTED TB (PRE-TREATMENT):</b> DS: drug sensitive DR: drug resistant <i>Tick all that apply ✓</i> <input type="checkbox"/> Suspected <b>DS-TB</b> (not on treatment) <input type="checkbox"/> Suspected <b>DR-TB</b> (not on treatment) <input type="checkbox"/> Previously treated for <b>DS-TB</b> <input type="checkbox"/> Previously treated for <b>DR-TB</b>	
<b>ON TREATMENT (MONITORING)</b> <input type="checkbox"/> TB Microscopy R 24 <input type="checkbox"/> TB Culture > R 96 <b>FOLLOW UP:</b> <input type="checkbox"/> TB GeneXpert R 173 <b>DRUG SUSCEPTIBILITY TESTING:</b> 1st line (rifampicin and isoniazid) R 176 2nd line (amikacin, ofloxacin) R 71		<b>ON TREATMENT (MONITORING):</b> <b>Number of Months on Treatment</b> <input type="checkbox"/> <b>DS-TB</b> (on treatment) <input type="checkbox"/> 0-2months <input type="checkbox"/> 2-6months <input type="checkbox"/> > 6months <input type="checkbox"/> <b>DR-TB</b> (on treatment) <input type="checkbox"/> 0-2months <input type="checkbox"/> 2-6months <input type="checkbox"/> > 6months <input type="checkbox"/> <b>DS-TB</b> failing treatment or persistently smear-positive <input type="checkbox"/> 0-2months <input type="checkbox"/> 2-6months <input type="checkbox"/> > 6months <b>COMMENTS:</b>  <b>PATIENT'S HIV STATUS:</b> Pos <input type="checkbox"/> Neg <input type="checkbox"/> Unknown <input type="checkbox"/>	
HIV - SPECIFIC TESTS		HIV DATA COLLECTION - MUST BE COMPLETED	
P <input type="checkbox"/> CD4 (PLG) R 60  W <input type="checkbox"/> HIV Viral Load R 306  P <input type="checkbox"/> HIV PCR R 342  P <input type="checkbox"/> HIV Serology R 50  P <input type="checkbox"/> HIV Drug Resistance R 1872		<b>If ordering CD4, please tick one category:</b> A1 <input type="checkbox"/> First ever CD4 A2 <input type="checkbox"/> CD4 taken previously, not yet in ART care A3 <input type="checkbox"/> In ART care (please mark current drugs)  <b>If ordering HIV viral load, please tick one category:</b> B1 <input type="checkbox"/> First ever viral load (paediatric) B2 <input type="checkbox"/> Routine monitoring B3 <input type="checkbox"/> Other (e.g., illness, virological failure)  <b>If ordering HIV PCR, please answer:</b> Has mother received PMTCT? Yes <input type="checkbox"/> No <input type="checkbox"/> Has infant received PMTCT? Yes <input type="checkbox"/> No <input type="checkbox"/> Infant Breastfed in past 6 weeks? Yes <input type="checkbox"/> No <input type="checkbox"/>  <b>If ordering HIV Serology, please supply:</b> Clinic's HIV Rapid result (if Available): _____  <b>If ordering HIVDR, please tick one category and supply results:</b> <input type="checkbox"/> Baseline testing HIV Viral Load Previous: _____ Date: _____ <input type="checkbox"/> 1st line failure Date: _____ <input type="checkbox"/> 2nd line failure Latest CD4: _____ <input type="checkbox"/> 3rd line failure Date: _____  <b>Please tick current and previous ARV drugs</b> According to National ARV guidelines virological failure is defined with 2 consecutive viral loads > 1000 cpm/ml at least 2 months apart.	
<b>HIV drug resistance genotype testing will not be done</b> if the HIV status, results and treatment questions are not completed.  The DOH has approved HIV drug resistance genotype testing <u>only</u> for certain categories.		<b>Months on ARV treatment:</b> C1 <input type="checkbox"/> Baseline / work-up C2 <input type="checkbox"/> 6 months C3 <input type="checkbox"/> 12 months C4 <input type="checkbox"/> 24 months C5 <input type="checkbox"/> 36 months C6 <input type="checkbox"/> Other  <b>Currently off ART due to:</b> D1 <input type="checkbox"/> Adverse event D2 <input type="checkbox"/> Non-adherence D3 <input type="checkbox"/> Toxicity D4 <input type="checkbox"/> Other  <b>Current ARV drugs:</b> <input type="checkbox"/> FDC (Fixed dose combination) <input type="checkbox"/> AZT <input type="checkbox"/> 3TC <input type="checkbox"/> EFV <input type="checkbox"/> ABC <input type="checkbox"/> ddI <input type="checkbox"/> NVP <input type="checkbox"/> TDF <input type="checkbox"/> d4T <input type="checkbox"/> LPV/r <input type="checkbox"/> Other ARVs: _____  <b>Previous ARV drugs:</b> <input type="checkbox"/> FDC (Fixed dose combination) <input type="checkbox"/> AZT <input type="checkbox"/> 3TC <input type="checkbox"/> EFV <input type="checkbox"/> ABC <input type="checkbox"/> ddI <input type="checkbox"/> NVP <input type="checkbox"/> TDF <input type="checkbox"/> d4T <input type="checkbox"/> LPV/r <input type="checkbox"/> Other ARVs: _____	

NHP1201



**11.4** Figure 4: **Cytology Form**

NATIONAL HEALTH LABORATORY SERVICE

CYTOLOGY

A large white rectangular box is centered on the page, intended for patient identification details.

INSTRUCTIONS TO COMPLETE THIS FORM
<ol style="list-style-type: none"><li>1. When completing the form, ensure that writing is legible, and all ticks are placed clearly in the tick boxes.</li><li>2. Ensure that all mandatory and clinical history fields are completed in full.</li><li>3. Please label all specimen tubes, bottles or vials with one of the peel-off pre-printed labels, <i>in addition</i> to the patient identification label, EXCEPT for ready prepared slides, i.e. PAP smears; FNA smears, etc. which must be labeled by writing the patient details on the frosted-end of the slide with a pencil - NB. do NOT label slides with pre-printed labels.</li></ol>

P02A1395

Results: <http://196.7.68.30:8080/trakcarelab/default.html> <https://labresults.nhls.ac.za> Hotline: 0860 RESULT (737858)

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Practice number 5200296

NHLS LAB NUMBER BARCODE



## CYTOLOGY

<b>L O C</b>	CLINIC / CLINIC / HOSP			<b>S P E C I M E N</b>	SPECIMEN			
	WARD				ANATOMICAL SITE			
	AGK APPROV. CODE				COLLECTION DATE	TIME		
	COPY REPORT TO				COLLECTED BY			
<b>P A T I E N T</b>	PATIENT ID NO			<b>C L I N I C I A N</b>	CD10 DIAGNOSIS CODES			
	HOSPITAL NUMBER							
	SURNAME							
	FIRST NAME							
	DATE OF BIRTH	D D / M M / Y Y Y Y			SEX	M	F	
	RACE				TITLE			
<b>H C W</b>	PATIENT ADDRESS			<b>P R I V A T E</b>	AUTHORISATION NO			
	PATIENT TEL NO	H	W		C		FREE CLASS	
	CLINICIAN / HCW NAME				MEDICAL AD	PLAN		
	HPSCA / SANC NO				MEDICAL AD NO	DEP CODE		
	PRACTICE NO				MEMBER NAME			
	CONTACT NO				MEMBER ID NO			
EMAIL ADDRESS			MEMBER ADDRESS					
CLINICIAN'S SIGNATURE			MEMBER TEL NO					
			EMPLOYER					
			MEMBER'S SIGNATURE					

<b>SPECIMEN TYPE</b>	<b>PREVIOUS CYTOLOGY</b>	<b>PREVIOUS SURGERY / PATHOLOGY</b>	<b>RADIATION</b>
<input type="checkbox"/> CONVENTIONAL SMEAR <input type="checkbox"/> SELF COLLECTED SAMPLE <input type="checkbox"/> LBC <input type="checkbox"/> OTHER (please specify) _____	DATE ____ / ____ / ____ <b>Y N</b> CYTOLOGY NO: _____ CYTOLOGY DIAGNOSIS: _____	DATE ____ / ____ / ____ <b>Y N</b> SPECIMEN NO(S): _____ SPECIMEN TYPE: _____ DIAGNOSIS: _____	DATE ____ / ____ / ____ <b>Y N</b> AREA: _____ <b>CHEMOTHERAPY</b> DATE ____ / ____ / ____ <b>Y N</b> TYPE: _____

<input checked="" type="checkbox"/> <b>GYNAECOLOGICAL</b>		NUMBER OF SMEARS	<b>GENERAL CYTOLOGY</b>	
LMP DATE ____ / ____ / ____ CONTRACEPTION / HORMONES i.e. IUD, Pessary TYPE: <b>Y N</b> <input type="checkbox"/> PREGNANT WEEKS <input type="checkbox"/> POST PARTUM WEEKS <input checked="" type="checkbox"/> POSTMENOPAUSAL <input checked="" type="checkbox"/> POST MENOP. BLEED Period of bleeding: _____		RETRO VIRUS LABORATORY STAFF CODE <b>SYMPTOMATIC / DIAGNOSTIC</b> OR <b>CERVICAL SCREENING PROGRAMME</b>	<input checked="" type="checkbox"/> <b>ORIGIN OF SPECIMEN / ORGAN</b> <b>URINARY TRACT</b> <input type="checkbox"/> Bladder <input type="checkbox"/> Kidney <input type="checkbox"/> Ureter <input type="checkbox"/> Other: Specify _____ <b>RESPIRATORY</b> <input type="checkbox"/> Trachea <input type="checkbox"/> Bronchus <input type="checkbox"/> Lung <b>FLUID</b> <input type="checkbox"/> Pleural <input type="checkbox"/> Pericardial <input type="checkbox"/> Peritoneal <input type="checkbox"/> CSF <input type="checkbox"/> Other: Specify _____ <b>LYMPH NODES</b> <input type="checkbox"/> Supraclavicular <input type="checkbox"/> Cervical (Neck) <input type="checkbox"/> Axillary <input type="checkbox"/> Inguinal <input type="checkbox"/> Other: Specify _____	
<b>CONDITION OF CERVIX</b> <input type="checkbox"/> HEALTHY <input type="checkbox"/> INFLAMMATORY <input type="checkbox"/> SUSPECTED CA		<b>ORIGIN OF SMEAR / SPECIMEN</b> <input type="checkbox"/> Cervix <input type="checkbox"/> Endocervix <input type="checkbox"/> Vagina <input type="checkbox"/> Vault <input type="checkbox"/> Endometrium <input type="checkbox"/> Other: Specify _____	<b>HEAD AND NECK</b> <input type="checkbox"/> Mouth <input type="checkbox"/> Salivary Gland (Spec) <input type="checkbox"/> Larynx <input type="checkbox"/> Thyroid <b>GASTROINTESTINAL</b> <input type="checkbox"/> Oesophagus <input type="checkbox"/> Pancreas <input type="checkbox"/> Liver <input type="checkbox"/> Other: Specify _____ <b>BREAST</b> <input type="checkbox"/> Breast <input type="checkbox"/> Nipple discharge <input type="checkbox"/> Other (PLEASE SPECIFY) <input type="checkbox"/> Other e.g. Eye, Skin, Prostate, Hydrocoele, Testis, Ovary, Synovial, Bone, Soft tissue	

<b>CLINICAL DETAILS / SKETCH OF LESION</b>		<b>TYPE OF SPECIMEN</b>
DD MM CCYY CLINICIAN'S N E CLINICIAN'S SIGNATURE		<input type="checkbox"/> Sputum <input type="checkbox"/> Urine (voided) <input type="checkbox"/> Urine (catheter/scope) <input type="checkbox"/> Smear <input type="checkbox"/> Imprint <input type="checkbox"/> Washing / lavage <input type="checkbox"/> Brush <input type="checkbox"/> Suction aspiration <input type="checkbox"/> Fine needle aspiration (FNA) <input type="checkbox"/> Other: _____

LOC - Location detail - HCW - Healthcare Worker - SPEC - Specimen - CLIN - Clinical detail

POZAT355

CYTOLOGY REPORT: FOR LABORATORY USE ONLY									
<b>RECEIVED</b>  <b>DATE</b> <b>PREPARED BY</b>  <b>TIME</b>  <b>VOLUME</b>		<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">D</div> <div style="border: 1px solid black; padding: 2px;">D</div> <div style="border: 1px solid black; padding: 2px;">M</div> <div style="border: 1px solid black; padding: 2px;">M</div> <div style="border: 1px solid black; padding: 2px;">Y</div> <div style="border: 1px solid black; padding: 2px;">Y</div> </div>		<b>NUMBERS OF SLIDES</b> <b>PAP</b> <input type="checkbox"/> <b>MGG</b> <input type="checkbox"/> <b>H+E</b> <input type="checkbox"/> <b>SPECIAL STAINS:</b> <b>DATE</b> <div style="border-bottom: 1px solid black; width: 100%;"></div> <div style="border-bottom: 1px solid black; width: 100%;"></div>					
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		<div style="border: 1px solid black; padding: 2px; width: 100px; margin: 0 auto;">MACROSCOPIC APPEARANCE/QUALITY</div>							
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<b>GYNAE</b>					<b>NON-GYNAE</b>				
<b>SPECIMEN TYPE:</b> <input type="checkbox"/> CONVENTIONAL SMEAR <input type="checkbox"/> LBC <input type="checkbox"/> SELF COLLECTED SAMPLE <input type="checkbox"/> OTHER (please specify) _____  <b>SATISFACTORY FOR EVALUATION:</b> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">Y</div> <div style="border: 1px solid black; padding: 2px;">N</div> </div>					<b>CLINICAL HISTORY:</b> _____ _____ _____ _____				
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# SECTIONS 12.0

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## SPECIMEN COLLECTION CONTAINERS

## 12.0 SPECIMEN COLLECTION CONTAINERS

NHLS will provide selected specimen collection material. Examples of materials provided are shown in Figures 5-16 below. Please contact your local laboratory and inform them what materials you require, the contact details are in Table 1 on pages 17- 53. Please use the guidelines in Table 4 on page 207 so that the correct container can be used. Guidelines for specimen collection are provided in Section 13 from page 89 onwards. Please follow them to ensure that the laboratory provides you with reliable results.

### Examples of Materials for Specimen Collection



Figures 5-6. **Blood Culture Bottles and Blood Collection Tubes**



Figures 7-8. **Transport Medium Swabs**



Figures 9-11. **Slides and Slide Mailer/Container**



Figures 12-13. **Fixatives and Aylesbury Spatula**



Figures 14-15. **Universal Containers**



Figure 16: **Histology Specimen Container**



# SECTIONS 13.0

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## GENERAL SPECIMEN COLLECTION GUIDELINES



## 13.0 GENERAL SPECIMEN COLLECTION GUIDELINES

Several essential steps are required for successful sample collection:

- Identify the patient.
- Assess the patient's physical general condition (e.g. hydration, nutrition, stress).
- Complete the request form, including requested tests, patient information, and confirm the need for any special requirements.
- Prepare the necessary equipment and the patient.
- Collect the sample in the appropriate specimen container at the required volume and with appropriate mixing if required.
- Discard all collection material into appropriate waste containers.
- Label the collection container with a patient ID label or handwritten information at the patient's side.
- Assess the need for specimen re-collection and/or possible rejection.
- Recognise complications associated with the collection procedure and manage accordingly.
- Promptly send the specimens with the request form to the laboratory.

### 13.1 Patient Identification

#### Verbal identification

- Greet the patient and identify yourself.
- Ask the patient to state his/her full name. Always ask patients to state their names.  
Never ask, "Are you John Smith?"
- Remember that many patients have a tendency to say yes to anything in the outpatients setting.
- Ask the patient's date of birth and ask them to spell their names if you want to query the patient's identity.

#### Verifying identification

Examination of any of the following should follow verbal identification:

- Identity book.
- Wrist band: All information on the wristband should match the details provided on the request form. Note: a wristband lying on the bedside table may NOT be used for identification.
- Ankle band: used for paediatric patients and newborns
- Hospital/clinic card/book.
- Bed Number: a bed number on the request form cannot be used to identify ward patients.

- Hospital card/book: should be inspected to confirm the patient's name, hospital number and date of birth.

## 13.2 Completing the Request Form

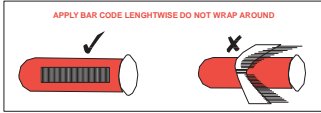
Complete the test request form as described in Section 11 on page 69.

## 13.3 Collecting the Specimen

Specimens should be collected according to the guidelines set out in the appropriate sections in this manual, including any specific volume or transport requirements as stated in Table 4 on page 207. Any specimens that require invasive sampling techniques should be conducted with the appropriate clinical consultation.

## 13.4 Labeling of Primary Specimens

- Please ensure that samples are properly labeled with adequate information that ensures that the specimen is traceable to the patient and the accompanying request form.
- Bar-coded stickers can be used to label specimens; alternatively, the patient's name and surname can be written on the specimen. Refer to the correct procedure for bar code labeling below.

INSTRUCTIONS TO COMPLETE THIS FORM															
<ol style="list-style-type: none"> <li>1 This NHLS request form indicates the <u>State</u> prices (2014) for tests, to the nearest Rand. (These are NOT private prices).</li> <li>2 When completing the form, ensure that writing is legible, and all ticks are placed clearly in the tick boxes.</li> <li>3 Please label all specimens with one of the peel-off pre-printed labels, <i>in addition</i> to the patient identification label.</li> <li>4 Use the correct specimen tubes, according to the specimen key next to each test.</li> <li>5 If TB or CCMT tests are requested, the Data Collection questions must be completed.</li> </ol>															
<p>APPLY BAR CODE LENGTHWISE DO NOT WRAP AROUND</p> 	<p><u>Specimen Key</u></p> <table> <tbody> <tr> <td>Yellow (or red) with gel</td> <td>Y</td> </tr> <tr> <td>Red without gel</td> <td>R</td> </tr> <tr> <td>Green (heparin)</td> <td>G</td> </tr> <tr> <td>Grey (fluoride)</td> <td>Grey</td> </tr> <tr> <td>Purple (EDTA)</td> <td>P</td> </tr> <tr> <td>Blue (citrate) Black (citrate)</td> <td>B BL</td> </tr> <tr> <td>White (Plasma Preparation Tube)</td> <td>W</td> </tr> </tbody> </table>	Yellow (or red) with gel	Y	Red without gel	R	Green (heparin)	G	Grey (fluoride)	Grey	Purple (EDTA)	P	Blue (citrate) Black (citrate)	B BL	White (Plasma Preparation Tube)	W
Yellow (or red) with gel	Y														
Red without gel	R														
Green (heparin)	G														
Grey (fluoride)	Grey														
Purple (EDTA)	P														
Blue (citrate) Black (citrate)	B BL														
White (Plasma Preparation Tube)	W														

- All slides and smears must be marked with the patient's Details on frosted ends with a pencil or bar coded sticker.

**NOTE:** Please ensure that the sticker does not cover the entire container, as the laboratory staff must be able to inspect the contents of the container

## 13.5 Specimen Rejection Criteria

- Please ensure that all the specimens are collected and transported correctly. This will allow proper diagnostic testing to be done by the laboratory.

The following are examples of specimens that are unacceptable for testing:

- **Unlabeled** or improperly labeled specimen
- Specimens received in **leaking**, cracked or broken containers
- Specimens **not appropriate** for a particular test
- Specimens with obvious (visually, apparent) **contamination**
- Expired tubes or other collection device
- Incorrect temperature and/or packaging of specimen
- Stability of the analyte in the specimen has been exceeded (specimen is too old upon receipt)
- Incomplete request forms
- Inadequate volume or overfilling of specimen container (See figure 17 – 19 on page 94)
- Incorrect specimen container or tube
- Request form not included with the specimen
- Specimen not included with the request form
- Specimen identification is missing or incorrect or does not correlate with the information on request form
- Specimen insufficient for testing
- Specimen haemolysed
- Specimen clotted

Specimens may also be rejected if the specific conditions for that particular test listed in Table 5 on page 241 are not met.

Exceptions to rejection of samples may be made for critical samples e.g. CSF, tissue, after consultation with the responsible health care worker.

### Examples of inadequate volume or overfilling of tubes:



Figure 17. Mini collect/Paediatric clotted (yellow top) tubes – Insufficient/underfilled and normal or sufficient serum



Figure 18. Mini collect/Paediatric EDTA (purple top) tubes – insufficient/underfilled, sufficient and overfilled



Figure 19. Adult sodium citrate (blue top) tubes for coagulation studies – underfilled, overfilled and normal filled

## 13.6 Specimen Packaging

- Always use sealable plastic bags with a separate pouch for the laboratory request form.
- The specimen must be placed in the sealed bag and the form in the outer pouch of the bag. More than one specimen from the same patient can be placed in one bag, but ONLY from that same patient.

## 13.7 Specimen Transport

Arrangements have been made with different facilities for specimen transport to the laboratory. Ensure that the specimens are transported in the conditions as described in Table 4 on page 207 under the specific test requested. All specimens are to be placed in the containers provided by the laboratory. These are then taken to the laboratories by different methods depending on the arrangements with the facility:

- Delivered by hospital staff members
- Collected by NHLS messengers and delivered to the laboratory following a specific schedule.
- Collected by drivers either employed by the NHLS or a courier company contracted by the NHLS and delivered to the laboratory following a specific schedule.

## 13.8 Multiple Specimens

Please submit a separate specimen for tests that are processed in different sections of the laboratory, for example CD4 and HIV viral load testing require separate specimens.

- Failure to do this may lead to any of the following:
  - Delay in results as some tests may have to wait for others to be completed before being done.
  - Possibility of errors due to aliquoting.
  - Possibility of inadequate specimen volume preventing all the requested tests to be done thus delaying patient management when another specimen must be sent at a later stage.
  - Please do not transfer specimens from one collection container to another as this may lead to the mixing of additives or preservatives.
  - Please ensure that all specimens are properly sealed to avoid leaking in transit.
  - A red biohazard sticker or label must be used on all specimens from patients suffering from or suspected of having infectious diseases that may put laboratory staff at risk e.g. Viral Haemorrhagic Fever. Please contact the laboratory BEFORE specimen collection in order to establish the correct procedure.





# SECTIONS 14.0

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## SAFETY AND INFECTION CONTROL



## 14.0 SAFETY AND INFECTION CONTROL

Due to contact with sick patients and their specimens, it is important to follow safety and infection control procedures.

### PROTECT YOURSELF

#### 14.1 Practice Universal Precautions

- Wear gloves and a lab coat or gown when handling blood/body fluids.
- Change gloves after each patient or when contaminated.
- Wash hands frequently, at least after each patient.
- Dispose of all items in the appropriate waste containers.
- Dispose of needles in a sharps container immediately upon removal from the patient's vein. Do not bend, break, or recap needles to avoid accidental needle puncture or splashing of contents.
- Clean up any blood spills or any other potentially infectious specimens with a suitable disinfectant such as freshly made 10% bleach.

#### 14.2 If You Stick Yourself with a Contaminated Needle

- Remain calm.
- Remove your gloves and dispose of them and the contaminated needle properly in the appropriate waste container.
- Squeeze puncture site to promote bleeding.
- Wash the area well with soap and water.
- Record the patient's name and ID number.
- Follow your institution's needle stick injury guidelines regarding further treatment and follow-up.

#### 14.3 Protect the Patient

- Place blood collection equipment away from patients, especially children and psychiatric patients.
- When wearing gloves, change them between each patient and wash or disinfect your hands frequently.



# SECTIONS 15.0

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## BLOOD SAMPLE COLLECTION PROCEDURE



## 15.0 BLOOD SAMPLE COLLECTION PROCEDURE

The procedure below is to be followed for collection of all specimens where blood has to be collected for testing in all disciplines of the laboratory, e.g. Chemical Pathology (Chemistry), Haematology, Immunology, Microbiology, Serology and Virology.

Please follow the guidelines given in Table 5 on page 241 on the type of tube to be used and the instructions to follow for each test.

Before drawing blood for an HIV screening test, counseling should be done by the relevant Health Care Practitioner from either the Department of Health or Private Sector. Counseling records are kept in the patient's file.

### 15.1 Venipuncture Procedure

The venipuncture procedure is complex, requiring both knowledge and skill to perform. Each phlebotomist generally establishes a routine that is comfortable for her or him. Several essential steps are required for every successful collection procedure:

- Identify the patient.
- Assess the patient's physical general condition (e.g., hydration, nutrition, stress).
- Check the request form for requested tests, patient information and any special requirements.
- Prepare the equipment, the patient and the puncture site.
- Perform the venipuncture.
- Collect the sample in the appropriate tube to the required filling level and with appropriate mixing.
- Label the collection tubes with patient ID label or handwritten information at the bedside or in the drawing area in the presence of the patient.
- Assess the need for sample re-collection and/or rejection.
- Recognise complications associated with the phlebotomy procedure and manage accordingly.
- Promptly send the specimens with the request form to the laboratory.

### 15.1.1 Order of Draw

Blood collection tubes must be drawn in a specific order to avoid cross-contamination of additives between tubes. The recommended order of draw is:

1. **First draw:** blood culture bottles
2. **Second draw: non-additive tube (clear top)**
3. **Third draw:** coagulation tube (blue top). A sodium citrate (blue top) tube should preferably NEVER be the first tube drawn. If a coagulation assay is the only test ordered, draw a clotted sample first and discard this sample.
4. **Fourth draw:** clotted tube (red or yellow top) and non-additive tube (clear top)
5. **Last draw:** additive tubes in this order
  - Heparin (dark green top)
  - EDTA (purple top)
  - PPT (pearl top) ACD (pale yellow)
  - Fluoride oxalate (grey top)
  - ACD tube









**NOTE:** Tubes with additives must be thoroughly mixed (by gentle inversion and not shaking). Erroneous test results may be obtained when the blood is not thoroughly mixed with the additive, especially tests for Haematology. Overzealous mixing also results in haemolysis. Certain tests cannot be performed accurately in the presence of haemolysis.

**WARNING:** Do not pour contents from one tube into another as this will cause cross contamination of additives, which may cause erroneous test results.

### 15.1.2 Venipuncture Site Selection

- Although the larger and fuller median cubital and cephalic veins of the arm are used most frequently, wrist and hand veins are also acceptable for venipuncture. If other sites are needed, they should be done with clinical consultation.
- Certain areas are to be avoided when choosing a site:
  - **Extensive scars from burns and surgery:** it is difficult to puncture the scar tissue and obtain a specimen.
  - **The upper extremity on the side of a previous mastectomy:** test results may be affected because of lymphoedema.

Figure 20. Order of Draw and Appropriate Sample Tubes

Collection Tube	Additive	Tests	Special instructions
<b>Blood cultures - SPS</b>			Volume stated on bottle – Adult: 5 – 10 ml; Paediatric: 1 – 5 ml <b>Invert 8 – 10 times after sampling</b>
<b>Blue Top</b> 	Sodium Citrate	Coagulation tests e.g. INR, PTT, fibrinogen & D-dimer	<b>Full draw required</b> (Volume stated on tube – Adult tube: 3.2 ml; Paediatric tubes: 1.8 ml OR 0.9 ml) <b>Invert gently 3 – 4 times</b>
<b>Red Top</b> 	Clot activator, silicon coated (plastic)	Most clinical chemistry, serology, immunology & toxicology	<b>Cannot be used for CSF specimens</b> Invert 5 times after sampling
<b>Yellow Top</b>   <b>Red/Gray</b>	Serum Separating Tube (SST) – clot activator & gel	Most clinical chemistry, serology, immunology & toxicology	Invert 5 times after sampling to ensure mixing of clot activator & blood
<b>Clear Top</b> 	No Additives	To be used for sterile fluids, aspirates & CSF specimens OR as a discard tube	
<b>Green Top</b>  	Sodium or lithium heparin (light green with gel)	Certain clinical chemistry tests e.g. Troponin T & ammonia, genetic studies & flow cytometry	Invert 8 times after sampling to ensure mixing of anticoagulant with blood to prevent clotting
<b>Purple/Lavender Top</b> 	K <sub>2</sub> EDTA	Certain haematology, clinical chemistry, toxicology & virology	Invert 8 times after sampling to ensure mixing of anticoagulant with blood to prevent clotting
<b>Pearl/White Top</b> 	Plasma preparation tube (PPT) – K <sub>2</sub> EDTA with gel	HIV viral load	Invert 8 times after sampling to ensure mixing of anticoagulant with blood to prevent clotting
<b>Black Top</b> 	Sodium citrate (buffered)	Erythrocyte sedimentation rate (ESR)	<b>Full draw required</b> Invert 8 times after sampling to ensure mixing of additives with blood
<b>Grey Top</b> 	Sodium fluoride & potassium oxalate or Na <sub>2</sub> EDTA	Glucose & lactate	<b>Full draw required</b> Invert 8 times after sampling to ensure mixing of additives with blood

PLEASE NOTE that the colour of the collection tube top may vary slightly between different manufacturers. Please select collection tubes according to the desired additive.

- **Haematoma:** may cause erroneous test results. If another site is not available, collect the specimen distal to the haematoma.
- **Intravenous therapy (IV)/blood transfusions:** fluid may dilute the specimen, so collect from the opposite arm if possible. Otherwise, satisfactory samples may be drawn below the IV by following these procedures:
  1. Turn off the IV for at least 2 minutes before venipuncture.
  2. Apply the tourniquet below the IV site. Select a vein other than the one with the IV.
  3. Perform the venipuncture. Draw 5 ml of blood and discard before drawing the specimen tubes for testing.
- **Cannula/fistula/heparin lock:** hospitals have special policies regarding these devices. In general, blood should not be drawn from an arm with a fistula or cannula without consulting the attending physician.
- **Oedematous extremities:** tissue fluid accumulation may alter test results.

### 15.1.3 Procedure for Vein Selection

- Palpate and trace the path of veins with the index finger. Arteries that pulsate are most elastic and have a thick wall. Thrombosed veins lack resilience, feel cord-like and roll easily.
- If superficial veins are not readily apparent, you can force blood into the vein by massaging the arm from wrist to elbow. Tap the site with the index and second finger, apply a warm, damp washcloth to the site for 5 minutes, or lower the extremity over the bedside to allow the veins to fill.

### 15.1.4 Performance of a Venipuncture

- Approach the patient in a friendly, calm manner. Provide for their comfort as much as possible, and gain the patient's co-operation.
- Identify the patient correctly.
- Practice Universal Infection control precautions as described under Safety and Infection Control (Section 14 on page 99).
- Properly fill out the appropriate request form, indicating the test(s) ordered.
- Verify the patient's condition. Fasting, dietary restrictions, medications, timing, and medical treatment are all of concern and should be noted on the lab request form.
- Position the patient. The patient should sit in a chair, lie down or sit up in bed. Carefully hyperextend the patient's arm.

**In the event of a dispute concerning this document, the electronic version stored on Q-Pulse will be deemed to be the correct version**

Figure 21.

**QUICK GUIDE TO PERFORMANCE OF A VENIPUNCTURE****Always use universal safety precautions.**

1. Collect supplies



2. Put tourniquet on patient about 7.5 – 10 cm above venipuncture site



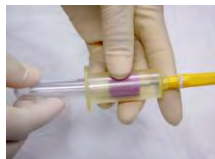
3. Have patient form a fist so veins are more prominent



4. After palpating the path of the vein, clean the venipuncture site with holder alcohol using a circular motion. Allow the area to dry.



5. Assemble needle and vacuum tube



6. Insert the collection tube into the holder until the tube reaches the needle



7. Remove cap from needle



8. Use your thumb to draw skin tight about 2.5–5 cm below the venipuncture site. Hold skin tight through Step 9



9. Insert the needle, bevel side up, into the vein

- Apply the tourniquet 7.5-10 cm above the selected puncture site. Do not place too tightly or leave on for more than 2 minutes.
- The patient should make a fist without pumping the hand.
- Select the venipuncture site.
- Prepare the patient's arm using an alcohol prep. Cleanse in a circular fashion, beginning at the site and working outward. Allow to air dry.
- Grasp the patient's arm firmly using your thumb to draw the skin taut and anchor the vein. The needle should form a 15 to 30 degree angle with the surface of the arm. Swiftly insert the needle through the skin and into the lumen of the vein. Avoid excessive trauma and probing.
- When the last tube to be drawn is filling, remove the tourniquet.
- Remove the needle from the patient's arm using a swift backward motion.
- Press down on the gauze once the needle is out of the arm, applying adequate pressure to avoid the formation of a haematoma.
- Dispose of needle in the sharps container **WITHOUT RECAPPING**.
- Dispose of contaminated materials/supplies in the designated waste containers.
- Have the patient hold a small gauze pad over the puncture site for a couple of minutes to stop the bleeding. Cover the puncture site with sterile gauze, held in place with an elastic plaster.
- Mix and label all appropriate tubes at the patient bedside. Label the tubes with the appropriate patient information as described in Section 13.4 on page 92.
- Send specimens to the laboratory immediately.

**NOTE** on special handling requirements: Some specimens need to be immediately transported to the laboratory under special conditions, e.g. ammonia and serum osmolality on ice-water and cryoglobulins at 37 °C (the specimen tube is best transported under the axilla to maintain temperature). Refer to the complete test list in Table 5 for full details of other analytes which may require special transport conditions.

## 15.2 Additional Considerations

### 15.2.1 Tourniquet Use

- The primary effect is haemoconcentration of non-filterable elements (i.e. proteins). The hydrostatic pressure causes some water and filterable elements to leave the extracellular space.

- Affects packed cell volume (PCV) and other cellular elements.

The following serum chemistry tests can be affected by tourniquet use which should, therefore, be minimised:

- Lactate
- Potassium
- Total protein
- Iron
- Cholesterol
- Triglycerides
- Bilirubin
- Aspartate aminotransferase

### **15.2.2 How to Prevent a Haematoma**

- Puncture only the uppermost wall of the vein.
- Remove the tourniquet before removing the needle.
- Use the major superficial veins.
- Make sure the needle fully penetrates the upper-most wall of the vein. Partial penetration may allow blood to leak into the soft tissue surrounding the vein by way of the needle bevel.
- Apply pressure to the venipuncture site after sample collection.

### **15.2.3 How to Prevent Haemolysis**

- Mix tubes with anticoagulant additives gently 5-10 times.
- Avoid drawing blood from a haematoma.
- Avoid drawing the plunger back too forcefully, if using a needle and syringe, and avoid frothing the sample.
- Use appropriate needle gauge (bore) size for the age of the patient.
- Make sure the venipuncture site is dry.
- Avoid a probing, traumatic venipuncture.

### **15.2.4 Indwelling Lines or Catheters**

- Potential source of test error.
- Most lines are flushed with a solution of heparin to reduce the risk of thrombosis.
- Discard a sample at least three times the volume of the line before a specimen is obtained for analysis.

### 15.2.5 Haemoconcentration

An increased concentration of larger molecules and formed elements in the blood may be due to several factors:

- Prolonged tourniquet application (no more than 2 minutes).
- Massaging, squeezing, or probing a venipuncture site.
- Sclerosed or occluded veins.

## 15.3 Patient Preparation Factors

- **Therapeutic drug monitoring:** different pharmacological agents have different patterns of administration, body distribution, metabolism, and elimination that affect the drug concentration as measured in the blood. Many drugs will have “peak” and “trough” levels that vary according to dosage levels and intervals. Check for timing instructions in Table 4 for drawing the appropriate samples. Timing of phlebotomy relative to drug dosing must be stated on the request form.
- **Effects of exercise:** Muscular activity has both transient and longer lasting effects. Creatine kinase (CK), aspartate aminotransferase (AST), lactate dehydrogenase (LDH), troponin, lactate and platelet count may be affected.
- **Stress:** May cause transient elevation in white blood cells (WBC's) and elevated adrenal hormone values (cortisol and catecholamines). Anxiety that results in hyperventilation may cause acid-base imbalances.
- **Diurnal rhythms:** Diurnal rhythms are body fluid and analyte fluctuations during the day. For example, serum cortisol levels are highest in early morning but are decreased in the afternoon. Serum iron levels tend to drop during the day. You must check the timing of these variations for the desired collection point.
- **Posture:** Postural changes (supine to sitting etc.) are known to influence laboratory results of some analytes. Certain larger molecules are not filterable into the tissue; therefore they are more concentrated in the blood. Enzymes, proteins, lipids, iron, and calcium are significantly increased with changes in position.
- **Other factors:** Age, gender, menstrual cycle and pregnancy have an influence on laboratory testing. Normal reference ranges are often noted according to age and gender, and therefore it is crucial to supply this information on the request form.

## 15.4 Factors Affecting Results

A variety of factors associated with specimen collection may influence laboratory results:

- Tourniquet application (for certain analytes)
- Incorrect collection tube selection
- Toppling between different collection tubes
- Incorrect order of the draw
- Incorrect sample volume
- Delay in analysis (refer to Table 4 on page 207 for individual analyte details)
- Incorrect transport conditions (refer to Table 4 on page 207 for individual analyte details)

## 15.5 Troubleshooting Guidelines

- If an incomplete collection or no blood is obtained:
  - Change the position of the needle. Move it forward (it may not be in the lumen of the vein) or move it backward (it may have penetrated too far).
  - Adjust the angle (the bevel may be against the vein wall).
  - Loosen the tourniquet. It may be obstructing blood flow.
  - Try another tube. There may be no vacuum in the one being used.
  - Re-anchor the vein. Veins sometimes roll away from the point of the needle and puncture site.
- If the blood stops flowing into the tube:
  - The vein may have collapsed - re-secure the tourniquet to increase venous filling. If this is not successful, remove the needle, take care of the puncture site, and redraw from a new site.
  - The needle may have pulled out of the vein when switching tubes. Hold equipment firmly and place fingers against patient's arm, using the flange for leverage when withdrawing and inserting tubes.
- Problems other than an incomplete collection:
  - A haematoma forms under the skin adjacent to the puncture site; release the tourniquet immediately and withdraw the needle. Apply firm pressure and redraw from a new site.
  - The blood is bright red (arterial) rather than venous (dark red). Apply firm pressure to the puncture site for more than 5 minutes.

## 15.6 Performance of a Fingerprick

- Follow the procedure as outlined above for greeting and identifying the patient. As always properly fill out the appropriate request form, indicating the test(s) ordered.
- Verify the patient's condition. Fasting, dietary restrictions, medications, timing, and medical treatment are all of concern and should be noted on the laboratory request form.
- Practice Universal Infection control precautions as described in Section 14.1 on page 99. Position the patient. The patient should sit in a chair, lie down or sit up in bed.
- The best locations for performing a fingerprick are the 3rd and 4th fingers of the non-dominant hand. Do not use the tip of the finger or the centre of the finger. Avoid the side of the finger where there is less soft tissue, where vessels and nerves are located, and where the bone is closer to the surface. The 2nd (index) finger tends to have thicker, callused skin. The fifth finger tends to have less soft tissue overlying the bone. Avoid puncturing a finger that is cold or cyanotic, swollen, scarred, or covered with a rash.
- Clean skin with an alcohol prep and allow to dry.
- Using a sterile lancet, make a skin puncture just off the centre of the finger pad. The puncture should be made perpendicular to the ridges of the fingerprint so that the drop of blood does not run down the ridges.
- Wipe away the first drop of blood, which tends to contain excess tissue fluid.
- Collect drops of blood into the collection device by gently massaging the finger. Avoid excessive pressure that may squeeze tissue fluid into the drop of blood.
- Cap, rotate and invert the collection device to mix the blood collected.
- Have the patient hold a small gauze pad over the puncture site for a couple of minutes to stop the bleeding.
- Dispose of contaminated materials/supplies in designated waste containers.
- Label all tubes with the appropriate information at the patient's bedside. Label the tubes with the patient's name and hospital/clinic number.
- Send specimens to the laboratory immediately.

Figure 22.

**FINGER PRICK**

Always use universal safety precautions.



1. Collect supplies.



2. Position hand palm-side up. Choose whichever finger is least calloused.



3. Apply intermittent pressure to the finger to help the blood to flow.



4. Clean the fingertip with alcohol. Start in the middle and work outward to prevent contaminating the area. Allow the area to dry.



5. Hold the finger and firmly place a new sterile lancet off-center on the fingertip.



6. Firmly press the lancet to puncture the fingertip.



7. Wipe away the first drop of blood with a sterile gauze pad or cotton ball.



8. Collect the specimen. Blood may flow best if the finger is held lower than the elbow.



9. Apply a gauze pad or cotton ball to the puncture site until the bleeding stops.



10. Properly dispose of all contaminated supplies.



Use of trade names and commercial sources is for identification only and does not imply endorsement by WHO, the Public Health Service, or by the U.S. Department of Health and Human Services (2005).



## 15.7 Blood Collection in Babies (Heel Prick)

- In most circumstances, the recommended location for blood collection on a newborn baby or infant is the heel.
- Pre-warming the infant's heel (42° C for 3 to 5 minutes) is important to obtain capillary blood for blood gas samples and warming greatly increases the flow of blood for collection of other specimens. However, do not use too high a temperature warmer, because a baby's skin is thin and susceptible to thermal injury.
- Clean the site to be punctured with an alcohol prep. Dry the cleaned area with a dry cotton swab. Hold the baby's foot firmly to avoid sudden movement.
- Using a sterile blood lancet, puncture the side of the heel. Do not use the central portion of the heel because you might injure the underlying bone, which is close to the skin surface. Do not use a previous puncture site. Make the cut across the heelprint lines so that a drop of blood can well up and not run down.
- Wipe away the first drop of blood with a piece of clean, dry cotton. Since newborns do not often bleed immediately, use gentle pressure to produce a rounded drop of blood. Do not use excessive pressure or heavy massaging because the blood may become diluted with tissue fluid.
- Fill the capillary tube(s) or micro collection device(s) as needed following the recommended order of the draw (see Section 15.1.1.1 on page 106).
- When finished, elevate the heel, place a piece of clean, dry cotton on the puncture site, and hold it in place until the bleeding has stopped.
- Be sure to dispose of the lancet in the appropriate sharps container. Dispose of contaminated materials in appropriate waste containers. Remove your gloves, dispose appropriately and wash your hands.
- Label all tubes with the appropriate information at the patient's side.
- Send specimens to the laboratory immediately.





# SECTIONS 16.0

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## ANATOMICAL PATHOLOGY



## 16.0 ANATOMICAL PATHOLOGY

### 16.1 Routine Histopathology

#### 16.1.1 General

- The Anatomical Pathology Department offers a comprehensive tissue diagnostic service. All specimens must be submitted in 10% buffered formal saline (formalin). The ratio of formalin to tissue should be 10:1 volume.
- URGENT specimens should be marked accordingly to allow for priority processing.
- Specimens from patients with potential biohazards (e.g. HIV, Hepatitis B, Hepatitis C) should be labeled appropriately.
- All specimens should be submitted with full patient demographic details including the surname of the patient, the first name of the patient, the hospital number of the patient, the age and sex of the patient as well as the referring clinician's name, Practitioner number, location, and if possible, a contact phone number. In addition all specimens should be submitted with as much detailed clinical information as possible. This expedites diagnosis.

#### 16.1.2 Frozen Sections

- All routine frozen sections as well as emergency, frozen sections must be arranged with the pathologist on emergency duty who will ensure that the emergency team is ready to receive the specimen.
- Frozen sections must be booked by contacting the administrative office.
  - The administrative clerk will require details such as patient name, hospital number, site of biopsy, requesting clinician and expected date and time of arrival of the frozen biopsy to record the booking.
  - All prior biopsy numbers must also be provided and it is advisable to book at least one day in advance.
  - The consulting pathologist must be contacted for the clinical discussion.
- If the clinical grounds for a frozen section are altered or the frozen section is cancelled, this must be conveyed to the pathologist office.
- The tissue for frozen section must NOT be submitted in a fixative.

## 16.1.3 Special Biopsies

### 16.1.3.1 MUSCLE BIOPSY

- Diagnostic appraisal of muscle biopsy requires 3 specimens, one each for light microscopy, enzyme studies and electron microscopy.
- All muscle biopsies must be submitted on cardboard on stretch and NONE of these must be immersed in saline.
  - All light microscopy specimens must be submitted in 10% buffered formalin.
  - For enzyme studies, specimens must be wrapped in saline-moistened gauze and placed in an appropriately sized container which must be transported on wet ice.
  - For electron microscopy, the specimen must be submitted in 4% glutaraldehyde fixative (See Table 3 on page 123).
    - Glutaraldehyde fixative has a shelf life of 14 days from the date indicated on the container
- The fixatives (formalin and glutaraldehyde) may be obtained by contacting the laboratory.

### 16.1.3.2 RENAL BIOPSY

- Diagnostic appraisal of renal biopsy requires 3 specimens, one each for light microscopy, immunofluorescence and electron microscopy.
- NONE of these are submitted immersed in saline.
- All light microscopy specimens must be submitted in Bouin's fixative.
- For immunofluorescence, specimens must be submitted in Michel's medium (pH7.2) and for electron microscopy; specimens must be submitted in 4% glutaraldehyde fixative (See Table 3 on page 123).
  - The fixatives (Bouin's, glutaraldehyde and Michel's medium) may be obtained by contacting the laboratory.

### 16.1.3.3 NERVE BIOPSY

- Diagnostic appraisal of nerve biopsy requires 2 specimens, one each for light microscopy and electron microscopy.
- Nerve biopsies must be submitted on cardboard on stretch.
- The specimen for light microscopy must be submitted in 10 % buffered formalin and the specimen for electron microscopy must be submitted in 2.5 % glutaraldehyde fixative (See Table 3 on page 123).

### 16.1.3.4 SKIN BIOPSY

- Diagnostic appraisal of a skin biopsy most often requires a single specimen for light microscopy submitted in 10 % buffered formalin.
- Should immunofluorescence be required an additional specimen in Michel's medium must be submitted (Table 3 below).
- Michel's medium must be kept at room temperature and has a shelf life of 6 months from the date indicated on the container.

### 16.1.3.5 BIOPSIES FOR HISTOCHEMISTRY IN THE CASE OF PATIENTS WITH HIRSCHSPRUNG DISEASE

Obtain tissue by suction of rectal biopsy or full thickness of rectal biopsy. Put on a gauze to avoid folding of the strip of tissue and immediately fixing a 10% buffered formalin.

**Table 3. Fixatives for special biopsies**

Special biopsy	Light microscopy	Electron microscopy	Immunofluorescence	Enzyme Histo
Muscle	10% Buffered formalin	4% Gluteraldehyde	-	Saline Moistened Gauze
Nerve	10% Buffered formalin	2.5% Gluteraldehyde	-	-
Renal	Bouin's fixative	4% Gluteraldehyde	Michel's medium	-
Skin	10% Buffered formalin	-	Michel's medium	-

### 16.1.4 Postmortem Examination

All potential autopsies should be discussed with the pathologist in charge of the autopsy service. Autopsies on persons who died of unnatural causes must be performed by a Government Pathologist and will thus be referred to the Government Mortuary for autopsy.

### **16.1.5 Electron Microscopy**

Specimens specifically intended for electron microscopy should be submitted in glutaraldehyde fixative. Containers are available directly from the laboratory on request. Tissue to be submitted must be no more than 1 x 1x 1cm cubes.

### **16.1.6 Immunohistochemistry**

The laboratory does a range of more than 120 immunohistochemical stains used for diagnostic as well as for prognostic purposes. Oestrogen receptor and progesterone receptor stains, as well as proliferation markers and diagnostic markers such as Cerb B2 are stocked. Although the use of these is usually at the discretion of the pathologist, they can be performed upon request.

### **16.1.7 Histology Polymerase Chain Reaction**

PCR for B-cell and T-cell gene rearrangement is offered on tissue specimens, as well as for mycobacterial DNA, EBV, HPV, synovial sarcoma, Bartonella and HHV8 DNA. These can be performed on request. Please contact the PCR laboratory.

### **16.1.8 Urgent Specimens**

Small biopsies, submitted urgently, before 12h00 can be processed rapidly on request with a 4-5 hour turnaround time, and a result can be given within 5 hours; however this is not recommended as a routine as the morphology is not well preserved.

## 16.2 Cytology

### 16.2.1 General

#### 16.2.1.1 REQUISITION FORM

- Fill in the cytology requisition form accompanying the specimen, with full demographic details and the following required information:
  - Nature of specimen
  - Adequate history including relevant previous investigations and treatment e.g. previous radiotherapy
  - Previous histology and cytology reference numbers

***Please note that the laboratory is legally entitled to return specimens that do not have these details legibly supplied.***

#### 16.2.1.2 SPECIAL INSTRUCTIONS

- Please discuss urgent cases with the cytology laboratory, as these will only be done by prior arrangement. Please refer to Table 1 on page 17 - 53 for the relevant contact numbers.
- If more than one investigation is to be done, (e.g. pleural fluid for Cytology and TB culture) please submit separate containers (where possible).
- It is very important that slides prepared by the clinician e.g. pap smears or gastric brushings are fixed promptly and correctly to optimise cytodiagnosics. Please see (Addendum I page 129) on correct fixation of specimens.

### 16.2.2 Cytological Tests

#### 16.2.2.1 FEMALE GENITAL TRACT

- Cervical smear
- Vaginal smear
- Vault smear
- Endocervical smear
- Endometrial smear
- Vulval smear

**Follow all instructions and filling clearly and adequately as per Cytology request form:**

- Please see Addendum II: "Sample technique to yield adequate smears"

Figure 23. Supplies for cytology smears



## 16.2.3 Non-gynaecological/General Cytology

### 16.2.3.1 RESPIRATORY SYSTEM

- Sputum
- Bronchial washings
- Tracheal aspirates
- Nasal smears
- Bronchiolar-alveolar lavage (BAL)
- Pharyngeal brushings
- Antral aspirates/sinus washings

Figure 24-25. **Supplies for respiratory specimens**



45 ml screw top



45 ml tube

### SPUTUM

Submit sputum after an early morning deep cough to ensure that sputum, and not saliva, is collected.

- Collect 6 sputa on consecutive days — 6 specimens on the same day do not yield equivalent results.
- State clearly if the patient is a smoker or asthmatic.
- State clearly if the patient has been treated with positive pressure oxygen.

- Label the specimen containers and complete the cytology request form.
- Give the patient clear instructions on how to produce a specimen as shown in Figure 27 on page 133.
- Use the supplied universal containers
  - The specimen container must be tightly capped and clearly labeled. (This should be done by the health care professional requesting the specimen, and should include the relevant clinical information as well as the diagnostic tests required.)
  - The specimen should be transported to the laboratory as soon as possible after collection.
  - If there is a delay in transport to the laboratory, for example from an outside clinic, then specimens should be refrigerated.

## DO NOT FREEZE SPECIMENS

### 16.2.3.2 FLUIDS

- Pleural
  - Peritoneal
  - Pericardial
  - Hydrocoele
  - Cerebrospinal fluid
  - Cyst fluid
  - Amniotic fluid
  - Peritoneal washings
  - Endometrial fluid
  - Ventricular fluid
- Ensure that fluids reach the laboratory as soon as possible as degenerate fluids are not suitable for accurate cytodiagnosis. Please preserve fluids in 90% alcohol if a delaying transit is anticipated.
  - Cerebrospinal fluid must reach the cytology laboratory on the day of collection, preferably within 4 hours of collection.
  - If a clot forms in the fluid, it will be sectioned and examined. A separate report will be issued.
  - If the fluid has been obtained during an intra-operative procedure, please state this clearly on the requisition slip.

### 16.2.3.3 CEREBROSPINAL FLUID

- Follow instructions for completing request form in Section 16.2.1.1 on page 125.
- Follow same procedures as described on page 162.
- Use plain tube for collection.

### 16.2.3.4 GASTRO-INTESTINAL TRACT

- Oesophageal brushing
- Gastric brushings
- Duodenal brushings
- Ampullary brushings
- Pancreatic duct aspirates
- Bile duct aspirates
- Bile duct brushings
- Colonic brushings
- It is very important that the clinician fixes the slides immediately (within 10 sec) with cytology spray fixative to prevent the degeneration of cells as this compromises cytodiagnosis. (Please see Addendum I on correct fixation of specimens).

### 16.2.3.5 UROGENITAL TRACT

- Voided urine (**Note that 24 hour urine collections are unsuitable for cytodiagnosis**)
- Catheterised urine
- Ureteric urine
- Renal cyst aspirate
- Renal pelvis brushings
- Urethral smear
- State clearly if the patient has recently:
  - undergone catheterization
  - undergone cystoscopy
  - undergone retrograde radiography
- Cells in urine deteriorate rapidly. Specimens must reach the laboratory within 24 hours.

## Addendum I. PROPER FIXATION TECHNIQUE

1. Air-drying of a specimen causes distortion and loss of cytoplasmic density. Crisp nuclear chromatic patterns are lost and the cytoplasm cannot be coloured properly. Hence **rapid fixation** is a vital step in cytological preparations. When the clinician is preparing a slide e.g. pap smear or bronchial, oesophageal or gastric brushings, the smear should be made in one direction with one motion and the doctor should avoid the same area twice. **All prepared slides should be sprayed with cytological fixative immediately** to prevent specimen degeneration.
2. Check expiry date on spray fixative.

## Addendum II. SAMPLING TECHNIQUE TO YIELD ADEQUATE SMEARS

1. Prepare consumables for sampling.
2. Prepare the patient.
3. Have a good light source.
4. Spread labia and insert the speculum correctly (speculum can be dry or moisten with saline or water).
5. Insert speculum dry or moisten with saline (not tap water).
6. Visualise entire cervix.
7. Remove any obscuring discharge and excess blood.
8. Use Aylesbury spatula to sample the cervical material.
9. Apply firm pressure and rotate spatula more than 360 degrees.
10. Apply material uniformly along the length of a slide & not onto the frosted end.
11. Fix rapidly with spray fixative (within 10 seconds).
12. Allow fixative to air-dry.
13. Package slide correctly into the slide container.

### Should you make use of a cervibrush:

- Insert into os.
- Sample the entire transformation zone by rolling the brush shaft between your thumb and forefinger while turning the brush 360°, 5x in a clockwise direction. Maintain gentle pressure. Spread the collected sample on the entire length of the clear slide with one side of the brush. Turn the brush over and again spread the material on the entire length of the slide. **Please note:** Smears made by each side of the brush should slightly overlap.
- Spray fix immediately (within 10 seconds).
- Allow slide to dry (after fixation) before packing to send off.

### How to visualise the cervical os when not seen:

- Ask the patient to cough or push or bear down.
- Put a pillow or a rolled towel under the pelvic area at the back.
- Rotate speculum / Cusco up or down or sideways to locate the cervix until the cervical os is visualised.
- For obese patients, use condom over the Cusco or speculum [which is cut on top] to prevent the fat tissue falling on the vaginal pathway thus obscuring the cervix.

### 16.2.3.6 THE BREAST

- Nipple discharge
- Nipple smears
- Breast aspirates

### 16.2.3.7 FINE NEEDLE ASPIRATION (FNA)

The cytology department may provide 2 FNA services:

- **Impalpable/Deep/Image-guided FNAs**

- Contact the radiologist to arrange for the procedure.
- Please note that cystic lesions cannot be processed on site.

- **Superficial or Palpable Lesions**

**Fine Needle Aspiration Biopsy Clinics**

- In many regions/hospitals there is a clinic which provides an FNA service staffed by the NHLS.
- For the location and hours of these clinics please contact the local cytology laboratory.
- Patients who are on oxygen, receiving blood products or are too ill to be transported by wheelchair to the clinic will be aspirated in the ward. No patient with stridor or respiratory distress and no child under the age of 13 years will be aspirated in the clinic.
- Please contact the clinic/pathologist to arrange for these procedures to be done in the ward/outpatient clinic.
- Send the bedletter with the patient (if an in-patient) or a note with the clinical history and referring doctor / contact telephone number (if an out-patient).
- Please make every effort to ensure the patient has his FNA before admission.
- Indicate clearly the area to be aspirated (preferably mark the lesions on the patient to ensure the correct site is aspirated).
- Please inform us if the patient has undergone previous FNA's.
- If a booked FNA is cancelled, inform us well in advance.
- If you cannot refer a patient to an FNA clinic run by the Cytopathology unit, see the technique of fine needle aspiration below.
- Training on the correct technique of FNA is available from the NHLS cytology laboratories.

### 16.2.3.7.1 FNA Collection Procedure

(Please note that this procedure is for palpable lesions and NOT for deep-seated lesions, which should be conducted under radiological guidance)

The patient is booked for the procedure to be collected.

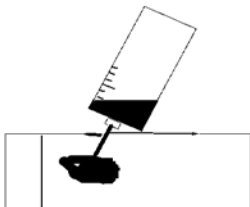
- Identify yourself and explain the procedure to the patient.
- Check the patient's file or doctor's request note to establish the site of the lesion and to check the patient's identity.
- Record the clinical information, patient's information, the aspirators name, site of the lesion and the number of passes and number of slides on the request form.
- Follow instructions for completing the request form in Section 16.2.1.1 on page 125.

#### How to Prepare the Smear

- Label all slides (on the frosted portion) in pencil with the patient's name or hospital number. **(Note: Do not label slides with barcodes. Put barcodes on slide container.)**
- Examine the nature of the lesion i.e. solid, cystic, mobile etc.
- Clean the overlying skin with antiseptic.
- Mobilise the lesion with two fingers to lessen the movement of the lesion when it is pricked.
- Pull the plunger back no more than 1ml, not directly in the centre of the lesion to avoid necrotic material. (Please note that aspirates from children as well as all thyroid should be done with a 23 gauge needle.)
- Insert the sterile 22 gauge (or 23 gauge as noted above) needle with an attached 10 or 20ml syringe into the lesion (not directly in the centre of the lesion) with the dominant hand while the mass is stabilized with the non-dominant hand.
- The syringe-piston retracted to approximately the 5ml mark to produce and maintain a negative pressure.
- Move the needle up and down and around in all angles to loosen the cells.
- The needle is moved in various directions to sample cells from different areas of the mass while maintaining the negative pressure.
- Do not allow the needle to leave the lesion.
- Allow the plunger to return to its original position when only the nub of the syringe is filled with aspirate material. Withdraw after releasing the plunger.
- Withdraw the needle and disconnect the syringe.
- Fill the syringe with air and reconnect to the syringe.

- Express the material/aspirate onto the slide NEAR to the frosted end (Figure 26 below) while holding the needle the prevent it from being disconnected from the syringe if the needle is blocked.
- Place the second slide on the first, and gently but firmly allow the material to spread to the edges (Figure 26 below).
- Pull the 2 slides apart keeping them firmly but gently completely apposed (Figure 26 below).

Figure 26. **Deliver material on slide**



- Hold the slide horizontally (if the slide is held at an angle, the material may be sprayed off the slide), and the aerosol spray fixative 17-22 cm from the glass slide. Spray-fix the first slide, and allow the second one to air-dry.
- Clearly mark the slides as to which is fixed and which is air-dried.
- Repeat the procedure if needed.
- Fix slides immediately.
- Figure 27 on page 133 shows prepared FNA slide smear.
- Label all slides (on the frosted portion) in pencil with the patient's name or hospital number. (**Note: Do not label slides with barcodes. Put barcodes on slide container.**)
- If TB is suspected clinically, rinse the needle and syringe in TB Transport medium (available from certain NHLS cytology laboratories) or in sterile saline and send for mycobacterial culture and /or GeneXpert.
- After the procedure, discard the needle into a sharps-container, and apply plaster on the needle hole of the patient.
- Inform the patient where and when to get their results.
- Send the sample and the request form to the laboratory for processing and diagnosis.

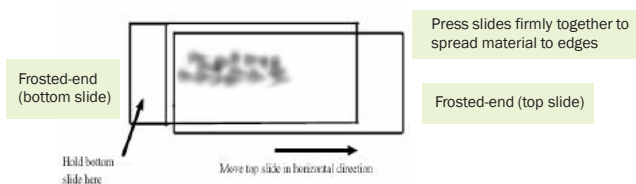
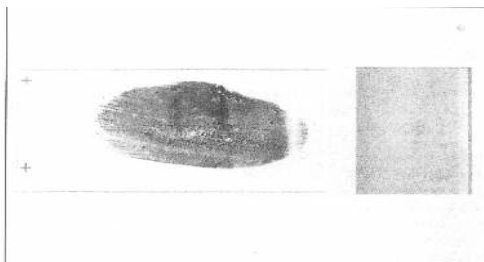
Figure 27. **Put slides together**Figure 28. **Example of a prepared smear**

Figure 1.5  
Stained smear showing appearance of properly smeared specimen with good distribution of material.

### 16.2.3.8 SPECIAL INVESTIGATIONS

Special stains are available e.g. Ziehl-Neelson for mycobacteria, silver stains for fungi etc. Other special investigations available include immunocytochemistry, and flow cytometry. Please note that these special stains will only be requested by the pathologist based on the relevant clinical information supplied by or in consultation with the clinician.

### 16.2.3.9 ORAL AND MAXILLOFACIAL PATHOLOGY

The discipline offers the following services:

- Surgical pathology diagnoses: including biopsies and other tissue specimens (e.g. resections) from the oral cavity, jawbones and surrounding anatomical regions. Kindly refer to the description of the routine diagnostic service in Anatomical Pathology for further details and the array of special services offered. Please submit whenever possible a (panoramic) radiograph and/or CT scans for accurate diagnosis of bone lesions. **NOTE: that frozen sections on bony specimens are not possible.**
- Microscopic examination of oral mucosa surface brushings to detect fungal infection and bacterial overloads can be performed. Kindly sample with a cervi-brush and submit exfoliative smears (on glass slides fixed with cytospray or alcohol) to the anatomical pathology laboratory with the specific request to stain for PAS.
- On-site clinical and radiological consultations in oral mucosal diseases and jaw lesions on request.
- Punch and/or scalpel biopsies, surface cytology brushings/modified deep (semi- invasive) cytology sampling for oral mucosal lesions and fine needle aspirations/core needle biopsies of oral deep soft tissues can be performed under local anaesthesia in the FNA clinic.





# SECTIONS 17.0

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## CHEMISTRY / CHEMICAL PATHOLOGY



## 17.0 CHEMISTRY/CHEMICAL PATHOLOGY

### 17.1 Sample Types

#### 17.1.1 Fasting Blood Samples

- A variety of tests require prior fasting:
  - Glucose (e.g. fasting plasma glucose, oral glucose tolerance test)
  - Triglycerides
  - Lipid electrophoresis
  - Gastrin
  - Xylose absorption test
- Collect the blood specimens using the guidelines in Section 15 on page 103 and in Table 5 on page 241.
- Complete the request form and follow instructions for completing the request form on in Section 11 on page 72.
- For all tests that require fasting, the patient should be fasted for at least 8–12 hours beforehand.
- Some fasts may require close clinical monitoring such as the elderly, acutely ill patients and babies.
- If patients cannot go without water, sips of water may be taken during the fast.

#### 17.1.2 Random Urine Sample

- Urine should be collected into appropriately labeled sterile universal specimen containers supplied by the laboratory.
- For sample collection for urine culture refer to Section 19.11 on 175 for special instructions
- Some urine tests may require additives as indicated in Table 4 on page 207. Please note that some additives may be corrosive and/or toxic.
- Some urine specimens may need to be transported immediately to the laboratory on ice as indicated in Table 5 on page 241.

#### 17.1.3 24-Hour Urine Collection

- The 24 hour collection container should be collected from the laboratory and labeled with appropriate patient identification.
- Instructions for 24 hour urine collection for the patient:
  - Void (discard) first morning urine

— Collect all urine passed for 24 hours including the first morning urine of the next day into a small clean container and after each void carefully transfer contents into the 24 hour urine container

— Return the 24 hour urine container to the clinic after completing the collection

- Some urine collections may need to be stored in the refrigerator or on ice until delivery to the laboratory (see Table 5 on page 241).
- Some urine collections require an accompanying serum sample, for example creatinine clearance (see Table 5 on page 241).
- **Some urine collections may require additives as indicated in Table 5 on page 241. Please note: some additives may be corrosive and/or toxic.**

#### 17.1.4 Cerebrospinal Fluid (CSF)

- Please follow collection instructions in Section 19.3 on page 162.
- Tubes:

— Microbiology: collection tube containing no additives

— Protein, chloride: collection tube containing no additives

— Glucose: grey top tubes

**NOTE:** CSF collected in grey top tubes cannot be used for chloride measurement, a separate tube without additives (red top) is required.

- For certain investigations, paired samples are required, for example:
  - CSF glucose: a CSF and a blood sample are needed, both in grey top tubes

(**NOTE:** must be in separate grey top tubes)

— CSF IgG index and assessment for oligoclonal banding (in suspected multiple sclerosis): a CSF sample (collection tube without additives) and a clotted blood sample (red or yellow top tube) must be collected at the same time.

#### 17.1.5 Stones

- Collect specimen and put in a dry container.
- Please send stone intact; do not reduce or sample.
- Do not send more than one stone per anatomical site.

### 17.1.6 Fluids

- Tubes:
  - Microbiology: collection tube without additives
  - Fluid chemistry: collection tube without additives
  - Glucose: grey top tubes

### 17.1.7 Stool

- Collect into a sterile universal container. Refer to Table 5 on page 241 for specific test-related stool collection instructions.
- Some tests can only be performed on diarrhoeal stools, for example stool osmolality.
- Some tests require paired samples, a clotted blood sample (red or yellow top tube) and the stool sample, for example alpha-1 antitrypsin inhibitor clearance.
- Some tests require timed collections, for example alpha-1 antitrypsin inhibitor clearance.
- Some tests require shipment to the laboratory on ice, for example stool osmolality.

### 17.1.8 Saliva

See Table 5 on page 241 for saliva collection for cortisol determination.

## 17.2 Special Instructions

### 17.2.1 Oral Glucose Tolerance Test

- Take note of medication known to affect glucose tolerance e.g. corticosteroids, oestrogen and thiazide diuretics.
- Perform test after 3 days of unrestricted diet, containing at least 150 g of carbohydrate per day, and an overnight fast (at least 8 hours).
- Patients should sit quietly for 30 minutes prior to and for the duration of the test. Smoking, walking/exercise, food or drinking (other than water) should be avoided.
- Take baseline/fasting glucose sample (grey top) and immediately send for analysis.
- A fasting glucose of  $\geq 7.0$  mmol/l is diagnostic for diabetes mellitus in adults, pregnant women and children. Consider discontinuing the test.
- Non-pregnant adults and pregnant women: a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in 250 ml water is ingested over 5min.

- Children: 1.75 g/kg anhydrous glucose dissolved in water to a maximum of 75 g is ingested over 5 minutes.
- Timing commences at the initiation of drinking the glucose load.
- Due to the risk of skin contamination with glucose, discard used gloves and wash hands including those of the patient.
- Repeat a glucose measurement 2 hours post glucose load.
- See <http://www.semdsa.org.za/> for current guidelines and interpretation of results.

### 17.2.2 Blood Gas Analysis

- Arterial puncture to facilitate the collection of a whole blood specimen carries a slight medical risk and should not be undertaken by anyone who has not been properly trained to perform it.
- Arterial collection of blood is suitable for all acid-base derangements, while venous blood only allows for metabolic abnormalities.
- When collecting venous blood, prolonged application of a tourniquet will decrease venous  $pO_2$  and pH.
- Arterial<sup>2</sup> and venous specimens are best collected anaerobically with lyophilised heparin anticoagulant in sterile syringes. If preheparinised syringes are unavailable, then liquid balanced heparin may be used. The syringe should contain only enough heparin to wet the wall and fill the dead space occupied by the hub.
- Exposure of arterial blood to the atmosphere causes a decrease in  $pCO_2$ , an increase in pH and an increase in  $pO_2$  in a patient breathing room air.
- Error can be minimized if any air bubbles in the syringe are expelled immediately upon removing the needle from the puncture site.
- The needle should be safely disposed of in a sharps container and a tightly fitting cap placed on the tip of the syringe to maintain anaerobic conditions.
- The effects of glycolysis and respiration on pH,  $PO_2$ ,  $PCO_2$ , glucose and lactate are best prevented by submerging the blood gas syringe in a mixture of ice and water and performing analysis within 30 minutes of collection.
- Please state clearly on the request form whether the sample is arterial or venous in origin.

### 17.2.3 Aldosterone and Renin

- The following factors should be noted when preparing patients for investigation for hyperaldosteronism:

- Patients should maintain liberal dietary salt intake prior to testing.
- Hypokalaemia should be corrected with supplemental potassium chloride tablets prior to testing (the absence of hypokalaemia does in no way exclude primary hyperaldosteronism).
- The following drugs may confound interpretation of results and should be discontinued before further investigation:
  - At least 4 weeks before testing: diuretics (including spironolactone).
  - At least 2 weeks before testing:  $\beta$ -blockers, clonidine, methyl-dopa, non-steroidal anti-inflammatories, ACE inhibitors, angiotensin II receptor blockers and dihydropyridine calcium channel blockers.
  - The best drugs to use in the interim are prozasin or verapamil slow-release.
  - After discontinuation of the above mentioned drugs, it is recommended that serum creatinine and electrolytes are repeated.
  - Contraceptive agents (which may influence results) are not withdrawn unless confident of alternative effective contraception.
- Minimum sample volumes: aldosterone 1.5 ml and renin 1.8 ml (avoid haemolysis).

#### **17.2.4 Urinary Vanillyl Mandelic Acid (VMA), Metanephrines and Plasma Catecholamines**

- It is recommended that all medication (in particular anti-hypertensives, anti-inflammatory, anti-histamines, and aminophylline/theophylline) should be discontinued for 3 days prior to and during 24-hour urine collection.
- Most anti-hypertensives cause falsely increased values. The following are contra-indicated due to analytical interference (this is method dependent) and should be replaced by alternatives: ACE-inhibitors, methyl-dopa,  $\beta$ -blockers.
- The following anti-hypertensives are preferred because they do not cause falsely elevated values: clonidine or guanethidine.
- Taper and discontinue treatment with the following psycho-active drugs two weeks before assessment: tricyclic anti-depressants, MAOI's, phenothiazines and lithium.
- Patients should avoid caffeine and nicotine 2 days before and during the 24 hour urine collection.

- The 24-hour urine collection containers can be obtained from the laboratory prior to the collection. The container must be acidified with hydrochloric acid.
- Supply 3 consecutive 24 hour urine collections (acidified, see Table 5 on page 241).
- For fractionated plasma catecholamines add stabilizer to sample (see Table 5 on page 241).
- **Please note all current medication on the request form.**

### 17.2.5 Urine 5-HIAA (5-Hydroxy-Indoleacetic Acid)

- The 24 hour urine collection containers can be obtained from the laboratory prior to the collection.
- Urine should be collected into a dark container, and the specimen refrigerated during collection.
- Patients should avoid dietary sources of 5-hydroxyindoles (e.g. walnuts, bananas, avocados, egg-plant, pineapples, plums and tomatoes) 3-4 days before and during 24-hour urine collection.
- It is recommended that the following medication should be discontinued for 3 days prior to and during 24-hour urine collection: L-dopa, methyl-dopa, isoniazid, imipramine, MAOI's, phenothiazines, reserpine, cough and cold preparations containing guaiphenesin or glycerol guaiacolate.
- Essential medication should be replaced by suitable alternatives.
- Please note all current medication on the request form.

### 17.2.6 Prolactin

The following drugs may cause increased prolactin levels:

- Dopamine receptor antagonists, e.g. phenothiazines, metoclopramide, sulpiride
- Dopamine depleting agents, e.g. methyl-dopa, reserpine
- Oestrogens
- H2-receptor blockers, e.g. cimetidine
- Tricyclic antidepressants

### 17.2.7 Lactate

- Patient should be at absolute rest for 2 hours before blood is drawn.
- Patient may not move hand or arm immediately before or during the procedure.

- A tourniquet should preferably not be used, but if one is used it should only be applied for 30 seconds. If applied longer, the tourniquet should be removed with the needle still in the vein and the blood allowed to circulate for at least 2 minutes before the sample is collected.
- Discard the first 2ml of blood.

### **17.2.8 Porphyrins**

- All specimens (EDTA [purple top] blood, urine and stool) should be collected, if clinically relevant, during an acute exacerbation and must be protected from light during collection and transport.
- Please indicate clearly on the request form the presence of skin lesions, abdominal complaints or neurological features in the clinical presentation as this will assist in the interpretation of the results.

### **17.2.9 Alpha-1 Antitrypsin Clearance**

- Obtain a pre-weighed container from the laboratory. Collect a 24-hour stool specimen and, during the collection, a clotted (red or yellow top) blood specimen.

### **17.2.10 Aluminum Serum and Urine Sample Collection**

- The use of a stainless steel needle for the collection of blood should be avoided to minimise contamination. An acceptable alternative is the use of a polypropylene intravenous cannula.
- Phlebotomy should be performed with a syringe, the blood transferred into trace element tubes (royal blue top, additive free) and left standing to form a clot.
- The tubes are spun and serum transferred with a plastic pipette to other clean plastic tubes before being sent to the referral laboratory for analysis. Polypropylene tubes are recommended for use; glass and rubber stoppers should be avoided.
- The use of anticoagulants is very problematic and can cause contamination, as most of them are either metal chelators or polyanions. Therefore, no serum separators or anticoagulants should be used.
- All polythene plastic containers that are used for the collection of urine should be acid washed before use. For further handling of the sample powder-free gloves must be worn.
- Likely sources of contamination for aluminum samples come from water, dust and reagent acids.

### 17.2.11 Xylose Absorption Test

- Adults and children: 24 hours prior to the test no food high in pentoses such as fruits, jams, jellies and pastries should be consumed.
- Patient preparation (25 g load):
  - Adults: Fast overnight (>8 hours), may drink water.
  - Children: Fast for >4 hours.
- Following morning:
  - Draw blood for fasting xylose (grey top tube).
- Just prior to administering xylose, patient should empty bladder, then:
  - Adults: 25 g xylose in 250 ml water orally.
  - Children: 0.5 g/kg xylose in water orally, maximum 25 grams.
- During the test patients may rest in a chair or bed, and drink water as desired, but smoking is prohibited.
- Draw blood for xylose analysis:
  - Adults: 2 hours after taking xylose (grey top tube)
  - Children: 1 hour after taking xylose (grey top tube)
- Collect urine (into a dark bottle) for 5 hours starting with ingestion of xylose.
- Side effects of 25 g xylose: nausea, abdominal discomfort, diarrhoea
- Xylose absorption: 5 g load (adults who cannot tolerate 25 g)
  - Obtain patient length and mass and record on request form, take blood fasting and 1 hour after xylose load (grey top tube).
  - Collect urine as above.

### 17.2.12 Unstable Analytes

For certain analytes, the time period between collection and analysis is critical. For example:

- Blood gas
- Ammonia
- Ketones
- Ionised calcium
- Lactate

Please refer to Table 5 on page 241 for specific instructions.





# SECTIONS 18.0

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## HAEMATOLOGY



## 18.0 HAEMATOLOGY SPECIMENS

- Collect the blood specimens using guidelines in Section 15 on page 103.
- Use the guide in Table 4 for appropriate containers.
- Always put on appropriate personal protective equipment
- Always discard all collection material in appropriate biohazard containers.
  - Complete the request form and follow instructions for completing the request form in Section 11 on page 69.

### 18.1 Bone Marrow

- Make an appointment in advance with the laboratory for bone marrow collection.
- In smaller laboratories, please book Monday–Thursday’s preferably in the morning so that the slides and Trephine Biopsy can be sent with the courier service in the afternoons to the relevant testing laboratory.
- In smaller laboratories, please discuss the patient with the laboratory staff at the tertiary institute where the marrow will be interpreted to ensure that all the relevant samples have been collected for analysis.
- Bone Marrow aspirates clot faster than peripheral blood; it is therefore advisable to make a smear immediately at the bedside without delay and store the rest of the aspirate in an EDTA (purple top) tube. More films can then be performed in the laboratory as required.
- For most haematologic conditions the following samples are required to ensure an accurate diagnosis: Peripheral blood smear, aspirate smear, an aspirate sample for cytogenetics in a heparin tube (green top), extra peripheral blood slides/aspirate slides to be prepared for FISH if required, a peripheral blood/aspirate sample for flow cytometry and a sample for PCR (discuss with the tertiary institute).
- Please perform an imprint of the trephine biopsies to ensure the assessment of cytology in the event that the aspirate is suboptimal.
- Complete the request form and follow instructions for completing the request form in Section 11 on page 69.
- Air dry the slides completely before packing.
- Pack slides separately.
- Collect blood specimens for full blood, differential and platelet counts at the same time since the results will be needed for interpretation of results.
- Discard all collection material in appropriate biohazard containers.

- RNA based BCR/ABL and PML/RARA require that the EDTA samples be sent to the laboratory on ice or in a suitable transport medium, e.g. RNA later. Contact the testing laboratory.

**NOTE:**

- *Aspirate specimens must be accompanied by a full clinical history.*
- *Each slide must be individually labelled.*
- *Please pack aspirate slides completely separately from trephine biopsies as the transporting medium of the trephine may leak and destroy the integrity of the aspirate slide making interpretation impossible, even exposure to formalin vapour may affect morphology and staining of slides.*
- *In smaller laboratories, please ensure that the correct SOP is being used for fixing the trephine biopsy as this is a very critical step in ensuring a good sample for analysis at the end of processing.*
- *In smaller laboratories, please ensure that the correct medium for transportation of the trephine biopsy is being used. Refer to the relevant SOP of the laboratory.*
- *Do not flush the syringe with heparin prior to aspiration as this causes a blue stain on the slides rendering interpretation of morphology difficult.*
- *Do not spray fixative onto slides.*

## 18.2 Immunophenotyping

- Specimen must be obtained at the time of the bone marrow aspirate.
- Specimen must be collected into either an EDTA (purple top) or heparinised (green top) tube. Consult with the laboratory about which is appropriate for your site.
- Do not aspirate more than ~2ml as a greater volume leads to excessive haemodilution.
- Specimen must be kept at room temperature and must NOT be put on ice.
- The specimen should reach the testing laboratory as soon as possible.
- Specimens must be accompanied by a full clinical history.

- Specimens older than 24-hours will have to be rejected.
- If anticipated that transport of immunophenotyping (flow cytometry) specimen will be delayed, an appropriate transport medium/stabilisation solution should be considered to be added to the specimen. Please discuss with the testing laboratory.

### **18.3 CD4 Sample Collection, Handling and Storage**

- Type of Sample: 4ml EDTA (purple top tube) venous blood sample.
- Samples should be stored at room temperature at 20–25 °C prior to collection by the NHLS courier.
- Samples must be kept away from direct sunlight.
- Samples should not be exposed to dramatic temperature fluctuations.
- Samples should not be exposed to vibrations (of particular relevance when being transported) or left on a blood mixer overnight.
- If samples have been collected after the NHLS courier has been to the health facility, samples should preferably be stored at room temperature (20–25 °C) for up to four days.
- Where room temperature exceeds 25 °C samples should ideally be stored in the refrigerator ( $\pm 5^{\circ}\text{C}$ ) to preserve sample integrity, but not for longer than 24 hours.



# **SECTIONS 19.0**

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## **CLINICAL MICROBIOLOGY AND INFECTIOUS DISEASES**



## 19.0 CLINICAL MICROBIOLOGY AND INFECTIOUS DISEASES

- It is of critical importance that clinicians use the following guidelines for the proper collection and transport of specimens.
- All diagnostic information from the microbiology laboratory is contingent on the quality of specimen received.
- Consequences of a poorly collected and/or poorly transported specimen include:
  - Failure to isolate the causative microorganism, and
  - Recovery of contaminants or normal microbial flora, which may be misleading, and resulting improper treatment of the patient.

### 19.1 General Guidelines for Specimen Collection

- To minimise contamination, use strict aseptic technique when collecting specimens
- Collect specimens prior to initiation of antimicrobial therapy.
- Collect specimens from anatomic sites most likely to yield pathogens and least likely to yield contaminants.
- Use appropriate collection devices.
- Tissue or fluid submitted for culture is always superior to material on swabs.
- Submit adequate volumes of specimens.
- Always wear appropriate protective clothing.
- If the patient may be infected with pathogens known to be (provisional clinical diagnosis of the patient) hazardous to laboratory personnel please notify the laboratory prior to sending the specimen — refer to Table 1 on pages 17 and 53 for relevant contact telephone numbers.
- Provide complete information on:
  - The type of specimen submitted (Be specific: e.g., Tissue is insufficient, state type of tissue)
  - Specific site from which specimen was collected
  - Specific pathogens that are being sought (to optimize conditions for culture)
  - Methods by which specimens were collected

### 19.1.1 Guidelines for Proper Specimen Transport

- Collect specimens in sturdy, sterile, screw cap, and leak-proof containers with lids that do not create an aerosol when opened.
- Clinicians should be made aware a microbiologist can be contacted on advice for appropriate specimen and collection.
- All specimens should be transported to the laboratory promptly. Failure to do this may result in the death of fastidious organisms and in overgrowth by more hardy bacteria.
- If prompt delivery is not possible specimens should be refrigerated at 4–8 °C, with the following exceptions:
  - Blood cultures
  - CSF specimens should be kept at room temperature unless they are to be cultured for viruses. If viral cultures are requested an aliquot should be removed aseptically and stored at 4–8 °C.
  - Specimens that may harbour temperature-sensitive organisms such as *Neisseria* species should be left at room temperature.

### 19.1.2 Specimen Containers

Sterile, disposable culture collection and transport system consisting of plastic tube/vial containing transport medium to prevent drying of bacteria and maintain pH.

#### 19.1.2.1 SWABS

- **Calcium Alginate Swabs (calgiswabs)**
  - Can be toxic for some strains of HSV and may be toxic for some cell cultures. Some lots of calcium alginate may be toxic to certain gonococcal strains. Cotton swabs may also be used; however, some brands of cotton contain fatty acids that may be inhibitory for gonococci.
  - Therefore, calcium alginate and cotton swabs should be used only if the specimen is inoculated directly onto growth media or transported in non-nutritive media containing charcoal to absorb or neutralize inhibitory material. Calcium alginate swabs are unsuitable for specimens sent for PCR.

- **Cotton Swabs**

- Residual fatty acids may inhibit some bacteria. If cotton is glued or spun to wooden applicator, wooden stick may inactivate HSV and interfere with some identification tests. Wood swabs are not suitable for PCR. Cotton swabs are not suitable for PCR.

- **Dacron Swabs**

- Useful in collection for viral, B. pertussis, group A streptococcus, and *Neisseria gonorrhoeae* isolation. Dacron/Rayon swabs may be suitable for PCR (non-wood swabs).

- **Nasopharyngeal and Urethrogenital Swabs**

- Flexible wire shafts and small tips provide easier specimen collection.

- **Swabs in transport media (Amies, Stuarts)**

- It is preferred for specimens with a delay in transport.

#### 19.1.2.2 STERILE SCREW-CAP UNIVERSAL CONTAINERS

- Useful for collection of urine, sputum, stool, bronchoalveolar lavage, and biopsy specimens.
- If the biopsy specimen is small, add a small amount of sterile saline to the container.
- Never place the biopsy specimen in formalin, or wrap in gauze.

#### 19.1.2.3 STERILE PETRI DISHES / SLIDES

- Useful for hair or skin-scraping specimens.
- Tape petri dish/slides securely prior to transport.

#### 19.1.2.4 STERILE TUBES

- Screw-cap glass, plastic tubes, or sterile Vacutainer tubes without additives.
- Useful for collection of sterile fluids, bronchoalveolar lavage, drainage, or brush specimens.

#### 19.1.2.5 VIRAL TRANSPORT SYSTEMS (VTM)

- Refer to Virology Section (Section 23 on page 211).

## 19.2 Blood Cultures

- Blood culture is the specimen of choice for microbiological diagnosis of septicaemia, infective endocarditis and PUO (pyrexia of unknown origin).
- If a blood culture is positive, empirical use of antimicrobial agents can be advised based on gram stain results.

### 19.2.1.1 SITE SELECTION

- Select a different site for each blood sample.
- Avoid drawing blood through indwelling intravenous or intra-arterial catheters.
  - This may be required in special cases where line sepsis of chronic indwelling line is considered i.e. Hickmann line, draw blood through line and send a blood from a simultaneously collected peripheral draw so that differential time to positivity may be calculated. Remember to state clearly that blood culture was taken from line or peripherally.

### 19.2.1.2 SITE PREPARATION

- Vigorously cleanse the venepuncture site with 70% isopropyl or ethyl alcohol (chlorhexidine may also be used).
- Starting at the centre of the site, swab concentrically with 1 to 2 % tincture of iodine for 30 seconds or with 10% povidone-iodine solution for 1 minute. If these solutions are not available, 70% isopropyl alcohol can be used instead.
- Allow alcohol/povidone iodine solution at the venipuncture site to dry.
- Do not touch the venipuncture site after preparation and prior to phlebotomy.
- Remove the lid without touching the top of the bottle. If contamination occurs during removal of the lid, alcohol can be used to disinfect the top.
- Do not use iodine on the tops of the BacT/Alert bottle.

### 19.2.1.3 COLLECTION OF BLOOD

- Using syringe and needle insert the needle into the vein, and withdraw blood. Do not change needles before injecting the blood into the culture bottle. The closed system consisting of a vacuum bottle and double-needle collection tube can be used.
- After the blood is inserted into the blood culture system, mix well to avoid clotting.

- Use a new needle if the vein is missed initially.
- Add sufficient volume of blood to attain a 1:10 ratio of blood to medium. Each bottle can accommodate a maximum 10 ml, this volume is also recommended for optimal recovery of organisms.
- After phlebotomy, cleanse the site with 70% alcohol to remove remaining iodine that can cause irritation in some patients and cover puncture wound appropriately.

#### 19.2.1.4 SPECIMEN VOLUME

- The volume of blood is critical because the number of organisms in the majority of bacteraemias is low, especially if the patient is on antimicrobial therapy.
- Children: Infants and children have a lower total blood volume. 1 to 5 ml of blood should be drawn per venipuncture; a minimum requirement is 0.5ml per blood culture.
- Adults: 20 ml blood distributed between two aerobic bottles. If clinical diagnosis indicates an anaerobic infection the initial volume drawn should be 20 ml of blood, which is divided equally between the aerobic and anaerobic bottle.

#### 19.2.1.5 OPTIMISING BLOOD CULTURES

- Blood obtained from one venipuncture site defines one blood culture, regardless of the number of bottles filled.
- Timing: Blood must be cultured as early as possible in the course of a febrile episode, and ideally before administration of antibiotics.
- Number of sites sampled: One venipuncture site is rarely sufficient. Sampling from two venipuncture sites is sufficient. It may be of benefit to collect sets over 3 consecutive days in FAN bottles (with charcoal which will absorb antibiotics) in patients on antimicrobial therapy or if fungaemia is suspected.
- **Multiple blood cultures should never be drawn from the same venipuncture site.**
- Sampling of 2 or 3 blood cultures should be spaced at intervals of at least 20 min, to detect transient or intermittent bacteraemia.
- For isolation of fastidious organisms, blood culture bottles can be held for up to 21 days. Please state on the request form if infective endocarditis is suspected so that the laboratory knows that prolonged incubation is required.

- The HACEK group of bacteria (*Haemophilus parainfluenzae*, & *Aggregatibacter aphrophilus*, *A. paraphrophilus*, *H. influenzae*, *Aggregatibacter actinomycetemcomitans*, *Cardiobacterium hominis*, *Eikenella corrodens*, *Kingella kinge*, and *K. denitrificans*) are associated with bacterial endocarditis. *Brucella* spp. and *Bartonella henselae* can also cause bloodstream infections and endocarditis.
- **Please note blood for fungal culture should be collected directly into a FAN BacT/ Alert blood culture bottle.**
- **If blood/bone marrow is sent for TB MC & S, submit 5ml blood in adequate culture bottle (obtainable from the Microbiology laboratory). An EDTA tube (purple top) is NOT acceptable.**

### 19.3 Cerebrospinal Fluid (CSF)

CSF is collected for the diagnosis of meningitis and is usually obtained by lumbar puncture. Subdural taps and ventricular aspiration may also be used.

- The lumbar puncture should be performed using an aseptic technique and should not be undertaken by anyone who has not been properly trained to perform it. Infection control guidelines recommend that the clinician wear a surgical mask when performing lumbar puncture.
- The patient is appropriately draped and an area overlying the lumbar spine is disinfected using the same skin preparation as required for collection of blood cultures. (See Section 19.2.1 on page 158 on blood culture specimen collection.)
- All microbiological CSF specimens should be collected in (clear top) collection tubes without additives; or if these are not available, red top tubes without gel may also be used.
- Each bacteriological and fungal test requires at least 0.5 ml of CSF, although larger volumes are preferred.
- The specimen should be transported to the laboratory promptly and processed as soon as possible.
- If delay in processing is unavoidable, the specimen should be held at room temperature.
- When requesting antigen testing on CSF, please ensure that you have specified whether bacterial or cryptococcal antigen detection is required.

**NOTE for processing CSF for mycobacteria:** The number of mycobacteria present in the CSF is small; therefore a large volume of specimen (3–5 ml) is necessary to maximize recovery of the organism in culture.

## 19.4 Bone Marrow

- Aspirate bone marrow into a sterile heparinised tube or into a FAN BacT/Alert blood culture bottle.
- Also make 2 smears for special fungal stains if required and submit this together with the culture specimen.

## 19.5 Sterile Fluids

Sterile fluids (e.g., synovial, culdocentesis and serous cavity fluids) should be collected aseptically. Submit the fluid in one of the following:

- A capped syringe (with the needle removed)
- Sterile tubes (If a cell count is required please submit some of the specimen in an EDTA (purple top) tube.)
- Blood culture bottles (in the same sample to medium ratio as recommended for blood, i.e., 10 ml for adult bottles and 1–5 ml for paediatric bottles)
- Pleural, peritoneal and joint fluids should be collected aseptically in a clean sterile universal container. Bloody specimens can be collected in a heparinised collection tube to prevent clotting.

**NOTE:** Swabs are the least desirable sample for culture of fluids and are discouraged.

## 19.6 Nasopharyngeal and Respiratory Tract Specimens

### Specimens for Lower Respiratory Tract Infections

Appropriate Specimens include sputum, tracheal aspirates, bronchial washings, bronchial brushes, bronchial biopsy specimens, bronchoalveolar lavage fluid, transtracheal aspirate, lung aspirates, nasogastric aspirates and lung biopsy specimens. Endotracheal tube tips should never be submitted for culture.

**NOTE:**

- If infection with *Legionella pneumophila* is suspected, a urine specimen should be submitted for urine antigen testing.
- Sputum induced with hypertonic saline has greater sensitivity for the diagnosis of *Pneumocystis jirovecii* than expectorated sputum.
- If bacterial pneumonia is suspected, submission of concomitant blood cultures is recommended.

**19.6.1 Sputum Specimens**

- The patient should be given clear instructions on how to produce an early morning sputum specimen as shown in Figure 29 on page 165.
- Aerosols containing TB bacilli may be produced during collection of a sputum specimen, and it is therefore advisable to collect specimens away from other people and in a well-ventilated area.
- An adequate specimen should contain at least 5ml of sputum.
- The specimen container must be tightly capped and clearly labeled. This should be done by the health care professional requesting the specimen, and should include the relevant clinical information as well as the diagnostic tests required.
- For the diagnosis of pulmonary TB, clearly identify the type of investigation required as per the algorithm in Figure 29 on page 165. If MC&S for organisms other than TB is needed, ask for standard MC&S.
- Use the supplied universal containers and close the lid tightly to prevent leaking of the specimen.
- The specimen should be transported to the laboratory as soon as possible after collection.
- If there is a delay in transport to the laboratory, for example from an outside clinic, then specimens should be refrigerated. **DO NOT FREEZE SPECIMENS.**
- Discard all collection material in appropriate biohazard containers.

Figure 29.

# TUBERCULOSIS (TB)

## SPUTUM COLLECTION PROCEDURE

1

### CLEAR YOUR MOUTH



Rinse with water



2

### BREATHE IN AND OUT 3 TIMES



3

### GIVE A SPUTUM SAMPLE



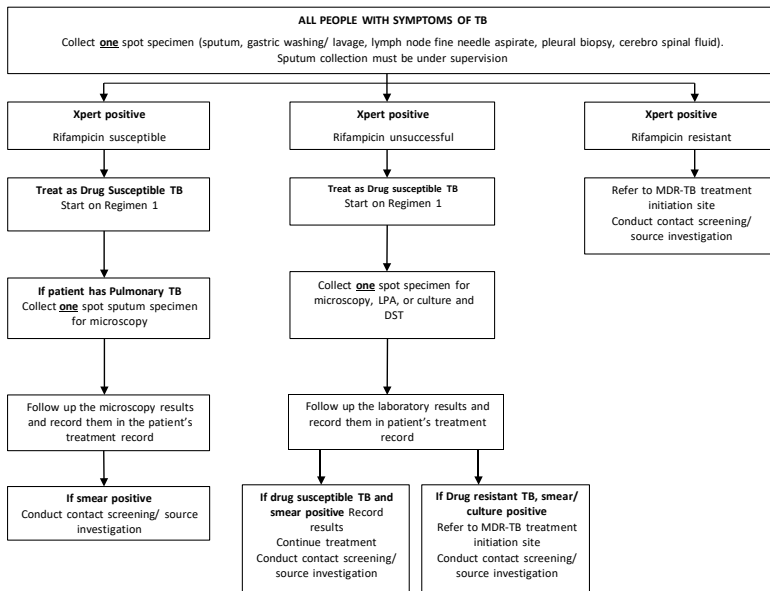
USAID  
U.S. Agency for International Development

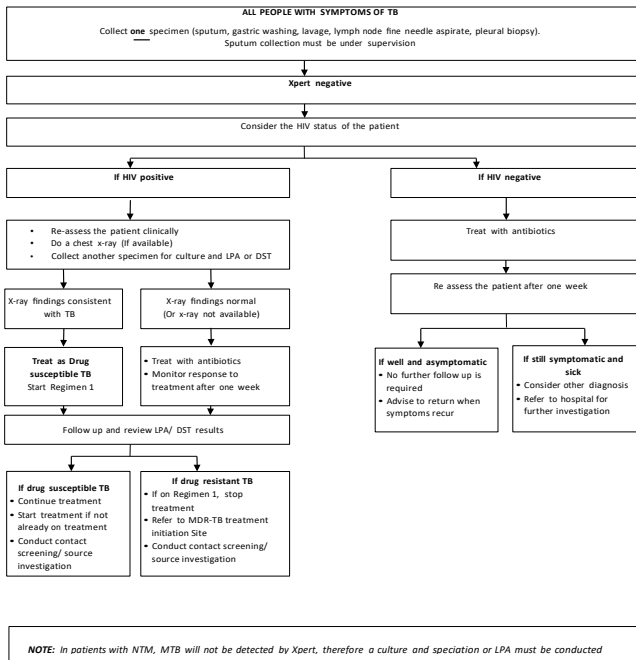
TUBERCULOSIS  
PREVENT  
STRATEGIES

Illustration of TB prevention and control strategies  
developed by the National Tuberculosis  
Institute (NTI) in collaboration with  
USAID and the Ministry of Health and Family Welfare  
Government of India

Figure 30.

## 4.1 XPERT DIAGNOSTIC ALGORITHM





**From: National Tuberculosis Management Guidelines 2014,  
Department of Health, Republic of South Africa**

## 19.6.2 Pharyngeal Specimens

### 19.6.2.1 THROAT SWABS

- Routinely used for the diagnosis of Group A streptococcal pharyngitis.
- Depress tongue gently with a tongue depressor.
- Extend sterile swab between the tonsillar pillars and behind the uvula.
- Avoid touching the cheeks, tongue, uvula or lips.
- Sweep the swab back and forth across the posterior pharynx, tonsillar areas, and any inflamed or ulcerated areas to obtain a sample.
- Send the swab to the laboratory in suitable transport media, as soon as possible.

**NOTE:** Do not attempt any throat swabs if the epiglottis is inflamed or if diphtheria is suspected as sampling may cause serious respiratory obstruction.

### 19.6.2.2 NASAL SWABS

Submitted primarily for the detection of nasal carries of *Staphylococcus aureus*.

- Insert a moistened sterile swab into the nose until resistance is met at a level of the turbinate.
- Rotate the swab against the nasal mucosa.
- Repeat the process on the other side using the same swab.
- Send the swab to the laboratory in suitable transport media, as soon as possible.

### 19.6.2.3 NASOPHARYNGEAL SWABS

Submitted primarily for the detection of carriers of *N. meningitides* and to diagnose *B. pertussis*. (See Section 19.6.2.5.2 on page 169 for additional information on collection for *B. pertussis*.)

- Carefully insert a flexible wire calcium alginate-tipped swab through the nose into the posterior nasopharynx, and rotate the swab.
- Keep the swab near the septum and floor of the nose during collection.
- Send the swab to the laboratory in suitable transport media, as soon as possible.

### 19.6.2.4 NASOPHARYNGEAL ASPIRATES

Nasopharyngeal aspirates are appropriate specimens for the detection of:

- *Bordetella pertussis*
- *Corynebacterium diptheriae*
- *Neisseria gonorrhoea*
- *Neisseria meningitidis*

The laboratory must be alerted before the specimen is sent to ensure that the appropriate culture media is available.

### 19.6.2.5 UNUSUAL PHARYNGEAL PATHOGENS

#### 19.6.2.5.1 *Neisseria gonorrhoeae* (gonococcal pharyngitis)

- Nasopharyngeal aspirates or swabs of the tonsillar pillars and the posterior pharynx should be collected.
- Swabs should only be used if there is a very short interval between collection and plating.
- The swab should be placed in a non-nutrient transport medium such as Stuart's transport medium.
- If a delay in transport to the laboratory is inevitable, the specimen should be inoculated on to New York City agar at the time of collection.

#### 19.6.2.5.2 *Bordetella pertussis* (Whooping Cough)

- The preferred specimen is an aspirate of the nasopharynx or bronchus/nasopharyngeal, however, a nasopharyngeal swab can be submitted.
- Small-tipped calcium alginate or Dacron swabs are suitable for collection of specimens.
- Rayon or cotton swabs should be avoided, as they contain fatty acids that are toxic to *B. pertussis*.
- Ideally the specimen should be inoculated at the bedside into charcoal based media, and 2 slides should also be made.
- Contact the laboratory for appropriate collection media before samples are collected. For *B. pertussis* PCR, please refer to Section 21.7 on page 192 for specimen collection.

## 19.7 Oral Cultures

Used for the detection of yeasts or fusospirocheatal disease.

- Complete the request form and follow instructions for completing the request form in Section 11 on page 69.
- Rinse the mouth with sterile saline.
- Wipe the lesion with sterile gauze.
- Swab or scrape areas of exudation or ulceration.

## 19.8 Ocular Specimens

### 19.8.1 General Considerations

- Several different techniques are used to collect specimens from different parts of the eye by an ophthalmologist as per clinical guidelines.
- The following specimen types and infection sites can be tested by the laboratory:
  - Conjunctiva/lid margins sample collection
  - Corneal scrapings
  - Intra-ocular fluids
  - Orbital or preseptal Cellutis
  - Lacrimal gland
  - Lacrimal sac
  - Lacrimal Canakiculus
- These specimens should be inoculated directly onto culture/transport media at the patient's side and slides are to be prepared at the time of collection (available from the laboratory).
- A conjunctival swab should accompany any specimen collected by an invasive method, as this well serve as a control (the conjunctiva is constantly contaminated by environmental/ocular adnexal flora).
- Send prepared smears and inoculated media promptly to the laboratory.

## 19.8.2 Special Considerations

- *N. gonorrhoea*: Use an Amies transport swab to collect the specimen; inoculate the scrapings onto a New York City agar plate at the patient's bedside.
- Fungi: Inoculate onto appropriate media e.g. Sabarauds dextrose agar at the patient's bedside.
- Anaerobes: Inoculate into anaerobic transport media or directly onto appropriate media at the patient's bedside.
- Viruses: Use Dacron/cotton swabs with non-wood shafts and send the specimen in the appropriate viral transport medium.
- *C. trachomatis*: Use only a Dacron swab available on request from the laboratory to collect the specimen. Please mark the request form clearly when a Chlamydia investigation on the specimen is required.

**All special transport media and agar plates must be collected from the laboratory BEFORE samples are taken.**

## 19.9 Tissue Biopsies, Aspirates/Swabs of Abscesses and Fluids

### 19.9.1 General Principles

- The character of the lesions in question may limit the usefulness of these cultures. Lesions connecting with skin, mucosal surfaces or the GIT will be encumbered by the presence of indigenous microflora. Therefore, for meaningful culture results, surgically obtained tissue samples, aspirates of closed abscesses and aliquots of pus/fluid are preferred rather than swabs.
- Swabs of superficial skin ulcers, the skin surface of sinus tracts and from open abscesses often yield mixed bacterial flora, which do not reflect the organisms of true infectious significance. Therefore, every effort should be made to sample from deeper aspects of the lesion with careful avoidance of the contaminated tissue surface.
- When anaerobic bacteria are expected, ideally the specimen should be inoculated into anaerobic transport medium (available on request from the laboratory) at the bedside and promptly transported to the laboratory.
- When looking for fastidious or unusual organisms please notify the laboratory so that cultures can be appropriately set up and held for prolonged incubation as needed.

- Providing the laboratory with the location or type of wound/abscess/tissue as well as a clinical diagnosis is useful as it can hasten recognition of specific pathogens associated with the type of infection in question.
- Specimens can be transported to the laboratory using:
  - A sterile universal container,
  - Transport medium (e.g., Amies or Stuart's medium),
  - Anaerobic transport medium if anaerobes are suspected.

## **19.9.2 Tissue Biopsies**

- Specimens collected at the time of surgery/endoscopy should be submitted in sterile universal containers without formalin added.
- The specimen may be kept moist by the addition of normal saline.

## **19.9.3 Pus Specimens**

### **19.9.3.1 ASPIRATES**

- Clean the surface of the wound with sterile water or saline.
- Aspirate the deepest part of the lesion using a 3–5ml syringe and a 22–23-gauge needle.
- If the initial aspirate fails to yield material, inject normal saline subcutaneously and repeat the aspiration attempt.
- Transfer the aspirate into a sterile universal container.

### **19.9.3.2 DEEP LESIONS**

- Clean the surface of the wound as above for aspirates.
- Aspirate the deepest part of the lesion.
- If the specimen is collected in theatre, submit a portion of the wall of the lesion.
- Submit the specimen in a sterile universal container in normal saline or in transport medium if a delay is anticipated.

### 19.9.3.3 BURN WOUNDS

- The surface of burn wounds may become colonized by the patient's own microbial flora or by environmental organisms.
- While surface cultures of burn wounds may be helpful from the standpoint of evaluating potential pathogens that exist on the patient and in the burns ward, they **do not give any indication of the status of the wound** itself.
- Assess clinically the burn wound site of sampling for signs of inflammation and purulence. Remove all superficial slough and debris prior to sampling.
- Biopsy of the wound has been shown to provide an **accurate** indication of its status. Sampling of different areas of the burn wound is recommended, as organisms may not be evenly distributed.
  - Clean the surface as described under the pus aspirate section (Section 19.9.3.1 on page 172).
  - Collect two punch biopsies and submit one (in a sterile universal container) for culture (without formalin) and the other with formalin for histology.

### 19.9.3.4 PUS SWABS

- Clean the wound as outlined in pus aspirate (Section 19.9.3.1 on page 172).
- Obtain the swab from deep within the wound. Separate the wound margins with sterile gloves or make a sterile scalpel incision into a closed abscess.
- Take care to avoid adjacent skin margins.
- Send sample to the laboratory in the transport media provided.

**NOTE:** Dry swabs are unacceptable specimens. The swab should be inoculated onto suitable culture media ASAP or placed into suitable transport media (e.g., Amies or Stuart's) if a delay in processing is anticipated.

### 19.9.4 Ulcers

- Clean the surface as previously described in Section 19.9.3.1 on page 172 and allow to dry.
- Remove overlying debris.
- Curette the base of the ulcer; collect exudate from ulcer using a syringe or swab.

## 19.9.5 Rectal Biopsy

- Specimens requiring microbiological culture must NOT be submitted in formalin. Submit these specimens in a sterile, sealed universal container in normal saline to prevent drying.

## 19.10 Stool Specimens

### 19.10.1 General Principles

- Specimens should be collected in sterile containers that will not leak. Universal containers are suitable provided lids are closed properly.
- Containers should be clean and dry. The presence of water or urine can result in inaccurate interpretation.
- Suspected clinical diagnosis should be provided on the request form. This is essential where special techniques are required for culture and identification of certain organisms, e.g.: cholera, *C. difficile* or opportunistic parasites in HIV infection.
- Obtain unformed stool specimens.
- Do not submit more than one stool specimen for a particular patient in a 24-hour period.
- Stool specimens should preferably be sent within the first 3 days of admission.

**NOTE:** *Diarrhoea developing after this period is often nosocomial in origin, e.g.: antibiotic associated diarrhea. In these cases Clostridium difficile enzyme immunoassay, PCR or GeneXpert should also be requested.*

### 19.10.2 Rectal Swabs

- Rectal swabs may be submitted where stool cannot be obtained or when screening for carriage is required.
- Please indicate the purpose of the rectal swab (e.g. VRE or CRE screening) clearly on the request form.
- These swabs must be placed in transport media after collection, e.g.: Cary-Blair, Amies' or Stuart's transport medium, which is available from the laboratory.
- Method of collection:**
  - Moisten the swab in sterile transport medium.
  - Gently insert the swab 2–3 cm into the anal canal and rotate to sample anal crypts. Remove the swab and inspect for visible faeces.

- Immediately insert the swab into the transport medium and deliver to laboratory promptly. If delays are anticipated, the swab in transport medium can be refrigerated.

### 19.10.3 Cholera and *Clostridium difficile* Infections

Early diagnosis is essential as these are notifiable and reportable diseases respectively. For PCR detection of toxigenic *C. difficile* refer to infection control section (Section 21.8 on page 192).

### 19.10.4 Parasites

- Requests for parasite examination must be clearly stated on the form.
- Stool specimens should be transported to the laboratory as soon as possible — within 1 hour if trophozoites are suspected.
- Substances such as bismuth, antibiotics and anti-motility agents can interfere with parasite detection.
- Please provide relevant clinical information. Opportunistic parasites in HIV infection require special staining procedures.
- Several specimens may be needed to identify the presence of parasites due to cyclical variations in excretion.

## 19.11 Urine Specimens

### 19.11.1 General Principles

- Urine is normally a sterile body fluid. If specimens are not collected adequately, contamination by normal flora of the perineum, urethra and vagina can occur.
- Please stipulate the type of specimen, e.g.: midstream urine, suprapubic aspirate, catheter urine specimen.
- Early morning and mid-stream urines are the preferred specimens and have the best yield.
- Suprapubic aspirate may be required from infants.
- Both males and females should pass a few milliliters of urine into the toilet bowl, DO NOT STOP THE FLOW, and then collect the midstream portion of urine into a sterile container.
- Specimens >48 hours old may be rejected unless refrigeration has occurred.
- Do not force fluids prior to urine collection as this will dilute colony counts and result in potential misinterpretation.
- **Never submit urine collected in a bedpan or urinal.**

### 19.11.2 Catheter Specimens

- Catheter specimens may be used to obtain urine directly from the bladder. This is not routine as organisms can be introduced during the procedure. If performed, aseptic technique must be followed.
  - When necessary a urinary catheter may be inserted for the sole purpose of collecting urine. This should be done using the same care as would be practised if an indwelling catheter was being inserted. In this case urine is collected from the open end of the catheter directly into a suitable screw-topped container. The catheter is then immediately removed. This specimen should be clearly marked as an “IN-OUT CATHETER SPECIMEN.”
- Urine collected from indwelling catheters is often contaminated

Figure 31: **Catheter urine collection process**



**NOTE:**

- *The laboratory will not process Foley catheters or their tips, as these have no value due to extensive contamination by colonising flora.*
- *The specimen should not be obtained from the collection bag.*
- ***Do not send urine catheter (tube) as it is not processed in the laboratory.***

### 19.11.3 Parasites, Dysmorphic Cells and Casts

- Requests for parasites and/or casts must be clearly stated on the request form.
- These specimens must arrive promptly at the laboratory.
- Urine for *Schistosoma haematobium* is best collected from midday–2pm when ova excretion is highest.

### 19.11.4 Renal Tuberculosis

- Urine specimens for AFB (acid fast bacilli) and TB culture may be a useful adjunct in the diagnosis of renal TB.
- Up to 3 early morning (first void) specimens may be required and should consist of 200–400 ml.
- Microscopy for AFB is not a sensitive screening tool. However, TB culture has a better yield provided a sufficient number of specimens are submitted: 80–90% sensitive if at least three early morning specimens are collected and cultured.

## 19.12 Mycology Specimens

**Please indicate clearly on the request form if mycology investigations are required.**

### 19.12.1 Tissues

- Collect tissue biopsies aseptically.
- Put the specimen in a sterile universal container and do NOT add saline.
- Transport to the laboratory immediately or refrigerate at 2–8 °C if transport is delayed.

### 19.12.2 Purulent Exudates and Fluids

- Pus should be aspirated aseptically from closed lesions where possible and placed in a sterile universal container and transported to the laboratory as soon as possible.
- Wound dressing can be sent for examination of granules if suspected mycetoma or actinomycosis is suspected clinically.
- Pus swabs are generally inferior specimens and should be avoided.
- Other swabs (e.g. vaginal, penile, throat, oral) should be transported to the lab as soon as possible.
- Aspirate bone marrow into a sterile heparinised tube or into a blood culture bottle. Also make 2 smears for special fungal stains and submit together with the culture specimen.

- Pleural, peritoneal and joint fluids should be collected aseptically in a clean sterile universal container. Bloody specimens can be collected in a heparinised collection tube to prevent clotting.
- Corneal scrapings obtained by a platinum spatula must be transferred onto an agar plate (blood, dextrose) at the patient's side. Smears of the scraped material should also be prepared on clean, alcohol flamed slides.

### **19.12.3 Urine, Stool and Rectal Swabs**

- Collect urine in a sterile universal container and send to laboratory without delay.
- Stool specimens or rectal swabs for fungal culture are rarely useful as the significance of their presence in such a contaminated material is controversial.

### **19.12.4 Lower Respiratory Tract Infections**

- Collect specimens appropriately as described above in Section 19.6 on page 163 into sterile universal containers without additives and send to the laboratory for processing.
- If a delay in transport is suspected, refrigeration is not advisable for suspected histoplasmosis.
- Collect three early morning specimens resulting from deep cough or sputum. Please specify on the request form that fungal infection is suspected. Lung biopsy or aspirates are also appropriate specimens.

### **19.12.5 Skin**

- Clean the area of skin from which a specimen is to be collected with 70% alcohol if ointments or other topical medications have been recently applied.
- Scrape the active peripheral edge of the lesion with a scalpel or the end of a microscope slide.
- Place the scales in a sterile Petri dish or container or between 2 glass slides taped together and send promptly to the laboratory.

### **19.12.6 Nails**

- Cleanse nails thoroughly with an alcohol wipe.
- Scrape deeply using a blunt scalpel to obtain recently invaded nail tissue.
- Initial scrapings are usually contaminated and thus should be discarded.

- Clippings of whole thickness of affected nail can be obtained using nail clippers.
- Place the scrapings and nail clippings in a sterile Petri dish or container and send promptly to the laboratory.

### 19.12.7 Hair and Scalp

- Send basal portions of the infected hair and scalp skin scrapings from the affected areas promptly to the laboratory in a sterile container to prevent overgrowth of contaminating fungi.

### 19.12.8 $\beta$ -D Glucan Fungitell® Assay

- Test for qualitative detection and quantitation of 1-3- $\beta$ -D glucan — (a component of fungal cell walls or fungal antigen in the blood).
- This test detects  $\beta$ -D glucan in patients with invasive fungal infections, including *Pneumocystis jirovecii*.
- Not recommended for *Cryptococcus spp.* and zygomycetes.
- Conditions interfering with  $\beta$ DG results:
  - Hemolysis
  - Sample turbidity due to lipemia
  - Presence of visibility apparent bilirubin (turbid serum)
  - False negatives
    - \*Early candidemia
    - \**Candida parapsilosis*
    - \*Immune complex disease
    - \**Cryptococcus neoformans*
    - \*Zygomycetes
  - False positives
    - \*Haemodialysis with cellulose membrane
    - \*Administration of blood products (immunoglobulin or albumin)
    - \*Antibiotics: amoxicillin-clavulanate, piperacillin-tazobactam (introduction of galactofuran during manufacturing, not the antibiotic itself)
    - \*Use of surgical gauzes containing glucan
    - \*Severe bacterial infections and mucositis



# SECTIONS 20.0

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## COMMUNICABLE AND REPORTABLE DISEASES



## 20.0 COMMUNICABLE AND REPORTABLE DISEASES

Anthrax	Smallpox
Botulism	Tetanus
Campylobacter	Tuberculosis
Cholera	Typhoid Fever
Diphtheria	Viral Haemorrhagic Fever
Dysentery	Whooping cough
<i>E. coli</i> 0157	Yellow Fever
Food Poisoning	
Hepatitis (Viral)	
<i>Haemophilus influenza</i> type b Infection	
Legionnaire's disease	
Leprosy	
Leptospirosis	
Malaria	
Measles	
Meningococcal septicaemia	
Mumps	
Paratyphoid Fever	
Plague	
Poliomyelitis	
Psittacosis	
Rabies	
Relapsing Fever	
Rubella	
Salmonellosis	
SARS-CoV	
Scarlet Fever	
Shigellosis	

### Notification of new cancer cases

New regulations with regards to the registration of all new cancer diagnoses were promulgated in April 2011. The amendment makes provision for the establishment of a Population Based Cancer Registry and also stipulates the compulsory notification of all new cancer cases on the prescribed form. Failure to comply with the provisions of the new regulations is regarded as an offence which may lead to prosecution. Cancer notification forms are to be submitted to the National Cancer Register (NCR) within 3 months of diagnosis. Forms are to be completed in duplicate in **BLOCK LETTERS**. The original must be submitted to the National Cancer Register and the copy to be retained in the patient's file.

### Cancer notification forms can be submitted to the National Cancer Register via:

E-mail: [cancer.registry@nhls.ac.za](mailto:cancer.registry@nhls.ac.za)

Fax: (011) 489 9132 / (011) 489 9152

Post: PO Box 1038, Johannesburg, 2000

### For a detailed description of the new regulations please see:

Act No. 61 of 2006 – Regulations related to Cancer Registration No. R.380



# SECTIONS 21.0

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## INFECTION CONTROL



## 21.0 INFECTION CONTROL

### 21.1 Hemodialysis Water

#### 21.1.1 Test Frequency and Timing

##### ROUTINE

Collect samples for monitoring purposes at least monthly.

##### REPEAT

Collect repeat samples when bacterial counts exceed the allowable level. If culture growth exceeds permissible standards, re-culture the water system, usually weekly, until acceptable results are obtained.

##### AD HOC

Collect samples when clinical indications suggest pyrogenic and/or septicemic complications following a specific request by the clinician and/or the infection control practitioner.

##### TIMING

If the water system has been treated with formaldehyde or chlorine for sanitisation, flush the system completely before collecting samples. Drain and flush storage tanks and water lines (15-minute flush time recommended) before collecting samples. Culture water and dialysis fluid monthly unless a greater frequency is dictated by historical data at your institution.

#### 21.1.2 Specimen Collection, Transport and Storage

##### A. Dialysis water

- Use standard universal specimen containers (i.e. urine-sputum sample bottle).
- Sample at a point immediately past the water production system (e.g., reverse osmosis system, deionization units).
- Sample wherever storage of water occurs, e.g., storage tank used to store water from the water treatment system.
- Sample just before the water enters the dialysis machine or central proportioner.

##### B. Dialysate

- Following dialysis, collect fluid from dialyser.
- Single-pass system: Sample where dialysate leaves dialyser.
- Re-circulatory system: Sample at the periphery of the re-circulation chamber containing the coil dialyser.

## C. Volume

Collect a minimum of 5 ml from each sample point into sterile universal containers.

## D. Method

At each point of collection, open the valve and allow the water to flow for a minimum of 2 minutes before the sample is collected.

## E. Transport and Storage

Culture of dialysis water and dialysate must preferably start within 30 minutes of collection. If delays are expected, store the specimens at 4–5° C and culture within 24 hours of collection.

### 21.2 Collection of Water from Hydrotherapy Pools

- At least 30 ml of water sample should be collected from both the deep and shallow ends of the pool. The specimen collection container should contain sodium thiosulphate to neutralize the pool chlorine unless the sample can be processed within 3–4 hours of collection. Water samples should be tested twice a week. Where there are financial constraints the sampling should not be less than every two weeks.
- The container should be held with the mouth in the direction of the water flow so that the sample does not become contaminated with bacteria from the sampler's hand.
- Samples must be delivered to the laboratory in a polystyrene container with ice-packs within 2 hours of specimen collection.
- If chlorination is done manually, samples should be taken before the next dose is added to the pool or at the beginning of the day before there is any bathing.

### 21.3 Culture of Continuous Ambulatory Peritoneal Dialysis Fluid

#### Specimen collection and transport:

- Enclose dialysate bag in a larger plastic bag. Place this bag into a disposable plastic pan, and transport it to the laboratory.
- Transport
  - For immediate delivery, transport at room temperature.
  - For delayed delivery (i.e. > 1 hour after collection) refrigerate but

**DO NOT** freeze.

## 21.4 Culture of Intravascular Devices

### 21.4.1 Specimen Collection

- To prevent contamination by skin microorganisms and antibiotic ointment, clean the skin insertion site with an iodophore (e.g. povidone-iodine) and alcohol prior to removal of the cannula.
- Remove the cannula in an aseptic manner once the alcohol has dried and send promptly to the laboratory in a sterile container.
- If purulence of the catheter exit site is evident, send pus in a sterile container for MC&S.

### 21.4.2 Long Catheters

- Two portions of these catheters should be sent for culture — the distal intravascular tip and the proximal transcutaneous segment.
- Each segment should be approximately 2 to 3cm long.

### 21.4.3 Short Catheters

- The cannula is cultured in its entirety following removal of the hub.
- To remove the hub, use sterile scissors, or snap off the steel needles with a sterile hemostat.

### 21.4.4 Specimen Transport

- Transport catheter tips in a sterile universal container (without saline).
- Use a universal sample container.
- If tips are cut to a proper length (send proximal portion, ideally <5 cm), there is no need to bend them for insertion into the sterile universal container.
- Tips must be cultured within 2 hours of collection to prevent desiccation of microorganisms.

## 21.5 Surveillance Cultures for Multidrug Resistant Micro-Organisms and as Part of Infection Prevention and Control Strategies

### 21.5.1 Selective Culture for Fungi

Collect urine, stool and oropharyngeal specimens by using the techniques for obtaining these specimens for routine cultures as described previously. Please state clearly on the request form that fungal culture is required.

### 21.5.2 Surveillance Culture for Vancomycin-Resistant Enterobacteriaceae (VRE), Methicillin-Resistant Staphylococcus Aureus (MRSA) and Carbapenem-Resistant Enterobacteriaceae (CRE)

- A selection of appropriate sites, e.g., hand, axilla, throat, rectum, vagina, and the central line site, is chosen by agreement of the health care providers. All swab specimens are submitted in the transport media that are routinely employed for other swab cultures.
- Please state clearly on the request form the type of surveillance required.
- In general sites are as follows:
  - MRSA: anterior nares; throat; axilla; groin.
  - VRE & CRE: rectal swab.

**NOTE:** Active screening usually performed in certain situations guided by site specific policies (outbreaks/high risk patients). Discuss with Microbiologist/ infection Control Practitioner regarding local policy.

### 21.5.3 Selective Bowel Culture

A rectal swab or a stool specimen is collected and submitted as if for routine culture.

## 21.6 Information and Samples Required to Diagnose Infusate Related Sepsis

### 21.6.1 Required Information

- The time of administration of the infusate.
- The diagnosis of the patient's underlying condition.
- Time taken until the manifestation of adverse effects (e.g.: pyrexia after administration).
- State if there are any other patients with similar symptoms and signs after receiving the same infusate batch number.

- The batch number and details of the infusate in question.
- The blood culture result from the patient taken at the time of suspected infusate related-sepsis.
- If any additives were administered with the infusion or added directly to the bag by a pharmacist.
- How the bag was stored prior to administration.
- The procedure followed when setting up the bag, i.e., how the skin was disinfected and if the health care worker was wearing gloves.
- Was the bag inspected for leaks?

### **21.6.2 Specimens**

The following specimens are required which must be sent to the laboratory in separate sealed plastic bags:

- The full IV set and infusate in use at the time when the patient spiked a temperature.
- Any “Add-in-line” bags.
- A blood culture taken through the line.
- A blood culture taken from a remote venipuncture site.
- A swab from each catheter hub.
- A swab from the skin site.
- The transcutaneous segment of the catheter.
- The distal portion of the catheter.
- Any other bags with the same batch number.

### **21.6.3 Collection and Sending of Infusates**

- Aerobic BacT/Alert bottles must be used.
- The plastic cap on the BacT/Alert bottle must be removed, and the rubber bung must be disinfected with an alcohol swab containing 70% isopropyl alcohol.
- When the alcohol has evaporated, under strictly aseptic conditions, inoculate 10ml of infusate sample into the BacT/Alert bottle.
- Each bottle must be accompanied with its own slip containing; all relevant data regarding the sender (name, address, contact numbers, account details); the batch number, the site, the date, and the bar code sticker, which must be removed from the bottle.
- The slips must be attached to the corresponding bottle.
- The bottles must be sent to the referral laboratory in a safe container to prevent breakage of BacT/Alert bottles.

## 21.7 PCR Detection of *Bordetella pertussis* in Nasopharyngeal Swabs and Aspirates

- Nasopharyngeal samples must be taken with **Dacron** or **Rayon** swabs since calcium alginate strongly inhibits the PCR (non-wood shafts). If a sample has been taken using another type of swab, and cannot be repeated, the Molecular laboratory will process it according to a protocol with less chance of success than with the dacron swabs.
- If there is inhibition of the internal control, it will be reported as 'no result' as inhibition is suspected, and the result for *B. pertussis* is unknown.
- After streaking the swab head onto a charcoal Bordetella agar plate (preferably done by the clinician at the bedside, or by laboratory staff), it must be placed into a sterile container and sent to the Molecular Division as soon as possible.
- This can be done by placing the swab into a plastic bag and sealing (not the original swab wrapping, unless that is sealed), or by cutting the shaft off (not too close to the head) and sending in a universal specimen container. Please indicate the type of swab used when sending for analysis.
- Nasopharyngeal and sinus aspirates, sputum and throat swabs can also be sent for analysis.
- Leaking samples and samples older than 10 days and gel swabs will be rejected.

## 21.8 PCR Detection of Toxigenic *Clostridium difficile* in Stool Samples

- Loose, unformed stool samples are required for the detection of *Clostridium difficile* infection. Formed stool will be rejected.
- These are to be collected in sterile containers that will not leak.
- Leaking samples and samples older than 48 hours will be rejected.
- Note that Test of Cure testing is not recommended.

## 21.9 Infection Control Tests

Clinical specimens

Peritoneal dialysis

bags Intravascular

device tips

Screening for Vancomycin Resistant  
Enterococci (VRE)

Screening for Carbapenem-Resistant  
Enterobacteriaceae (CRE)

Screening for Methicillin Resistant  
*Staphylococcus aureus* (MRSA)

Extended identification of aerobes  
and anaerobes

Specialized antibiotic susceptibility

MIC testing

Synergy testing by E tests

Serum activity

Serum assay

Outbreak

investigations Clinical

Environmental/foods

Environmental

Air sampling

Rodac surface

cultures. Air settle

plates

Surface swabs

Positive pressure testing (smoke

tubes) Testing of water for *Legionella*

Culturing of sputum for *Legionella*

Urine antigen test for *L.*

*pneumophila*

SG 1

Public Health Microbiology

Water

Total bacterial counts

Coliform counts

*Escherichiae coli* type 1

Waters for culture

Detection and identification of *Vibrio*  
*cholera*

Dairy Products

Total bacterial

counts Coliform

counts *Escherichiae*

*coli* type 1

Milk phosphatase

Milk methylene blue reduction

*Brucella*

Foods

Total plate counts

Coliform counts including *E. coli* type 1

Culture for *Staphylococcus aureus*,  
*Bacillus cereus*, *Clostridium*  
*perfringens*, *Listeria*, *Campylobacter*

Faecal Enterococci, Yeasts,  
Moulds, *Salmonella*, *E. coli*

O157, *Shigella*, *Yersinia*  
*enterocolitica* and *Vibrio*

Toxin testing

*Staphylococcus aureus*

Diarrhoeal toxin in

*bacillus*

*Clostridium perfringens* enterotoxin

Molecular biology laboratory  
Polymerase chain reaction screening  
for  
Vancomycin Resistant Enterococci.

Molecular typing  
(fingerprinting) of nosocomial  
pathogens in elucidation of  
nosocomial outbreaks.

Research into molecular  
mechanisms of antibiotic  
resistance

Disinfectant  
testing Hard

surface

testing

Intraluminal  
testing

Testing against *Cryptosporidium*  
*parvum*

Suspension disinfection testing

# SECTIONS 22.0

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## PUBLIC HEALTH



## 22.0 PUBLIC HEALTH

### 22.1 General Guidelines for Sample Collection and Transport

It is of critical importance that Clinicians/Environmental Health Practitioners (EHP) use the following guidelines for the proper collection, discarding of consumables utilized in the collection and the appropriate transport of samples, as the quality of results hinges on this.

Consequences of a poorly collected and/or poorly transported sample include:

- Failure to isolate the causative microorganism, and
- Recovery of contaminants or normal microbial flora, which may be misleading, and result in improper treatment of the patient.

#### 22.1.1 Clinical Samples

- Use strict aseptic technique to prevent contamination when collecting samples.
- Use sterile, leak-proof containers with lids that do not create an aerosol when opened.
- Samples and request forms should ideally be placed in separate plastic bags with the request form in the separate pouch of the plastic bag to prevent damage in the case of a leak in transit and packaged as per the relevant legal requirements.
- Collect clinical samples prior to initiation of antimicrobial therapy.
- Collect samples from anatomic sites most likely to yield pathogens and least likely to yield contaminants.
- Provide complete information on the request form including all clinical data. Ideally, all tests referred electronically to the Public Health Laboratory, should be accompanied by the request form.

#### 22.1.2 Environmental, Food and Water Samples

- Use strict aseptic technique to prevent contamination when collecting samples.
- Collect sample in sturdy, sterile, screw cap, and leak-proof containers with lids that do not create an aerosol when opened.

## 22.1.3 Proper Sample Transport

- Samples should be transported from the collection site to the receiving laboratory promptly at temperature not exceeding 26 °C unless otherwise stated.
- This includes when samples are being transported from a peripheral laboratory to the Public Health Laboratory.

### 22.1.4 Sample Containers

- The appropriate sample container must be used for the sample collected/test type.
- The container must be clearly labeled (if necessary use indelible ink) with the following details:
  - Sample type
  - Patient's initial and surname — for clinical samples
  - Date sample taken
  - Sample reference number/ patient's hospital or clinic number.
  - Submitting institution and ward where applicable
- **All the sample containers below are obtainable from the nearest laboratory, after prior arrangement:**
  - **Sterile screw-cap universal container:** used for collection of urine and stool
  - **Sterile tubes:** collection tubes (with/without additives) used for sterile fluids
  - **Sterile 150 ml plastic bottles:** used for the collection of water samples
  - **1 litre plastic water bottles:** used for collection of water samples for Legionella
  - **Moore Pad parcels:** used for collection of river water for Salmonella and Cholera culture
  - **Sterile plastic screw-cap bottles:** used for the collection of food samples
  - **¼ strength Ringer's solution:** used for surface swabs
  - **Sterile swabs:** individually packed, used for surface swabs

## 22.2 Samples (Milk, Food and Water)

### 22.2.1 Collection of Specimens to Test Food Products, Surfaces and Utensils for the Presence of Food Poisoning Organisms

#### 22.2.1.1 FOOD SAMPLING

- Sampling should be systematic, and articles sampled should cover as wide a range as possible.
- All food and beverage components of a shared meal suspected of causing a food borne outbreak should be sampled.
- Where possible, different types of foods must be placed in separate containers (e.g. “curry and rice”: curry in one specimen container, rice in another).
- The quantity of food taken for each sample must be sufficient (at least 50 – 100 grams).
- PLEASE NOTE: Sterile 120 ml sample containers are available from the Public Health Laboratory.
- Specimen labels must be filled in completely before the specimen is dispatched. The following information must appear on the label:
  - The date & time of sampling
  - If the sample has been submitted in a cooler box on ice
  - Sample type, i.e. chicken, gravy, water etc.
  - Site sample was taken from (samples may be taken from one site where the food outbreak occurred but the same item may have been sampled from left over in the fridge and from the remains of a meal)
  - The name of the outbreak should be recorded in the “Sample Description” column
  - All details of the sender including:
    - Name and ID Number [of sender]
    - Department / Health authority
    - Address
    - Telephone number
    - Cell phone number
    - Fax number
    - Email address
    - Alternative contact name and phone number

- Please use the back of the document to fill in details of symptoms, toxic reactions, deaths etc. The specimen must be immediately placed in a cooler box surrounded by crushed ice or ice packs, or any other suitable refrigeration, which is capable of reducing the temperature of the sample.
- If samples are to be transported or sent over long distances then please **DO NOT** use crushed ice as it will melt and may affect the integrity of the sample(s).
- Preserve the cold chain until delivered to the Public Health Laboratory. The temperature of the samples must not exceed 7 °C.

### 22.2.1.2 CLINICAL SAMPLES FOR FOOD POISONING

- When investigating a suspected food poisoning outbreak, clinical samples are often not taken. Thus critical information in tracing the outbreak is unavailable.
- It is essential to link the organisms isolated from the food samples with organisms isolated from the people affected.
- Clinical specimens include: faeces (or rectal swab) and vomitus.
- Please note that these samples and request forms should be labeled: **“Food borne Disease Outbreak” or “Food borne Pathogens”**
- Stools: Microscopy for leucocytes, red blood cells and parasites.
- Stools, rectal swabs and vomitus: Culture for *Salmonella*, *Shigella*, *E .coli* 0157, *Clostridium perfringens*, *Bacillus cereus*, *Staph aureus*, *Campylobacter jejuni*, *Listeria monocytogenes*, *Vibrio cholerae* and *Yersinia enterocolitica*.

### 22.2.1.3 SPECIMEN COLLECTION AND TRANSPORT

- The specimens must be clearly labeled with the patient's name, hospital number, date and time of collection and a brief history of food/fluids consumed by the patient.
- It would be ideal to send the patient stool and relevant food samples to the laboratory at the same time.
- Samples should be hand delivered in a cooler box directly to the laboratory.
- Samples from remote areas should not be dispatched via conventional delivery systems on a Friday or before a Public holiday.
- Stools and or rectal swabs may be sent as part of the investigation of a suspected food poisoning outbreak.
  - Specimens should be submitted as soon as possible.

- When testing food handlers or other individuals in a potential chain of transmission stool cultures should be collected and tested until there are a minimum of two consecutive negative stool samples collected more than 24-hours apart.
- Stool samples should be submitted to the laboratory in a sterile universal container.
- Care should be taken to ensure that the specimen is not contaminated with urine.
  - Rectal swabs should be submitted to the laboratory in an appropriate transport medium.
  - Vomitus
- A vomiting episode occurring between 15 minutes and a couple of hours after the ingestion of foodstuffs or fluids may indicate that the food poisoning is due to a pre-formed enterotoxin.
- The major aetiological considerations are *Staphylococcus aureus* and *Bacillus cereus* and the vomitus may be investigated for these organisms.
- The samples should be collected in sterile universal containers and sent to the laboratory as soon as possible with the food that was eaten.
  - Food samples
    - Culture for *Salmonella*, *Shigella*, *E. coli* O157, *Clostridium perfringens*, *Bacillus cereus*, *Staphylococcus aureus*, *Campylobacter jejuni*, *Listeria monocytogenes*, *Vibrio cholerae*, and *Yersinia enterocolitica* will be performed in the Public Health Laboratory.
  - Toxin tests
    - *Clostridium perfringens* toxin test will be done on samples of faeces only.
    - Toxin tests for *Staphylococcus aureus* and *Bacillus cereus* will be done if these organisms are isolated from clinical or food samples.

## 22.3 Environmental Swabs

- Samples are collected by swabbing from a group of four articles or components of the same kind, and must not include samples taken from any article or components of any other kind: If the number of articles or components of one kind sampled is less than four, the sample is collected from this lesser number.

- Sterile absorbent cotton wool-tipped swabs are used for collection of bacteriological samples.
- For the purpose of sampling two McCartney 10 ml bottles containing 10 ml of quarter-strength Ringer's solution are required for each article or group of articles or component or group of components.

### **22.3.1 Area to be Swabbed**

- In the case of cups, glasses and other drinking utensils, the samples are collected from the exterior and interior surface to a depth of at least 12 mm from the top of the rim.
- In the case of spoons and ice-cream scoops, the samples are collected from the entire inner and outer surface of the bowl.
- In the case of plates, saucers bowls etc., over an area of approximately 2500 mm<sup>2</sup> of the surface which comes in contact with the food.
- In case of all other articles or components, samples are collected from all parts of the surface likely to come into contact with the food.

### **22.3.2 Method of Swabbing**

- The defined area or areas of each article or component or group of articles from which a sample is to be taken shall be swabbed as follows:
  - First, with a swab moistened with Ringers Solution from one of the McCartney bottles (after the excess moisture has been expressed from the swab on the inside of the bottle before removal) swab an area of 50 x 50 mm. After sampling the swab is immediately immersed in the same bottle and the protruding portion of the stick above the neck of the bottle is broken off and the screw top replaced.
  - Immediately afterwards, over the same defined area(s) with a dry swab which shall be placed in the second bottle of Ringers Solution.
- In each case, the bottles are suitably marked so as to identify the article or component from which the sample was taken and to distinguish the wet from the dry swab.
- The person who collects these samples must, at the time sampling, record in duplicate the name and address of the premises, the number of articles or components in the group sampled, the time of taking the sample and the identification mark on each bottle.

- As soon as possible after sampling the bottles containing the swabs, together with the duplicate copy of the particulars mentioned in the previous paragraph, must be delivered to the laboratory within three hours after collection. Where this is not possible, samples must be maintained at a temperature not higher than 5 °C.

## 22.4 Collection of Milk Samples

- Samples are collected using aseptic technique and are transferred to sterile sample containers taking precautions to prevent the contamination of the samples.
- Sample containers are surrounded by crushed ice or other suitable refrigerant which can come into contact with the container and is capable of reducing and maintaining the temperature until delivery to the laboratory at a temperature not exceeding 5–6 °C.
- In the case of milk or cream it must be clearly stated whether it is pasteurised, certified, raw or ultra-light treatment (UHT).
- The **volume** of the sample must be sufficient, i.e.  $\pm 100$  ml. Sterile 120 ml sample containers are available from the nearest laboratory.
- A minimum of 50 g of reconstituted powdered milk should be sent to the laboratory at room temperature. Where the powdered milk has been reconstituted, please indicate on the request form if the milk has been pasteurised or not. The water that was used for reconstituting the milk must be sent to the laboratory for investigation as well.

## 22.5 Collection of Domestic Potable Water Samples

- A sterile container should be used. Sterile 120 ml containers are available from the nearest laboratory.
- Alternatively, a glass bottle may be used that has been boiled for 5 minutes and then placed in an oven to air dry at 100 °C.
- Allow the water to run for 5 minutes.
- Collect 100–200 ml in a sterile container and ensure that the lid is securely in place.
- Provide all relevant information, including address, telephone and fax numbers, on the request form.
- Place the sample in a cooler box with ice packs and transport to the laboratory without delay.

- Tests performed for microbiological potability include total plate count (TPC), coliforms and *E. coli*.
- Samples may be delivered Mondays to Thursdays from 08h30–14h00.

## **22.6 Collection of Water Samples for the Culture of Salmonella Species (Including *S. Typhi*), Shigella Species, *E Coli* 0157 and *Vibrio Cholerae***

### **22.6.1 Sample Taking**

- One-litre bottles are available from the laboratory. These may be used for TPC, coliforms, *E.coli*, salmonella and shigella testing. For *E. coli* 0157 and *Vibrio cholerae* testing, an additional one-litre sample is required for each test.
- Sterile 100 ml containers are also available, and these may be used for TPC, coliforms, and *E.coli* testing.
- Request forms are also available from the laboratory. Please ensure that a separate request form is used for each sample type, e.g., water, food or milk.
- Liaise with the laboratory ahead of the time if you wish to bring a large batch of samples. This is to ensure that adequate media stocks are on-hand.
- Start the sampling session early enough in the day to ensure that the samples can reach the laboratory early enough to be processed on the same day.
- In case there are delays, it is best not to take samples the day before a long weekend or on a Friday.
- When sampling from a borehole or tap allow the water to run for a few minutes so that you do not sample stagnant water in the pipes. Bacterial counts from stagnant water may not be reflective of the true water quality.
- Ensure that the sample is clearly labeled with a marker pen and that the sample container is not leaking.
- Immediately place the sample into a cooler box containing plastic ice packs. Please note that ice blocks from a domestic refrigerator are not a suitable alternative.
- As soon as the sampling session is completed transport the samples to the laboratory without delay.

## 22.6.2 Procedure for Neutralising Chlorine in Water Samples

- Sodium thiosulphate is used to neutralise chlorine in water samples.
- This is to prevent false negative results due to chlorine activity after the sample is taken.
- Please note that this is only for chlorinated water as supplied by your local municipality and does not apply to river water, dam water, borehole water or other environmental water samples.
- 0.5 ml of a 1% solution of sodium thiosulphate is added to a 100 ml sample of water. This will inactivate up to 60 parts per million chlorine in the sample.
- It is still important to transport the sample to the laboratory in a cooler box with ice packs as soon as possible.

## 22.7 Collection of Water Samples for Legionella Culture (Tested According to ISO 11731)

### 22.7.1 Sample Containers

- Samples of water should be collected in glass, polyethylene or similar containers able to hold a volume of 1000–2000 ml. One litre sample bottles are available from the laboratory.
- If used previously, they should be cleaned, rinsed with distilled or mains tap water and then pasteurised either with flowing hot water ( $>70^{\circ}\text{C}$ ) or steam for a period of not less than 5 minutes or autoclaved at  $121 \pm 1^{\circ}\text{C}$  for 15 minutes.
- Small sterile containers with a capacity of 100–250 ml may be used to collect slime, deposit or sediment.
- Access to sample points may be difficult, which can make the use of glass containers unsafe because of possible breakage.

### 22.7.2 Sampling in the Presence of Biocide

- If the water sampled contains or is thought to contain an oxidizing biocide, then add an excess of an inactivating agent to the container before or at the time of sampling.
- Chlorine and other oxidizing biocides are inactivated by the addition of potassium thiosulphate or sodium thiosulphate to the container at a concentration of 100 mg per litre.
- For other biocides the addition of a universal neutralising agent is not yet practicable.

### **22.7.3 Sampling Frequency**

- In South Africa there are no standards as yet but it is suggested that each system should be sampled at least annually and preferably every 6 months.
- If a cooling system has not been in use during the winter months it should be tested before start up.

### **22.7.4 Sample Volume**

- A minimum of 500 ml is required but 2000 ml is preferred, especially if the water is clear.

### **22.7.5 Transport to the Laboratory**

- Samples should be transported to the laboratory between 6 °C and 18 °C and should be protected from sunlight during transportation.
- Deliver the samples to the laboratory as soon as possible, preferably within 1 working day but not more than 2.
- The maximum time interval between taking the sample and processing is 5 days.
- If the delivery of the sample to the laboratory is delayed the specimens should be stored at 6° C.

## 22.8 Public Health Tests Available

**Table 4: Public Health Specimen Instructions**

PUBLIC HEALTH TEST	SAMPLE REQUIRED
Moorepad culture (cholera/typhoid)	Moore pads
Salmonella/Cholera/ <i>E.coli</i> 0157:H7 Agglutinations	Plate or slope
Surface swabs	Swab in ¼ strength ringers solution
Food Samples	Sample Required
Food Testing	Minimum 50 g sample
<b>Individual Tests:</b>	
Coliform Count	Minimum 50 g sample
<i>E.coli</i> Type 1 Count	Minimum 50 g sample
Culture for: <i>Staphylococcus aureus</i>	Minimum 50 g sample
<i>Bacillus cereus</i>	Minimum 50 g sample
<i>Clostridium perfringens</i>	Minimum 50 g sample
Salmonella	Minimum 50 g sample
Shigella	Minimum 50 g sample
<i>Yersinia enterocolitica</i>	Minimum 50 g sample
<i>E. coli</i> 0157	Minimum 50 g sample
Faecal enterococci	Minimum 50 g sample
<i>Listeria</i> species	Minimum 50 g sample
<i>Vibrio</i> species	Minimum 50 g sample
<i>Campylobacter</i> species	Minimum 50 g sample
<i>Staphylococcus aureus</i> Count	Minimum 50 g sample
Salmonella Count	Minimum 50 g sample
Inhibition test	Minimum 50 g sample

In the event of a dispute concerning this document, the electronic version stored on Q-Pulse will be deemed to be the correct version

<b>Milk &amp; Dairy Products</b>	<b>Sample Required</b>
Milk & Dairy Product Testing	Minimum 100 ml sample
<b>Individual tests:</b>	
Standard Agar Plate Count	Minimum 100 ml sample
Coliform Count	Minimum 100 ml sample
<i>E.coli</i> Type 1 Count	Minimum 100 ml sample
Alkaline Phosphatase test	Minimum 100 ml sample
Clot on Boiling test	Minimum 100 ml sample
Inhibition test	Minimum 100 ml sample
<i>Salmonella typhi</i> / species	Minimum 100 ml sample
<i>Staphylococcus aureus</i>	Minimum 100 ml sample
<i>Clostridium perfringens</i>	Minimum 100 ml sample
<i>Bacillus cereus</i>	Minimum 100 ml sample
<b>Water Samples</b>	<b>Sample Required</b>
Water Testing	120 ml sample
Standard Agar Plate Count	120 ml sample
Coliform Count	120 ml sample
<i>E.coli</i> Type 1 Count	120 ml sample
Bottled Water	500 ml sample
Dialysis Water (plate count)	120 ml sample
Culture for: <i>Salmonella typhi</i> / species	Moore Pad
<i>Shigella</i> species	Moore Pad
<i>E coli</i> O157	Moore Pad
<i>Vibrio cholerae</i>	Moore Pad
<i>Legionella</i> species	1 l water





# SECTIONS 23.0

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## VIROLOGY



## 23.0 VIROLOGY

### 23.1 General

- Be as specific in your request as possible i.e. state the specific virus AND the specific test method, e.g. HIV serology, HIV PCR, CMV viral load etc.
- In general, if the disease is localised, e.g. pneumonia, diarrhoea, meningitis, send an appropriate sample from the organ system in question.
- For systemic diseases such as measles, rubella and chickenpox, a clotted (yellow or red top) blood sample for serological testing is usually indicated.
- All HIV ELISA, PCR and viral load testing require a dedicated sample for testing.
- For needlestick injuries please refer to your local health establishment's needlestick injury protocol.

### 23.2 Guide to Appropriate Specimen Collection and Transport

Any patient test result from the virology laboratory is dependent on the quality of the specimen received. A poorly collected and/or poorly transported specimen can result in:

- Failure to isolate or identify the causative virus
- Contamination with bacteria or fungi
- Haemolysis of blood samples

#### 23.2.1 Urine Specimens

- Urine is normally a sterile body fluid, but can easily become contaminated if collected improperly. Please refer to Section 19.11 on page 175 for guidelines on the proper collection of urine specimens.
- Transport urine samples to the laboratory as soon as possible after collection.
- Urine specimens must be submitted for culture within 2 hours after collection. If this is not possible, the sample may be refrigerated at 4–8 °C. Samples must reach the laboratory within 24 hours after collection.
- Urine samples do not need to be transported in virus transport medium (VTM).

#### 23.2.2 Faecal Specimens

- Specimens should be submitted to the laboratory in a sterile screw-cap container as soon as possible after collection (i.e. within 1–2 hours).
- Care should be taken to ensure that the sample is not contaminated with

urine.

- The sample should be a freshly passed stool specimen (3–4 g) is sufficient for virological processing.
- Specimens for Acute Flaccid Paralysis (AFP) surveillance should be sent to the laboratory on ice.

### 23.2.3 Cerebrospinal Fluid (CSF)

- Please refer to Section 19.3 on page 162 for advice on the proper collection of CSF specimens using aseptic technique.
- NOTE: as far as possible CSF must be collected PRIOR to the administration of antiviral or antimicrobial therapy.
- Ideally 1–2 ml should be submitted to the laboratory for virological testing – greater volumes increase the chance of organism recovery.
- The ideal tube for collecting CSF specimens for virological testing is a sterile tube with no additives or clot activators.
- CSF specimens should be transported promptly to the laboratory. Failure to do this may result in the non-viability of some viruses.
- If prompt delivery is not possible, CSF specimens should be kept at 4–8 °C until delivery to the laboratory. Samples must reach the laboratory within 24 hours after collection.
- CSF specimens do not need to be transported in VTM.

### 23.2.4 Vesicle Fluid

- Vesicle fluid should be aspirated using sterile technique and inoculated into VTM. The transport medium can be drawn up into the syringe and then expelled into the VTM container to ensure that a maximum amount of vesicle fluid is submitted for testing.
- The aspirating syringe is NOT an acceptable transport container due to risk of needlestick injuries.
- Samples should be delivered promptly to the laboratory. If prompt delivery is not possible, vesicle fluid specimens should be kept at 4–8 °C until delivery to the laboratory. Samples must reach the laboratory within 24 hours after collection.

### 23.2.5 Respiratory Tract Specimens

- Infections of the lower respiratory tract are a major cause of morbidity and mortality. Diagnosis of these infections is frequently complicated by specimen contamination with upper respiratory tract secretions during collection.
- Please refer to Section 19.6 on page 163 for guidelines on the proper collection of respiratory tract specimens.

- If a swab is taken from a part of the respiratory tract, it is essential that it be placed in VTM. The swab should be placed into the bottle and the shaft broken off – this will allow the transport container to be closed with the broken-off swab inside.
- Swabs for viral culture must NOT be placed into the gel-based transport medium for bacterial culture – these samples will be rejected.
- Multiple swabs taken from the respiratory tract of the same patient can be pooled into a single container of VTM.
- All specimen containers must be tightly closed – leaking specimens will compromise the quality of results.
- Specimens must be transported promptly to the laboratory. Failure to do this may result in the death of fastidious organisms and overgrowth by more hardy bacteria.
- If prompt delivery is not possible, specimens should be kept at 4–8 °C until delivery to the laboratory. Samples must reach the laboratory within 24 hours after collection.

### 23.2.6 Tissue Specimens

- Tissue specimens should preferably be sent to the laboratory in a sterile container with VTM. If this is not available, use sterile water or saline – **DO NOT** use formalin.
- Brain tissue for rabies investigation should be transported in sterile 50% glycerol saline. Please refer to the **Rabies: Ante-mortem & Post-mortem Specimen Collection Guide** on page 198 for further details.

## 23.3 Viral Hepatitis Screening

- This seems to be an endless source of confusion, but the following basic approach may be helpful:

QUESTION	CORRECT TEST
Does my patient have hepatitis A?	Hep A IgM
Does my patient have hepatitis B? (acute or chronic)	Hep B surface antigen
Does my patient have acute hepatitis B?	Hep B core IgM
Does my patient have highly active hepatitis B?	Hep B e-antigen
Does my patient have hepatitis C?	Hep C antibody
Is my patient immune to hepatitis B? (can be due to previous infection or vaccination)	Hep B surface antibodies

- Please send a clotted (yellow or red top) blood sample for all hepatitis serology testing.
- Hepatitis A and B are common in South Africa. Hepatitis C is relatively uncommon, especially in children.
- Hepatitis A does not cause a chronic infection, and therefore does not cause cirrhosis or hepatocellular carcinoma. On the other hand, hepatitis B and C infections can become chronic and cause cirrhosis and hepatocellular carcinoma.

## 23.4 HIV Testing

- A diagnosis of HIV infection in an adult or child older than 18 months of age is made by an HIV ELISA test on a clotted (yellow or red top tube) blood sample. If the screening ELISA is positive, a confirmatory ELISA will automatically be done on the same sample. A second clotted blood sample should be sent for repeat testing to confirm the diagnosis.
- In HIV-exposed children less than 18 months of age, HIV is diagnosed by an HIV PCR on an EDTA (purple top) blood sample or dried blood spots (DBS). Please refer to the **Quick Guide to Sample Collection for HIV PCR** on page 217 for guidelines on DBS collection.
- HIV viral load testing is available for monitoring in patients already on antiretroviral therapy and is performed on an EDTA (purple top) or PPT (pearl top) blood sample.

**PLEASE NOTE:** that separate specimens are required for CD4 and HIV viral load testing as these tests are performed in separate sections of the laboratory. Please also keep in mind that specimens for CD4 must be kept at room temperature, while specimens for HIV viral load testing should be refrigerated. Specimens for CD4 should be placed in a separate bag to keep from mixing them with other specimens and getting accidentally put in the refrigerator.

Figure 32.

**QUICK GUIDE TO SAMPLE COLLECTION FOR HIV PCR**

Two types of blood samples can be used for an HIV PCR test:

- Dried blood spots (DBS)
  - Dried blood spots are technically easier to obtain and are suitable for blood sampling in the primary healthcare setting.
  - The DBS card has 5 pre-printed circles with perforated edges and space for labeling.
  - Dried blood spots can be collected from a heel-, toe- or fingerprick or prepared from venous blood.
- Whole blood in an EDTA (purple top) tube
  - Mix blood well to avoid clotting. Clotted blood samples interfere with HIV PCR test results.

**Materials required**

1. DBS collection kit
  - a. Instructions for performing the procedure are printed on the back of each kit. The kit contains consumables for:
2. Blood sampling
  - a. Disinfectant for skin (e.g. alcohol swab)
  - b. Single use, loaded lancing device (e.g. Hemocue)
  - c. Cotton wool or gauze
3. Collection
  - a. DBS card
  - b. Desiccant sachet
  - c. Sealable plastic bag
4. PLUS you'll need
  - a. CCMT (ARV) NHLS laboratory request form with bar-coded stickers
  - b. Powder-free gloves
  - c. Drying rack
  - d. Biohazard bag: a sealable plastic bag for specimen packaging

**Method**

- Confirm the patient's identity and check the expiry date on the filter paper card.
- Write the name, date of birth and today's date onto the filter paper card and complete the request form.
- Select an appropriate puncture site.



In infants and small children you can use the sides of the heel or big toe. Draw an imaginary line from the midpoint of the big toe to the heel and one form the between the 4th and 5th toe to the heel. The areas to the side of these lines on the heel and big toe are safe to use.

In children older than 9 months the finger may be used.

- Warm the area, e.g. with a soft cloth moistened with warm water, for 3 – 5 minutes to encourage blood flow.
- Wash your hands, dry thoroughly and put on gloves.

- Clean the area with an alcohol swab and allow it to dry thoroughly. Failure to allow the alcohol to dry may dilute the specimen.
- Puncture the site using a freshly unpacked sterile lancet.
- Dispose of the lancet safely into a sharps/infectious waste disposal container.
- Wipe away the first blood drop using a clean cotton wool swab. The initial drop contains tissue fluid that may dilute the specimen.



- Allow another large blood drop to form.
- Lightly touch filter paper card onto blood drop. Apply blood only to the side of the filter paper card with the printing on. Allow blood to soak through and to radiate to completely fill the circle but do not layer more than one blood drop onto the same circle. Do not touch the blood spots with your hands or gloves!
- Allow the next drop of blood to form and soak it onto the next marked circle. Repeat until at least three marked circles are filled with blood.
- The pre-printed circles hold  $\pm 75 \mu\text{l}$  blood each when completely filled. Samples with insufficient blood cannot be processed since the PCR result may be unreliable.
- Apply pressure to the puncture site using clean gauze (or cotton wool) to stop further bleeding and apply a plaster strip to puncture site.
- Place the card in the drying rack without the blood touching the rack. Do not allow blood spots to come into contact with any surface or each other.
- Allow to dry thoroughly for at least 3 hours while keeping it away from sunlight, dust or insects.
- Place the card with a desiccant sachet into an airtight sealable bag.
- Close bag and send it together with the request form to the laboratory. During transport the samples should not be left in the car as exposure to sunlight and heat may deteriorate the samples.



#### Features of acceptable and unacceptable DBS samples

##### Acceptable:

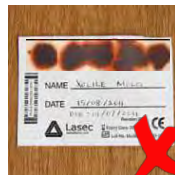
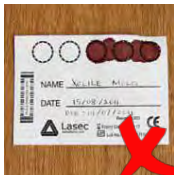
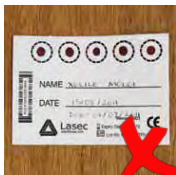
- At least three pre-printed circles should be completely filled with blood.
- The CCMT (ARV) NHLS laboratory bar-coded sticker should be affixed and the DBS card completely and accurately labelled.

##### Unacceptable:



The laboratory cannot process these DBS cards and repeat samples will be required to obtain a PCR result.

- Patient details on DBS card are not legible.
- Patient details on DBS card and CCMT (ARV) NHLS laboratory request form do not match and no barcode sticker is affixed.
- Insufficient sample for processing.
- Blood spotted outside the pre-printed circle and DBS cards containing clotted/crusted blood.
- Blood spots with serum rings due to contamination with alcohol.



## 23.5 EPI-Related Surveillance

### 23.5.1 Acute Flaccid Paralysis (AFP) Surveillance

#### 23.5.1.1 CASE DEFINITION

- A child under 15 years of age with sudden onset of weakness (acute flaccid paralysis) of any limb(s), excluding injury but including Guillian-Barrè syndrome and transverse myelitis OR
- A person of any age with paralytic illness in whom a clinician suspects polio

#### 23.5.1.2 SUSPECTED ACUTE FLACCID PARALYSIS NOTIFICATION AND TESTING PROTOCOL IN BRIEF

- Report the case to the local / provincial surveillance officer and obtain an EPID number.
- Complete the case investigation form with the relevant information, including the EPID number. The case investigation form can be obtained from your local surveillance or infection control officer. Alternatively the form can be downloaded from the following website: [http://www.nicd.ac.za/assets/files/AFP\\_CIF\\_and\\_Specimen\\_Collection\\_Guide.pdf](http://www.nicd.ac.za/assets/files/AFP_CIF_and_Specimen_Collection_Guide.pdf)
- Conduct a thorough neurological examination and carefully document site of paralysis, muscle tone, power and reflexes.
- Collect two (2) stool samples, taken 24–48 hours apart, within 14 days of onset of paralysis.
- Send the stool samples ON ICE, together with the case investigation form to the laboratory to reach the NICD within 3 days after sample collection.

### 23.5.2 Acute Measles Surveillance

#### 23.5.2.1 CASE DEFINITION

- Fever
- Maculopapular rash
- Cough, coryza or conjunctivitis

#### 23.5.2.2 SUSPECTED MEASLES NOTIFICATION AND TESTING PROTOCOL IN BRIEF

- Report the case to the local / provincial surveillance officer and obtain an EPID number.

- Complete the case investigation form with the relevant information, including the EPID number. The case investigation form can be obtained from your local surveillance or infection control officer. Alternatively the form can be downloaded from the following website:  
[http://nicd.ac.za/assets/files/DOH\\_Measles\\_CIF.pdf](http://nicd.ac.za/assets/files/DOH_Measles_CIF.pdf)
- Send the case investigation form AND a clotted (yellow or red top) blood sample to the laboratory.
- The samples should be stored at 4–8 °C until shipment takes place and should be transported to the NICD on frozen ice packs.

## 23.6 Special Viral Pathogens

### 23.6.1 Suspected Human Rabies

- Initial symptoms are often non-specific and may include fever, headache, malaise, and pruritis and parasthesia/tingling or pain around the original wound site (may be healed by the time rabies disease presents).
- A history of animal, particularly dog, exposures provide important epidemiological evidence towards the rabies diagnosis. Lack of history of animal exposure does not exclude the diagnosis of rabies, e.g., these events may be mundane (i.e. licks on broken skin or mucosal membranes such as the eyes and nose; small nicks or scratches may also transmit the viruses), young children may not report all exposures, exposures to animals such as bats may be cryptic and the patient may be unaware of the exposure event.
- Thereafter rabies in humans may present in two ways — furious/encephalitic rabies or dumb/paralytic rabies.
  - Symptoms of furious rabies include restlessness, agitation, hallucinations, difficulties with speaking and swallowing, hypersalivation, hydrophobia and aerophobia.
  - With paralytic rabies symptoms appear over a longer period of time, and include ascending (often asymmetrical) flaccid paralysis and confusion with progression to coma.
- Although these signs are characteristic of rabies they may or may not be present in all patients. Rabies disease is always progressive with rapid deterioration of patients over a couple of days. Few patients are hospitalised for more than 1–2 weeks.

*Protocol for the request for laboratory investigation of suspected human rabies cases:*

- Fully complete the suspected human rabies case history form.
- Call the NICD-NHLS Hotline at 082 883 9920 to inform them about the suspected rabies case.
- Collect the appropriate ante- or post-mortem samples according to the **Rabies: Ante- mortem & Post-mortem Specimen Collection Guide** on page 223.
- Send the samples and the fully completed case history form to the laboratory as soon as possible. The case history form can be obtained from the following website:

[http://www.nicd.ac.za/assets/files/Rabies\\_CIF\\_and\\_specimen\\_collection\\_guid e1.pdf](http://www.nicd.ac.za/assets/files/Rabies_CIF_and_specimen_collection_guid e1.pdf)

## **23.6.2 Suspected Viral Haemorrhagic Fever (VHF)**

- The diagnosis of VHF should be considered for any patient who presents with:
  - Acute onset of fever (less than 3 weeks duration)
  - Severe prostrating or life-threatening illness
  - Bleeding manifestations (at least two of the following: haemorrhagic or purpuric rash, petechiae, epistaxis, haematemesis, haemoptysis, blood in stool, or other evidence of bleeding) may be present
  - No predisposing factors for a bleeding diathesis
  - An appropriate travel or exposure history
- A wide range of conditions (bacterial, viral, and parasitic infections as well as non- infectious causes) should be considered in the differential diagnosis of VHF.

### **23.6.2.1 SUSPECTED VIRAL HAEMORRHAGIC FEVER PROTOCOL IN BRIEF**

- Follow your local regional or provincial protocol for the management of suspected or confirmed viral haemorrhagic fever cases.
- Contact your local virologist or infectious disease specialist physician to discuss the case, including appropriate specimen collection.
- Alternatively call the NICD-NHLS 24 hour Hotline for Clinical Advice at (082) 883 9920 to discuss and report the case.

### **23.6.2.2 THE FOLLOWING FIVE PRINCIPLES SHOULD BE OBSERVED IN THE COLLECTION OF ALL PATIENT SPECIMENS**

1. Only specimens essential for diagnosis or monitoring should be obtained.
2. Specimens should be obtained by staff experienced in the required techniques.

Staff should wear the appropriate personal protective equipment as per institutional protocols for infection control, including long sleeved gown, apron, gloves, and face shield or surgical mask with eye protection during specimen collection.

3. Wherever possible, glass containers should not be used. Disposable sharp objects, such as scalpel blades, should be placed in puncture-resistant waste containers immediately after use and later autoclaved before disposal or incineration.
4. Blood samples must be collected with extreme care to avoid self-inoculation. Needles should not be bent, broken, removed from disposable syringes, or otherwise handled. After use, blood-taking equipment should be immediately placed in a rigid plastic waste container filled with disinfectant solution and autoclaved before disposal or incineration.
5. The entire outside surface of each specimen container should be wiped with disinfectant, and a label should be attached bearing the patient's name, hospital number, source of the specimen and date of collection. Clinical laboratory specimens should be placed in plastic bags that are sealed, and then transported in durable, leak proof containers directly to the receiving area of the laboratory by the responsible health care worker. The outside of these bags should be wiped with a disinfectant solution such as 1:100 dilution of household bleach before leaving the patient's room. Laboratory staff should be alerted to the nature of the specimens.

*(Adapted From: Abraham E, et al. Viral Hemorrhagic Fevers (VHFs) Contingency Plan – Ontario)*

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Figure 33.

## RABIES: Ante-mortem & Post-mortem Specimen Collection Guide

### Ante-mortem specimens

Suitable ante-mortem specimens for rabies testing include **saliva**, **nuchal skin biopsy** and **cerebrospinal fluid (CSF)**. Submitting a full range of specimens for a suspected rabies cases is recommended.

### Post-mortem specimens

It is important to conduct laboratory investigations on persons who died from a suspected rabies virus infection. A **brain specimen** is the preferred specimen, which may be conducted by a Forensic Pathologist. However, if not available, clinicians may obtain a **post-mortem nuchal skin biopsy** for rabies diagnosis.

### Saliva specimens

- Collect at least 500 µl of saliva into a universal specimen container — often easiest using a syringe or suction device. Sputum is **NOT** an acceptable specimen.
- If possible, collect 3 specimens in total: 1 specimen daily on 3 consecutive days (**NOT** 3 specimens on the same day).

### CSF specimens

Collect at least 500 µl of CSF in a sterile tube without additives or clot activator.

### Nuchal skin biopsy

A section of skin, 5–6 mm in diameter and ≈ 5–7 mm depth, must be taken from the nape of the neck (Figure). It is important that specimens contain **hair follicles** and should be of sufficient depth to include the **cutaneous nerves** at the base of hair follicles.

- Collect the skin biopsy. This can be done as an excision or punch biopsy.
- Moisten a piece of gauze with saline or water.
- Place the skin biopsy onto, and cover with, a piece of moist gauze.
- Place the gauze with the biopsy into a screw-top container.

### Brain specimens

- Whole, half or sections of both the cerebellum and the cerebrum may be submitted.
- Place the specimen in a sterile screw top container and submerge the specimen in 50% glycerol saline (half volume glycerol and half PBS). If glycerol saline is not available: freeze and send ASAP. DO NOT place in formalin.

### Transportation

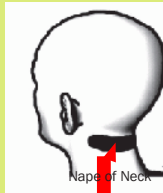
- The specimens should be packaged in accordance with the guidelines for the transport of dangerous biological goods (triple packaging using absorbent material) and transported directly to:

**Special Pathogens Unit**  
**National Institute for Communicable Diseases (NICD) National**  
**Health Laboratory Service (NHLS)**  
**No. 1 Modderfontein Rd**  
**Sandringham, 2131**  
**Gauteng, South Africa**

- Keep the specimen cool and send ASAP.
- ALL specimens should be labeled AND accompanied by a fully completed Suspected Human Rabies Case History Form.

**Please inform the NICD-NHLS Hotline (082) 883 9920**, a 24-hour service for all healthcare professionals countrywide, when submitting specimens for rabies diagnosis.

**NOTE:** hotline is NOT a service for the public. Public should contact the Department of Health for any queries.





# SECTIONS 24.0

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## GENETIC TESTING: SAMPLE COLLECTION AND TRANSPORT



## 24.0 GENETIC TESTING: SAMPLE COLLECTION AND TRANSPORT

Results of tests for inherited disorders carry serious medical and social implications for the patient and his/her family. For this reason, patients should be counseled by a clinician/clinical geneticist/genetic counselor on the genetic background, informativity and potential implications of the test results. The relevant details may be obtained by contacting the laboratory (see Table 1 on pages 17 - 53).

A written, informed consent should be obtained for certain types of genetic testing e.g. predictive or carrier. This should be obtained from the patient, or in the case of a minor, from the parents or guardians. It is also important to provide the laboratory with a detailed family history (a pedigree sketch, if possible) and clinical information, as it may impact on the test report and subsequent counseling. This information may be provided by completing a special Genetic test request form, which should be available from the referral laboratory. Alternatively the Hospital, Clinic or Comprehensive Care request form may be used, with additional notes attached.

### 24.1 Cytogenetics

Cytogenetic studies include both traditional cytogenetic techniques (cell culture and karyotyping) as well as molecular cytogenetics by Fluorescent *In Situ* Hybridization (FISH), Multiple Ligase-dependent Probe Amplification (MLPA), Quantitative fluorescence PCR for aneuploidy (QF-PCR) and microarray analysis.

#### 24.1.1 Specimen Types

- Peripheral blood
- Amniotic fluid
- Bone marrow
- Chorionic villi samples (CVS), products of conception (POC), and skin.
- Specimens for FISH studies

### 24.1.2 Specimen Collection

**All samples are to be kept at room temperature or in fridge until collected for transport to the laboratory.**

#### 24.1.2.1 PERIPHERAL BLOOD

- Samples should be collected using sterile technique into a 5ml heparinised (green top) tube. A minimum of 2ml blood should be collected. If using a paediatric tube, 0.5ml of blood is sufficient for the culture and analysis.
- For haematological cytogenetics, a minimum of 4ml of blood should be collected into a heparinised (green top) tube. A blast count of at least 20% is required for initiation of peripheral blood leukaemic cell cultures.

#### 24.1.2.2 AMNIOTIC FLUID

- Approximately 10–15 ml of amniotic fluid should be collected into a sterile 25ml universal container supplied by the laboratory. If the initial volume of sample is blood- stained, the remainder should be collected into a second tube to reduce the amount of maternal contamination (both tubes are submitted). Some sample syringes have a rubber plunger which is toxic to cells. It is therefore advisable to transfer the fluid into a universal container as soon as possible after sampling. The amniotic fluid should reach the laboratory within 24 hours of sampling.
- If molecular prenatal testing (i.e. mutation analysis or QF-PCR) is requested in addition to cytogenetic analysis, an additional volume of the fluid should be collected (approximately 5 ml) into a separate, clearly marked, universal container.

#### 24.1.2.3 BONE MARROW ASPIRATE

- At least 1–5 ml of bone marrow should be collected into a 5 ml heparinised (green top) tube, using sterile techniques.

#### 24.1.2.4 CHORIONIC VILLUS SAMPLES (CVS), PRODUCTS OF CONCEPTION (POC), AND SKIN

- All specimens should be taken using sterile technique and transported to the laboratory in sterile saline. **DO NOT** fix in formalin.
- Whole fetuses or large tissue specimens are not a suitable sample type for genetic testing, as genetic laboratories do not have resection or appropriate disposal facilities.

### 24.1.2.5 SPECIMENS FOR FISH STUDIES

Different types of samples can be used for constitutional and oncology FISH studies:

- Amniotic fluid
- EDTA and Heparinised blood samples
- Peripheral blood smears
- Heparinised bone marrow aspirate samples
- Bone marrow smears
- Fluid samples (e.g. pleural or ascetic fluids)
- Paraffin embedded tissue (3–5 µm sections on positively charged slides)
- Cytological preparations
- Cell suspensions from cultured peripheral blood lymphocytes or bone marrow aspirates
- Single cell isolated from solid tumours
- Single cell suspensions
- Buccal swabs

### 24.1.3 Specimen Transport

- Specimens should be transported in cooler boxes (ice packs may be used) and protected from direct sunlight.

**NB:** Specimens **MUST NOT BE FROZEN**. Cooler boxes and ice packs may be used.

- Fresh specimens for culture and FISH studies must reach the referral laboratory within 48 hours of sampling.

## 24.2 Molecular Genetics

Molecular genetic testing is based on analysis of extracted genetic material (DNA or RNA), for the purpose of mutation detection. This, for the most part, involves testing for heritable monogenic disorders and certain types of cancers. DNA-based parentage and HLA typing is also offered.

Requests for testing are categorised as:

- **Diagnostic:** the patient is symptomatic.
- **Predictive:** the patient is asymptomatic but is at risk of having inherited a mutation previously detected in other members of his/her family, and developing symptoms at a later stage in life.
- **Carrier:** the patient is asymptomatic but may be carrying a disease-causing mutation, which could be passed onto his/her offspring.
- **Prenatal:** DNA of an unborn foetus is tested for the presence of a disease-causing mutation.

## 24.2.1 Specimen Types

- Peripheral Blood
- Amniotic Fluid
- CVS
- Tissue (fresh or fresh frozen paraffin embedded tissue (FFPE))
- Dried blood spot
- Other (buccal swabs, saliva etc.)

## 24.2.2 Specimen Collection

**All samples are to be kept at room temperature or in the fridge until collected for transport to the laboratory.**

### 24.2.2.1 PERIPHERAL BLOOD

- At least 5 ml of blood should be collected into an EDTA (purple top) tube. Where possible, two or three tubes should be collected to allow for potential future testing and storage. In paediatric cases, an attempt should be made to obtain at least 2 ml of blood. A lesser volume may yield insufficient DNA for certain types of analyses (e.g. those employing Southern blotting). In problematic cases, the testing laboratory should be contacted for details. Blood should be received within 72 hours of sampling, as prolonged delay will compromise the quality of the extracted DNA and may result in sample rejection.

**NB:** It is essential to ensure proper mixing of the blood with the anticoagulant in the tube, as even partial clotting will drastically affect the DNA yield.

### 24.2.2.2 AMNIOTIC FLUID

- Molecular prenatal testing may be requested alone or in addition to cytogenetic analysis. It is however recommended that mutation analysis be accompanied by karyotyping for aneuploidies and chromosomal structural aberrations. Care must be taken to collect a sufficient volume of the fluid, and to transport it according to the requirements for both types of investigations (see CYTOGENETICS). Amniotic fluids should be collected into sterile 25ml universal containers supplied by the laboratory. If the initial volume of sample is blood-stained, the remainder should be collected into a second tube to reduce the amount of maternal contamination (both tubes are submitted). An additional universal container should be collected if both molecular (e.g. mutation analysis) and cytogenetic testing is required. Some sample syringes have a rubber plunger which is toxic to cells. It is therefore advisable to transfer the fluid

into a universal container as soon as possible after sampling. Amniotic fluids should reach the laboratory within 48–72 hours of collection for molecular testing.

#### 24.2.2.3 CHORIONIC VILLUS SAMPLES (CVS) AND FRESH TISSUE

- All samples should be taken using sterile technique and transported in sterile saline to the laboratory. Do not freeze. Do not fix in formalin. Fresh tissue samples for DNA extraction should not be larger than approximately 1cm<sup>3</sup>.
- **NB:** whole organs or large tissue specimens are not a suitable sample type for genetic testing, as genetic laboratories do not have resection facilities.

#### 24.2.2.4 FORMALIN-FIXED PARAFFIN-EMBEDDED TISSUE (FFPE)

- DNA can be extracted from tissue sections and used in molecular assays. This is most commonly done in cancer genetics, though it is also occasionally performed as part of other types of genetic investigations. Paraffin blocks or mounted (unfixed) sections may be submitted.
- It may be important to mount (do not fix) the section on a slide and delineate the extent of the tumour and the normal tissue in a section using a koki pen. This is **specifically required for microsatellite instability (MSI) testing in Lynch syndrome and should be performed as shown below**. The laboratory where the test is performed should be contacted to confirm details.

#### 24.2.2.5 OTHER SAMPLE TYPES

Genetic material can also be extracted from other specimen types such as buccal swabs, saliva, body fluids, etc. This however should be discussed with the referral laboratory before submitting the sample, to confirm suitability for the specific investigation and methodology employed by the laboratory.

#### 24.2.2.6 SPECIMEN TRANSPORT

##### • Specimens for DNA studies

Specimens must be transported at room temperature and be protected from direct sunlight. All fresh blood/tissue/fluid samples should reach the laboratory within 3 days of sampling.

**NB:** Specimens **MUST NOT BE FROZEN**. Cooler boxes and ice packs may be used.

Figure 34.

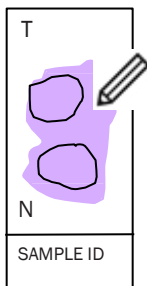
**A:** Following histological examination, the extent of the tumour must be delineated on the original H&E slide, by outlining it in a koki pen. The normal parts of the section should be marked out in a similar manner.

T = tumour

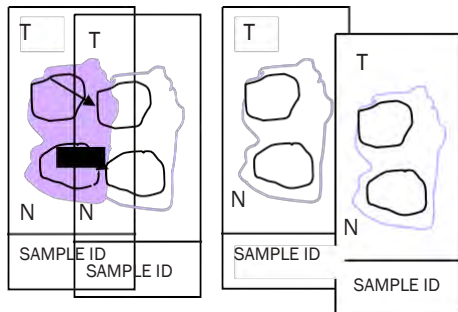
N = normal.

**B:** Additional slides (3 or 4, if possible) of about ~ 8 microns in thickness must then be cut for DNA extraction, using a **fresh blade** to prevent DNA contamination from other specimens. These **unstained** sections should then be lined up against the H&E slide and the tumour and normal parts outlined with a koki pen.

**A.**



**B.**





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# SECTIONS 25.0

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## IMMUNOLOGY

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## 25.0 IMMUNOLOGY

### 25.1 General

The five major disciplines in Immunology are Auto-immune disease diagnostics, Allergy, Tissue Immunology, Immunodeficiency testing and Serology. Only four academic NHLS laboratories cater for all these disciplines and most NHLS laboratories refer specialised Immunology tests to these major centres. The majority of testing is done on serum, therefore 5 ml clotted (red or yellow top) blood will suffice, with the exception of:

- Immunodeficiency testing (i.e. lymphocyte- and neutrophil function analysis etc.) require EDTA (purple top) blood.
- Tissue Immunology (entails the isolation of viable cells or DNA) require ACD (light yellow top), EDTA (purple top) or heparinised (green top) blood, depending on the test and/or testing site requirement. Please liaise with the testing laboratory when HLA typing is required.

### 25.2 Allergy – testing for allergens (allergies)

Allergy or the identification of known allergen sensitisation are requested to diagnose:

- Atopy (i.e. causes for rhinitis/hay fever)
- Food allergies
- Sensitisation to occupational allergens
- Possible parasitic infections

There are over 600 allergens available as well as a variety of mixed associated allergens (i.e. pediatric foods, nut mixes, mould mixes etc). It is impossible to cater for all these allergens and allergen availability should be confirmed with the testing laboratory. Please indicate clearly on the request form which specific allergens should be tested for.



# SECTIONS 26.0

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## LIST OF TESTS OFFERED IN THE NHLS

## 26.0 LIST OF TESTS OFFERED IN THE NHLS

Table 5 from page 241 onwards shows the tests, specimen types and special instructions for tests performed by the NHLS laboratories). Refer to your local laboratory or Service Level agreements signed between NHLS and the different Provinces for TATs. The clinic and hospital TATs will also vary because of the transport between laboratory and clinic or hospital. Some tests are only done in certain laboratories depending on the resources available and the number of requests received per laboratory, please consider this factor as well for TATs.

**Table 5:** NHLS Test List

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
11-deoxycortisol	5 ml clotted (red or yellow top) blood	For transport separate serum and send frozen on dry ice.
17-hydroxyprogesterone	5 ml clotted (red or yellow top) blood	NOTE: Please ensure that the patient's age is indicated on the request form. Please contact the referral laboratory for transport conditions.
5-hydroxy-indoleacetic acid (5-HIAA)	24 hr urine collection (best practise) OR 20 ml random urine for babies	NOTE: Urine should be collected into a dark container, and the specimen refrigerated during collection. Acidify with HCl. See Section 17.2.5 for detailed instructions and precautions.
5- $\alpha$ -Reductase Deficiency (SRD5A2) (DNA analysis)	5ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Acetaminophen (Paracetamol)	5 ml clotted (red or yellow top) blood	
Acid base studies	25 ml random urine in a universal container ON ICE	NOTE: Deliver sample immediately to the laboratory on ice. Please discuss with the referral laboratory before sample collection.
Acid phosphatase (prostatic)	5 ml clotted (red or yellow top) blood	Separate serum promptly. Add 1 drop (30 $\mu$ l) stabiliser (0.8 M acetic acid) to 1 ml serum within 1 hr of collection. Sample is stable at 4 °C for 8 days.
Acid phosphatase (total)	5 ml clotted (red or yellow top) blood	Separate serum promptly. Add 1 drop (30 $\mu$ l) stabiliser (0.8 M acetic acid) to 1 ml serum within 1 hr of collection. Sample is stable at 4 °C for 8 days.
Acidified Glycerol Lysis Test	5 ml EDTA (purple top) blood AND 5 ml EDTA (purple top) blood from a healthy control	NOTE: Please arrange test with the referral laboratory before sample collection. Specimen must reach the laboratory within 4 hrs of collection.
Activated protein C resistance (APCR)	5 ml sodium citrate (blue top) blood	NOTE: Please provide full clinical history. Sample must reach the laboratory within 6 hrs of collection. For transport separate plasma and send frozen on dry ice.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Acute flaccid paralysis (AFP) surveillance	2 x fresh stool sample in a universal container on ice taken 24 - 48 hrs apart within 14 days of onset of paralysis	NOTE: See Section 23.5.1 for specific guidelines on this notifiable condition.
Acylcarnitine profile (serum)	5 ml clotted (red or yellow top) blood	NOTE: Deliver sample immediately to the laboratory on ice. For transport separate serum and send frozen on dry ice.
Acylcarnitine profile (urine)	25 ml random urine in a universal container	NOTE: Deliver sample immediately to the laboratory on ice. For transport send frozen on dry ice.
Adenosine deaminase (CSF)	0.5 ml CSF in a (clear top) collection tube without additives	
Adenosine deaminase (fluid)	5 ml fluid in a (clear top) collection tube without additives	NOTE: Pus and bloody fluid samples are unsuitable.
Adenosine deaminase (serum)	5 ml clotted (red or yellow top) blood	
Adenovirus isolation (culture)	Random urine sample in a universal container OR respiratory tract sample in viral transport medium (VTM)	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Adenovirus PCR	Random urine sample in a universal container OR respiratory tract sample in viral transport medium (VTM)	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Adenovirus type 40/41 Antigen Rapid test	1–2 g fresh stool sample in a universal container	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Adrenal Antibodies	5 ml clotted (red or yellow top) blood	
Adrenocorticotrophic hormone	5ml EDTA (purple top) blood on ice	NOTE: Deliver sample immediately to the laboratory on ice. Consider factors such as prior administration of corticosteroids and time of sampling (diurnal variation). For transport centrifuge sample immediately and send frozen on dry ice.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Alanine aminotransferase (ALT)	5 ml clotted (red or yellow top) blood	
Albumin (CSF)	0.5 ml CSF in a (clear top) collection tube without additives	
Albumin (fluid)	5 ml fluid in a (clear top) collection tube without additives	
Albumin (Microalbumin) (urine)	25 ml random (early morning) or timed urine in a universal container	NOTE: Testing is not recommended in blood-stained urine.
Albumin (serum)	5 ml clotted (red or yellow top) blood	NOTE: Avoid prolonged stasis during venesection.
Alcohol (ethanol) (serum)	Contact laboratory for collection tube type	NOTE: Results cannot be used for medico-legal purposes. Do not clean collection site with alcohol.
Aldolase	5 ml clotted (red or yellow top) blood	
Aldosterone	5 ml clotted (red or yellow top) blood	NOTE: See Section 17.2.3 for detailed instructions and precautions.
Alkaline phosphatase (ALP)	5 ml clotted (red or yellow top) blood	
Alkaline phosphatase (bone specific)	5 ml clotted (red or yellow top) blood	NOTE: Avoid haemolysis during venesection. For transport < 72 hrs send serum on ice; otherwise if delayed > 72 hrs send frozen on dry ice.
Alkaline phosphatase iso-enzymes	5 ml clotted (red or yellow top) blood	NOTE: Avoid haemolysis during venesection. A fasting sample is preferred.
Allergy Test: Food Panel (RAST)	5 ml clotted (red or yellow top) blood	
Allergy Test: Inhalant Panel (RAST)	5 ml clotted (red or yellow top) blood	
Allergy Test: Inhalant screen (Phadiatop)	5 ml clotted (red or yellow top) blood	

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Allergy tests (IgE-specific Antibodies )	5 ml clotted (red or yellow top) blood	NOTE: Please specify allergens on the request form. Testing is done in batches.
Aluminium (serum)	5 ml blood in a trace metal (royal blue top, additive free) tube	NOTE: Test very prone to contamination. See Section 17.2.10 for detailed instructions.
Aluminium (urine)	25 ml random urine in a universal container	NOTE: Test very prone to contamination. See Section 17.2.10 for detailed instructions.
Amikacin	5 ml clotted (red or yellow top) blood	NOTE: Trough levels to be collected 30 min prior to next dose, peak levels to be collected 30 min after a 1 hr infusion. Please state the time of last dose on the request form.
Amino Acids (CSF) (quantitative)	0.5 ml CSF in a (clear top) collection tube without additives	NOTE: Deliver sample to the laboratory immediately after collection. If delivery is delayed, send frozen on dry ice. Individual amino acids may also be requested.
Amino Acids (serum or plasma) (quantitative)	5 ml clotted (red or yellow top) or heparinised (green top) blood	NOTE: Minimum acceptable volume 1 ml. Deliver sample to the laboratory immediately after collection. If delivery is delayed, separate and send frozen on ice. Pre-prandial sample preferred. Individual amino acids may also be requested.
Amino Acids (urine)	25 ml random urine in a universal container	NOTE: Deliver sample to the laboratory immediately after collection. If delivery is delayed, send frozen on dry ice. Individual amino acids may also be requested.
Aminolaevulinic acid (ALA)	Random or 24 hr urine sample	NOTE: Protect specimen from light during collection and transport. Random urine sample can be taken during an acute attack. Early morning urine is needed for latent porphyria.
Aminophylline (see Theophylline)		
Ammonia	Contact laboratory for collection tube type	NOTE: Neither patient nor phlebotomist may smoke in the 8 hr period prior to sample collection. Sample must reach the laboratory on ice within 15 min of collection.

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NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Amphetamines (urine) (qualitative)	25 ml random urine in a universal container	For transport send fresh urine on ice.
Amylase (fluid)	5 ml fluid in a (clear top) collection tube without additives	
Amylase (serum)	5 ml clotted (red or yellow top) blood	Separate serum from cells within 2 hrs after collection. For transport < 48 hrs send on ice; otherwise if delayed > 48 hrs send frozen on dry ice.
Amylase (urine)	25 ml random urine in a universal container	NOTE: Deliver sample immediately to the laboratory on ice. Serum lipase recommended for acute pancreatitis. For transport alkalinise urine (just above pH 7) with 1 M NaOH and send on ice.
Andermann Syndrome (KCC3) (Afrikaner) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Androgen Receptor Insensitivity (AR) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Androstenedione	5 ml clotted (red or yellow top) blood	
Angelman/Prader Willi Syndrome Methylation study (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Angiotensin-converting enzyme (ACE)	5 ml clotted (red or yellow top) blood	NOTE: Icteric and lipaemic samples are not suitable. Collect fasting sample and separate serum within 6 hrs of collection.
Anti - Acetylcholine Receptor Antibodies	5 ml clotted (red or yellow top) blood	For transport separate serum and send frozen on dry ice.
Anti - Adrenal Antibodies	5 ml clotted (red or yellow top) blood	

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Anti - Aquaporin 4 (AQP4) Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Cardiac Muscle Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Cardiolipin (ACLA) Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Centromere Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Cyclic Citrunillated Peptide (CCP) Antibodies	5 ml clotted (red or yellow top) blood	
Anti - DNase B titre	5 ml clotted (red or yellow top) blood	
Anti - double stranded DNA Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Endomysium Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Extractable Nuclear Antigen (ENA) Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Factor Xa (Coagulation test)	5 ml sodium citrate (blue top) blood	NOTE: Sample must be taken 3 hrs after last dose of Low Molecular Weight Heparin. Sample must reach the laboratory within 30 min of collection. For transport separate plasma within 1 hr of collection and send frozen on dry ice.
Anti - Fibrillarin Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Ganglioside Antibody screen (Immunoblot)	5 ml clotted (red or yellow top) blood	
Anti - Glomerular Basement Membrane (GBM) Antibodies	5 ml clotted (red or yellow top) blood	

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Anti - Glutamic Acid Decarboxylase (GAD) Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Glutamic Acid Decarboxylase/Islet Antigen 2 (GAD/IA2) Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Histone Antibodies	5 ml clotted (red or yellow top) blood	
Anti - IgE Receptor Antibodies	5 ml clotted (red or yellow top) blood	NOTE: Samples are batched and sent overseas to Germany for testing. TAT is approximately 3 months.
Anti - Islet Antigen 2 (IA2) Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Jo-1 Antibodies	5 ml clotted (red or yellow top) blood	
Anti - La (SSB) Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Liver/Kidney Microsomal Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Mi-2 Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Mitochondrial Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Mullerian hormone	5 ml clotted (red or yellow top) blood	NOTE: Deliver sample to the laboratory on ice.
Anti - Myeloperoxidase (MPO pANCA) Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Neuronal Antibody screen (Immunoblot)	5 ml clotted (red or yellow top) blood	
Anti - Neutrophil Cytoplasmic Antibodies (ANCA)	5 ml clotted (red or yellow top) blood	

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Anti - N-Methyl-D-aspartate (NMDA) Receptor Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Nuclear Antibodies (ANA)	5 ml clotted (red or yellow top) blood	
Anti - Nucleosome Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Pancreas Islet cell Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Parietal cell Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Phosphatidyl serine Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Phospholipid Antibodies	5 ml clotted (red or yellow top) blood	NOTE: When requested both anti - Cardiolipin (ACLA) Antibodies and anti - $\beta$ 2 Glycoprotein 1 Antibodies will be tested.
Anti - Polymyositis/Scleroderma (PM/ScI) Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Proteinase 3 (PR3 cANCA) Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Reticulin Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Ribonucleoprotein (RNP) Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Ribosomal P Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Ro (SSA) Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Saccharomyces cerevisiae Antibodies (ASCA)	5 ml clotted (red or yellow top) blood	

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Anti - Scleroderma 70 (Scl70) Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Skeletal (Striated) Muscle Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Skin Auto-antibodies	5 ml clotted (red or yellow top) blood	
Anti - Smith (Sm) Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Smooth Muscle Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Streptolysin O (ASO) titre	5 ml clotted (red or yellow top) blood	
Anti - Thrombin III	5 ml sodium citrate (blue top) blood	NOTE: Sample must reach the laboratory within 4 hrs of collection or send frozen plasma on dry ice.
Anti - Thyroid peroxidase Antibodies	5 ml clotted (red or yellow top) blood	
Anti - Tissue Transglutaminase Antibodies	5 ml clotted (red or yellow top) blood	
Anti - U1 Ribonucleoprotein (RNP) Antibodies	5 ml clotted (red or yellow top) blood	
Anti - $\beta$ 2 Glycoprotein 1 Antibodies	5 ml clotted (red or yellow top) blood	
ApoE (APOE) (DNA analysis)	5ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Apolipoprotein A	5 ml clotted (red or yellow top) blood	For transport separate serum and send on ice.
Apolipoprotein B	5 ml clotted (red or yellow top) blood	For transport separate serum and send on ice.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Apt test (foetal haemoglobin)	5–10 ml gastric aspirate or meconium in a universal container	Transport sample on ice.
AR Polycystic Kidney Disease ( <i>PKHD1</i> ) Afrikaner (DNA analysis)	5ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Arsenic (hair)	Hair plus roots	NOTE: At least 100 mg hair plus roots is required - mark root end with a piece of cotton.
Arsenic (nails)	Nails	NOTE: At least 100 mg of nails is required.
Arsenic (serum)	5 ml clotted (red or yellow top) blood	NOTE: Patient must not eat seafood for 72 hrs before sample collection.
Arsenic (urine)	25 ml random urine in a universal container	NOTE: Patient must not eat seafood for 72 hrs before sample collection.
<i>ARXdup24</i> (DNA analysis)	5ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Aryl sulphatase A enzyme activity (leukocyte) (metachromatic leukodystrophy)	13 ml ACD solution B (light yellow top) tube blood	NOTE: Mark clearly on request form: DO NOT SPIN. Sample must reach laboratory within 24 hrs of collection. Transport at room temperature.
Aryl sulphatase A enzyme activity (plasma)	Adult: 12–15 ml ACD solution B (light yellow top) tube blood (3 tubes); Children: 5 ml ACD solution B (light yellow top) tube (1 full tube)	NOTE: Requires control sample to be sent with patient sample.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Ashkenazi Jewish Screen (common Ashkenazi mutations: Cystic fibrosis, Fanconi Anaemia, Tay Sachs Disease, Canavan Disease, Familial Dysautonomia, Mucopolidosis IV, Niemann-Pick Disease Type A, Glycogen Storage Disease Type 1a, Bloom Syndrome) (DNA analysis)	5ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Aspartate aminotransferase (AST)	5 ml clotted (red or yellow top) blood	
Asperigillus Precipitin	5 ml clotted (red or yellow top) blood	
Astrovirus antigen ELISA	1–2g fresh stool sample in a universal container	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed. Samples are batched and testing is performed once a week.
Avian Precipitin (Budgerigar)	5 ml clotted (red or yellow top) blood	
Avian Precipitin (Parrot)	5 ml clotted (red or yellow top) blood	
Avian Precipitin (Pigeon)	5 ml clotted (red or yellow top) blood	
Barbiturates (serum)	5 ml clotted (red or yellow top) blood ON ICE	
Barbiturates (urine) (qualitative screen)	25 ml random urine in a universal container	For transport send fresh urine on ice.
Bardet-Biedl Syndrome (common Caucasian BBS1 mutation) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Bardet-Biedl Syndrome BBS10 (common Xhosa BBS10) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Barth Syndrome (TAZ1) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Benzodiazepines (serum)	5 ml clotted (red or yellow top) blood	
Benzodiazepines (urine) (semi-quantitative screen)	25 ml random urine in a universal container	For transport send fresh urine on ice.
Bile acids (serum or urine)	For pregnant women 5 ml clotted (red or yellow top) blood; random urine in a universal container for all other patients	NOTE Deliver sample to the laboratory on ice. For transport separate and send serum on ice.
Bilharzia (Schistosoma) Antibodies	5 ml clotted (red or yellow top) blood	
Bilharzia (Schistosoma) Ova Microscopy	Random urine sample in a universal container	NOTE: Please state clearly on the request form that Bilharzia (Schistosoma) microscopy is requested.
Bilirubin (amniotic fluid) (OD 450)	15 ml amniotic fluid in a collection tube without additives	NOTE: Protect sample from light. Avoid contamination with blood during sampling.
Bilirubin (conjugated)	5 ml clotted (red or yellow top) blood	
Bilirubin (total)	5 ml clotted (red or yellow top) blood	
Bilirubin (total, direct/conjugated)	2 ml clotted (red or yellow top) blood	
Bilirubin (urine) (qualitative dipstix)	25 ml random urine in a universal container	NOTE: Protect sample from light (sample must be wrapped in tin foil). Deliver to the laboratory within 4 hrs of collection.

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NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Biotinidase Deficiency ( <i>BDT</i> ) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Biotinidase enzyme activity	5 ml EDTA (purple top) blood	NOTE: Deliver sample immediately to the laboratory on ice. Test must be arranged with the referral laboratory before sample collection.
BK virus PCR	5 ml EDTA (purple top) blood OR random urine sample in a universal container	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
BK virus viral load	5 ml EDTA (purple top) blood OR random urine sample in a universal container	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Bleeding time	No blood sample is required as the test is done on the patient at the bedside	NOTE: Please contact the laboratory to arrange for the test.
Blood Culture	Adults: 20 ml blood divided between 2 blood culture bottles; Children: 1–5 ml blood divided between 2 blood culture bottles	NOTE: Do not stick patient label underneath the bottom of the bottle or over the bottle's bar code label. Please see Section 19.2 for detailed instructions on sample collection.
Blood gas	Capped heparin syringe, no air bubble	NOTE: See Section 17.2.2 for detailed instructions and precautions
Blood Grouping: ABO Blood Grouping	5 ml EDTA (purple top) blood	NOTE: Samples must be kept at 2–8 °C.
Blood Grouping: Atypical antibody identification	5 ml EDTA (purple top) blood	NOTE: Samples must be kept at 2–8 °C.
Blood Grouping: Atypical antibody titration	5 ml EDTA (purple top) blood	NOTE: Samples must be kept at 2–8 °C.
Blood Grouping: Blood Group system phenotyping	5 ml EDTA (purple top) blood	NOTE: Samples must be kept at 2–8 °C.
Blood Grouping: Rhesus (Rh typing)	5 ml EDTA (purple top) blood	NOTE: Samples must be kept at 2–8 °C.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Blood-brain barrier studies (CSF IgG index)	1 ml CSF in a (clear top) collection tube without additives AND 2 ml clotted (red or yellow top) blood	NOTE: Submit simultaneous clotted (red or yellow top) blood sample.
Bloom Syndrome (Ashkenazi Jewish) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
BMT Chimerism analysis (DNA analysis)	5 ml EDTA (purple top) blood	
Bone Marrow Aspirate (BMA) for Tuberculosis Culture	BMA in MycoF Lytic blood culture bottle	NOTE: Please clearly indicate sample type on request form.
Bone Marrow Aspirate (BMA) Morphology	6 x BMA slides	Full clinical history must be provided. Request Full Blood Count with Differential on the same day. Sample must reach the laboratory immediately after collection.
Bone Marrow trephine (BMT) (Anatomical)	Core biopsy in sterile container with formalin	
Bordetella pertussis PCR	Sputum, tracheal aspirate OR nasopharyngeal aspirate in a universal container	
Breast Cancer Familial (common mixed ancestry mutations) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Breast Cancer Familial (common Afrikaner mutations) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Breast Cancer Familial (common Indian mutations) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Breast Cancer Familial (comprehensive BRCA1/BRCA2 mutation screen) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Breast Cancer Familial common (common Ashkenazi Jewish mutations) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Brucella abortus (Malta fever) agglutination test	5 ml clotted (red or yellow top) blood	
Brucella IgG & IgM Antibodies	5 ml clotted (red or yellow top) blood	
Bruton's X-linked Agammaglobulinemia (exon3 BTK) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
B-type natriuretic peptide (BNP)	5 ml EDTA (purple top)	NOTE: Avoid haemolysis during venesection. For transport < 24 hrs, separate plasma and send on ice; otherwise if delayed > 24 hrs send frozen plasma (min 500 µL) on dry ice.
Buffy coat smear	5 ml EDTA (purple top)	NOTE: Requested as part of the Full Blood Count and platelets. Please arrange this test with the laboratory before sample collection.
C1-Esterase inhibitor	5 ml clotted (red or yellow top) blood	For transport separate serum and send on ice.
CA 125	5 ml clotted (red or yellow top) blood	For transport separate serum and send on ice.
CA 15-3	5 ml clotted (red or yellow top) blood	For transport separate serum and send on ice.
CA 19-9	5 ml clotted (red or yellow top) blood	For transport separate serum and send on ice.
CA 72-4	5 ml clotted (red or yellow top) blood	For transport separate serum and send on ice.
Cadmium (blood)	5 ml EDTA (purple top) or lithium-heparin (green top) blood	

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Cadmium (urine)	24 hr urine collection	NOTE: 24 hr urine must be collected in a metal-free container without preservatives.
Caeruloplasmin	5 ml clotted (red or yellow top) blood	
Calcitonin	5 ml clotted (red or yellow top) blood	NOTE: Fasting blood sample required. Deliver sample on ice to the laboratory and separate serum within 15 min of collection.
Calcium (ionised)	Capped heparin syringe, no air bubble	NOTE: Deliver sample on ice to the laboratory within 30 min of collection. Maintain anaerobic conditions.
Calcium (total)	5 ml clotted (red or yellow top) blood	NOTE: Avoid prolonged stasis during venesection.
Calcium (urine)	Random or timed urine (U-Ca/day)	NOTE: Collect urine in a container with HCl (urine pH <3).
Calculus (stone) analysis	Clinical specimen in a universal container	NOTE: Send the specimen as is; do not put in any fluid.
Calprotectin	Random stool specimen in universal container	
Canavan Disease (Ashkenazi Jewish) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Cannabinoids (urine) (semi-quantitative screen)	25 ml random urine in a universal container	Please freeze if delivery delayed > 3 days.
Carbamazepine (Tegretol)	5 ml clotted (red or yellow top) blood	NOTE: Collect trough level just before next dose. Please state the time of last dose on the request form.
Carbohydrate-deficient transferrin (CDT)	5 ml clotted (red or yellow top) blood	For transport separate serum and send frozen on dry ice.
Carbon dioxide (total) (serum bicarbonate)	5 ml clotted (red or yellow top) blood	For transport separate serum and send tightly stoppered on ice.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Carbon dioxide (total) (urine bicarbonate)	10 ml random urine in a universal container	NOTE: Fill container and deliver to the laboratory on ice. Interpretation requires simultaneous serum result.
Carboxyhaemoglobin	Contact laboratory for collection details	NOTE: Completely fill tube (no air). Deliver to the laboratory immediately on ice. Arrange test with the laboratory before sample collection.
Carcinoembryonic antigen	5 ml clotted (red or yellow top) blood	
Carnitine profile (serum)	5 ml clotted (red or yellow top) blood	NOTE: Deliver sample to the laboratory immediately on ice. For transport separate serum and send frozen on dry ice.
Carnitine profile (urine)	25 ml random urine in a universal container	NOTE: Deliver sample to the laboratory immediately on ice. For transport send frozen on dry ice.
CAST assay (Cellular Assay Stimulation Test)	10 ml EDTA (purple top ) blood ON ICE	NOTE: Sample must be wrapped in bubble wrap to prevent lysis. Sample must reach the testing laboratory within 24 hrs of collection. Some allergy tests are only available as CAST assays.
Catecholamines (fractionated) (plasma) (adrenaline,noradrenaline, dopamine)	2 x 5 ml EDTA (purple top) blood on ice	NOTE: Discontinue interfering food/beverages and medication (see Section 17.2.4 for detailed instructions). 10% Sodium metabisulphite is added as a stabiliser to the sample after collection. The sample should be spun down and the plasma snap frozen and transported frozen to the referral laboratory. Record must be made of whether the collection was during active or supine state.
Catecholamines (urine)	24 hr urine collection	NOTE: 24 hr urine sample must be collected in a container with 10 ml 2 M HCl. See Section 17.2.4 for detailed instructions.
Cell count	3 ml serosal fluid in an EDTA (purple top) tube OR 1 ml CSF in a tube without any additives	NOTE: For serosal fluid please contact your laboratory for sample tube type.
Cerebrotendinous Xanthomatosis (CYP27A1) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Charcot-Marie-Tooth (CMT1A/HMSN1A) (PMP22 duplication) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Chitotriosidase enzyme activity (Gaucher's disease)	5 ml clotted (red or yellow top) blood	
Chlamydia polyvalent Antibodies (IFA)	5 ml clotted (red or yellow top) blood	
Chloride (CSF)	0.5 ml CSF in a (clear top) collection tube without additives	
Chloride (serum)	5 ml clotted (red or yellow top) blood	
Chloride (stool)	Watery stool in a universal container	
Chloride (urine)	25 ml random urine in a universal container	
Cholera culture	Fresh stool sample in a universal container OR rectal swabs	NOTE: Please indicate this request on the form as this is not part of the routine culture for stool. Transport samples refrigerated in Cary-Blair media.
Cholesterol (fluid)	5 ml fluid in a (clear top) collection tube without additives	
Cholesterol (serum) (total)	5 ml clotted (red or yellow top) blood	For transport separate serum and send on ice
Cholinesterase (pseudo) (serum)	5 ml clotted (red or yellow top) blood	NOTE: Avoid haemolysis during venesection.
Cholinesterase (red cell)	Contact laboratory for tube type	
Cholinesterase phenotyping (dibucaine and fluoride numbers)	5 ml clotted (red or yellow top) blood	NOTE: Defer testing until after scoline apnoea has resolved.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Chromium (urine)	25 ml random urine in a universal container	NOTE: Sample must be collected in metal free container.
Chromium (whole blood)	5 ml blood in a lithium-heparin (green top) tube	
Chromogranin A	Contact laboratory for tube type	NOTE: Patient must rest for 30 min pre-test. Deliver sample to the laboratory on ice. Spin and transfer serum/plasma to cryotubes and transport on ice.
Chromosome analysis (constitutional)	5ml lithium heparin (green top tube without gel) blood; 10 ml amniotic fluid; 10–15 mg chorionic villus sample in a universal container; products of conception in a sterile container OR a minimum of 2g tissue in normal saline in a universal container	NOTE: Specimens must reach the referral laboratory within 48 hrs of collection. Ensure meticulously sterile sampling conditions. Do not use expired tubes and avoid clotting.
Chromosome analysis (oncology)	5 ml leukaemic blood in sodium/lithium heparin (green top) collection tube; bone marrow aspirate in a sodium heparin (green top) tube OR a minimum of 2g tissue in normal saline in a universal container	NOTE: Ensure meticulously sterile sampling conditions.
Chromosome breakage analysis: Fanconi Anaemia	5ml blood in lithium heparin (green top without gel) tube	NOTE: Do not use expired tubes and avoid clotting. Blood must reach the referral laboratory within 48 hrs of collection.
Chylomicrons	5 ml fluid in a (clear top) collection tube without additives	
Chymotrypsin	5 ml clotted (red or yellow top) blood	
Circulating Immune Complexes (CIC)	5 ml clotted (red or yellow top) blood	
Citrate	25 ml random urine in a universal container or timed urine	NOTE: Collect 24 hr urine in 20 ml conc. HCl (urine pH < 3).
Citrulline	5 ml EDTA (purple top) or heparin (green top)	NOTE: Deliver sample to the laboratory immediately on ice. Arrange test with referral laboratory before sample collection.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Clonazepam (Rivotril)	Contact laboratory for tube type	NOTE: Indicate on the request form weight and age of patient, and time of dose prior to specimen collection. Preferably take trough level just before next dose.
Clostridium difficile (toxigenic) PCR	Watery, unformed stool sample in a universal container	NOTE: Sample must reach the referral laboratory on ice within 48 hrs of collection.
Clostridium difficile toxin test	Watery, unformed stool sample in a universal container	NOTE: Submit 3 freshly passed stool specimens on separate days to increase the probability of detection.
Clozapine (Leponex)	5 ml clotted (red or yellow top) blood	
CNS virus panel PCR	1 ml CSF in a (clear top) collection tube without additives	NOTE: Specific viruses in the panel depend on the assay used by the different referral laboratories. Transport specimen to the laboratory at 4 °C.
Cobalt (serum)	5 ml blood in a trace metal (royal blue top, additive free) tube	
Cobalt (urine)	25 ml random urine in a metal-free container	
Cocaine (urine) (qualitative screen)	25 ml random urine in a universal container	For transport send fresh urine on ice.
Codeine (urine) (semi-quantitative screen for opiates)	25 ml random urine in a universal container	For transport send fresh urine on ice.
Coeliac disease: Anti - Gliadin (deamidated) Antibodies (IgA and IgG)	5 ml clotted (red or yellow top) blood	NOTE: Patient must include gluten in diet to avoid false negative results.
Coeliac disease: Anti- tissue transglutaminase (tTG) Antibodies (IgA and IgG)	5 ml clotted (red or yellow top) blood	NOTE: Patient must include gluten in diet to avoid false negative results. To rule out false negative anti-tTG IgA result due to IgA deficiency, a total IgA should be requested. If total IgA is deficient, IgG Coeliac disease diagnostic tests are performed.

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NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Cold agglutinins	Contact laboratory for tube type	NOTE: Blood tubes, syringes, needles must be kept at 37 °C before and after blood collection. Please arrange test with the laboratory before sample collection.
Complement C3	5 ml clotted (red or yellow top) blood	
Complement (Total, Classic)	5 ml clotted (red or yellow top) blood on ice	NOTE: The sample must be spun down and frozen within 2 hours of collection and transported to the referral laboratory on ice.
Complement C4	5 ml clotted (red or yellow top) blood	
Complement C6	5 ml clotted (red or yellow top) blood	
Congenital adrenal hyperplasia (CYP21A2) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Coombs (Direct - screening)	Contact laboratory for tube type	
Coombs (Direct - typing)	Contact laboratory for tube type	
Coombs (Indirect)	Contact laboratory for tube type	
Copper (liver) (Wilson's disease)	Liver biopsy	NOTE: Collect biopsy specimens into sterile plastic tubes. Transport at room temperature.
Copper (serum)	5 ml blood in a trace metal (royal blue top, additive free) tube	NOTE: Avoid haemolysis during venesection.
Copper (urine)	24 hr urine collection (best practise) OR random urine in a universal container	NOTE: For transport send urine on ice.
Corneal scraping M&CS	Labeled slides and BHI plate	NOTE: Please contact the laboratory for special instructions on sample collection.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Cortisol (saliva)	Saliva	NOTE: Patient must not eat, chew gum or brush teeth 30 min before collection. Rinse mouth with cold water 5 min before collecting at least 0.5 ml saliva into device (contact referral laboratory for details). Sample stable for 1 wk at 37 °C.
Cortisol (serum)	5 ml clotted (red or yellow top) blood	
Cortisol (urine)	24 hr urine collection	NOTE: Contact referral laboratory about preservative requirements.
Costello Syndrome (HRAS1) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Cotinine (nicotine)	5 ml clotted (red or yellow top) blood	For transport separate serum and send at room temperature.
Coxiella burnetii (Q-fever) IFA	5 ml clotted (red or yellow top) blood	
Coxsackievirus B1 - 6 neutralising antibody titres	5 ml clotted (red or yellow top) blood	NOTE: Two samples taken 14 days apart is needed for meaningful interpretation.
C-peptide	5 ml clotted (red or yellow top) blood	
CPT2 Deficiency (CPT2) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Craniosynostoses (FGFR-related) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
C-reactive protein (CRP)	5 ml clotted (red or yellow top) blood	
Creatine kinase	5 ml clotted (red or yellow top) blood	
Creatine kinase isoenzymes	5 ml clotted (red or yellow top) blood	NOTE: Avoid haemolysis during venesection. Arrange test with referral laboratory before sample collection.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Creatine kinase MB (CK-MB)	5 ml clotted (red or yellow top) blood	
Creatinine (fluid)	5 ml fluid in a (clear top) collection tube without additives	
Creatinine (serum)	5 ml clotted (red or yellow top) blood	
Creatinine (urine)	Random or timed urine	
Creatinine clearance	5 ml clotted (red or yellow top) blood AND 24 hr urine collection	NOTE: Submitted blood sample must be taken within urine collection period. Supply patient's mass and height on the request form for calculation of corrected creatinine clearance.
Cryoglobulins	2 x 5 ml clotted (red or yellow top) blood	NOTE: Sample must be collected and delivered at 37 °C. Please state on the request form if patient is receiving anticoagulant therapy.
Cryohaemolysis test	5 ml EDTA (purple top) patient blood AND 5 ml EDTA (purple top) control blood	NOTE: This test must be arranged with the laboratory before sample collection.
Cryptococcal antigen test (CrAg)	1 ml CSF in a (clear top) collection tube without additives OR 3 ml clotted (red or yellow top) blood	
Crystals (synovial fluid)	1 ml synovial fluid in a (clear top) collection tube without additives	NOTE: Please state clearly on the request form that the sample was aspirated from a joint.
CSF bacterial antigen test	1 ml CSF in a (clear top) collection tube without additives	
CSF Culture	1 ml CSF in a (clear top) collection tube without additives	Transport at room temperature as sending on ice may affect the culture of some fastidious organisms.
CSF Microscopy	1 ml CSF in a (clear top) collection tube without additives	A Gram stain and cell count will be performed.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
C-telopeptide	5 ml EDTA (purple top) blood	NOTE: A morning fasting sample is required. If transport < 24 hrs send at room temperature; otherwise separate plasma and send frozen on ice.
Cyanide	2 x 5 ml EDTA (purple top) blood	
Cyclosporine	5 ml EDTA (purple top) blood	NOTE: Collect peak level 2 hrs after dose and trough level just before the next dose. Indicate clearly on request form whether sample is peak or trough. For transport send whole blood on ice.
Cystic Fibrosis (3120+1G>A) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Cystic Fibrosis (Ashkenazi Jewish) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Cystic Fibrosis (CFTR mutation screen) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Cystic Fibrosis DeltaF508 (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Cysticercus Antibodies	5 ml clotted (red or yellow top) blood	
Cystine (leukocytes)	5 ml heparinised (green top) or EDTA (purple top) blood	NOTE: Minimum 2 ml blood required. Mark clearly on request form: DO NOT SPIN. Sample to be taken just before next dose of phosphocysteamine (patients on 12 hrly dosage regimen to omit dose on morning of clinic visit). Do not refrigerate or freeze.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Cytology (Fine Needle Aspirate)	Fine Needle Aspirate (FNA) taken from Head and Neck, Breast, Lymph nodes, and other non-palpable lesions	Refer to Section 16.2.2.7 for guidelines on Fine Needle Aspirate procedure. FNA of deep seated lesions must be performed under ultrasound or CT scan guidance. Smears to be stained with Pap stain must be fixed with a Cytofixative or immersed into a suitable jar containing 96% ethanol and smears for Giemsa staining must be air-dried. Aspirates from different anatomical sites must be clearly defined.
Cytology (Gynaecological)	Pap smear taken from cervix, endocervix, vagina, vault or endometrium	NOTE: Please refer to Addendum II in Section 16.2.2 on page 113 for instructions on preparing a slide smear. Label the slides on the frosted end with a lead pencil. DO NOT label the slide with a barcode sticker. Smears must be fixed immediately with Cytofixative before drying. Specimens collected with cotton wool swabs are not acceptable for routine gynaecological processing.
Cytology (Non-Gynaecological)	Sputum sample in a universal container; other respiratory tract samples, random urine sample, other body fluids OR CSF in a (clear top) collection tube without additives	NOTE: Samples must reach the laboratory within 24 hrs of collection. If transportation is delayed, add equal amounts of 96% ethanol to the volume of the specimen. Syringes with needles still attached will not be accepted. Specimen collection containers must contain no additives.
Cytomegalovirus (CMV) IgG	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Cytomegalovirus (CMV) IgG avidity index	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Only done if both CMV IgG & IgM are positive.
Cytomegalovirus (CMV) IgM	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Cytomegalovirus (CMV) isolation (culture)	Random urine sample in a universal container OR respiratory tract sample in viral transport medium (VTM)	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Cytomegalovirus (CMV) PCR	1 ml CSF in a (clear top) collection tube without additives; 5 ml random urine sample, tissue biopsy material, fluid aspirate or amniotic fluid in a universal container	NOTE: Biopsy material must be sent in normal saline (NEVER in formalin). Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Cytomegalovirus (CMV) pp65	5 ml EDTA (purple top) blood	NOTE: Sample must be tested within 48 hrs of collection. Transport the specimen at 4 °C.
Cytomegalovirus (CMV) viral load	5 ml EDTA (purple top) blood OR 1 ml CSF in a (clear top) collection tube without additives	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
D-Dimer	5 ml sodium citrate (blue top) blood	NOTE: Samples must reach the laboratory within 6 hrs of collection or frozen plasma must be sent on dry ice.
Dehydroepiandrosterone sulphate (DHEAS)	5 ml clotted (red or yellow top) blood	For transport < 48 hrs separate serum and send on ice. If transport delayed > 48 hrs separate serum and send frozen on dry ice.
Dentatorubral Palidolysian Atrophy (DRPLA) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Deoxypyridinoline	25 ml random early morning urine in a universal container	
Dichloromethane	25 ml random urine in a universal container	Transport urine on ice.
Differential white cell count	5 ml EDTA (purple top) blood	NOTE: Sample must reach the laboratory as soon as possible after collection, preferably within 12 hrs.
Digoxin (Lanoxin)	5 ml clotted (red or yellow top) blood	NOTE: Collect the sample 8–24 hrs after the last dose. Please state the time of the last dose on the request form.
Down Syndrome screening (maternal blood)	5 ml clotted (red or yellow top) blood	NOTE: Maternal blood sample required. Indicate the following (specific form available from referral laboratory): gestation (sonar/dates), maternal age/weight, DM, twins, previous abnormal pregnancy.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Drugs of abuse (urine) (confirmation)	25 ml random urine in a universal container	NOTE: Quantitation for amphetamine, cannabis, cocaine, ecstasy, methamphetamine, methcathinone (khat), methaqualone. For transport send fresh urine on ice.
Drugs of abuse screen (urine) (qualitative)	25 ml random urine in a universal container	NOTE: Includes screening tests (semi-quantitative) among others: amphetamines, cocaine, cannabinoids, opiates, methadone, phencyclidine, barbiturates, benzodiazepines, tricyclic antidepressants. For transport send fresh urine on ice.
Duchenne / Becker Muscular Dystrophy (del/dup MLPA screen) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Dystonia (DYT1) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Echinococcus Antibodies	5 ml clotted (red or yellow top) blood	
Efavirenz (Stocrin)	5 ml clotted (red or yellow top) blood	
Elastase	Fresh stool sample in a universal container	NOTE: Deliver sample to the laboratory on ice. For transport < 72 hrs send on ice; otherwise send frozen on dry ice. Stool volume: 5 ml.
Electron Microscopy (Anatomical Pathology)	Samples must be fixed in 4% glutaraldehyde solution	NOTE: Please phone the laboratory before collection to allow for preparation the correct transport medium (4% glutaraldehyde solution).
Entamoeba histolytica IgG	5 ml clotted (red or yellow top) blood	
Enterovirus isolation (culture)	1–2 g fresh stool sample in a universal container	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed. The specific enterovirus isolated can be identified with additional testing.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Enterovirus PCR	1 ml CSF in a (clear top) collection tube without additives; respiratory tract sample in viral transport medium (VTM) OR fresh stool sample in a universal container	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Eosinophils	Random urine sample, fresh sputum sample OR nasal secretions in a universal container	NOTE: Refrigerate specimen if transport is delayed.
Epstein-Barr virus (EBV) IgG (EBNA)	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Epstein-Barr virus (EBV) IgM (VCA)	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Epstein-Barr virus (EBV) Monospot	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Epstein-Barr virus (EBV) PCR	1 ml CSF in a (clear top) collection tube without additives	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Epstein-Barr virus (EBV) viral load	5 ml EDTA (purple top) blood OR 1 ml CSF in a (clear top) collection tube without additives	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Erythrocyte Sedimentation Rate (ESR)	2 ml buffered citrate (black top) blood OR 5 ml EDTA (purple top) blood	NOTE: Sample must reach the laboratory within 6 hrs of collection.
Erythropoietin	5 ml clotted (red or yellow top) blood	
Ethylene glycol (antifreeze)	5 ml heparinised (green top) blood OR 25 ml random urine in universal container	NOTE: Urine is the preferred sample.
Everolimus (Certican)	5 ml EDTA (purple top) blood	
Eye samples for MC&S	Various samples	NOTE: Please see Section 19.8 for specific guidelines on sample collection. Special transport media and plates must be collected from the laboratory before sample collection.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Factor V	5 ml sodium citrate (blue top) blood	NOTE: Please provide full clinical history. Samples must reach laboratory within 4 hrs or frozen plasma must be sent on dry ice.
Factor VII	5 ml sodium citrate (blue top) blood	NOTE: Please provide full clinical history. Samples must reach laboratory within 4 hrs or frozen plasma must be sent on dry ice.
Factor X	5 ml sodium citrate (blue top) blood	NOTE: Please provide full clinical history. Samples must reach laboratory within 4 hrs or frozen plasma must be sent on dry ice.
Factor XI	5 ml sodium citrate (blue top) blood	NOTE: Please provide full clinical history. Samples must reach laboratory within 4 hrs or frozen plasma must be sent on dry ice.
Factor XIII	5 ml sodium citrate (blue top) blood	NOTE: Sample must reach the laboratory within 2 hrs of collection or frozen plasma must be sent on dry ice.
Factor B (complement)	5 ml clotted (red or yellow top) blood	
Factor II	5 ml sodium citrate (blue top) blood	NOTE: Please provide full clinical history. Samples must reach laboratory within 4 hrs or frozen plasma must be sent on dry ice.
Factor II G20210A mutation (DNA analysis)	5 ml EDTA (purple top) blood	NOTE: Please provide full clinical history.
Factor IX	5 ml sodium citrate (blue top) blood	NOTE: Please provide full clinical history. Samples must reach laboratory within 4 hrs or frozen plasma must be sent on dry ice.
Factor IX Inhibitor level	5 ml sodium citrate (blue top) blood	NOTE: Please provide full clinical history. Samples must reach laboratory within 4 hrs or frozen plasma must be sent on dry ice.
Factor V Leiden mutation (DNA analysis)	5 ml EDTA (purple top) blood	NOTE: Please provide full clinical history.
Factor VII & IX Inhibitor Screen	5 ml sodium citrate (blue top) blood	NOTE: Please provide full clinical history. Samples must reach laboratory within 4 hrs or frozen plasma must be sent on dry ice.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Factor VIII	5 ml sodium citrate (blue top) blood	NOTE: Please provide full clinical history. Samples must reach laboratory within 4 hrs or frozen plasma must be sent on dry ice.
Factor VIII Inhibitor level	5 ml sodium citrate (blue top) blood	NOTE: Please provide full clinical history. Samples must reach laboratory within 4 hrs or frozen plasma must be sent on dry ice.
Factor XII	5 ml sodium citrate (blue top) blood	NOTE: Please provide full clinical history. Samples must reach laboratory within 4 hrs or frozen plasma must be sent on dry ice.
Faecal occult blood	Random stool sample in a universal container	NOTE: Contact the laboratory for advice on possible dietary restrictions. A negative result does not exclude a proximal GIT bleed. Diarrhoeal stools are not suitable. Deliver sample to the laboratory immediately after collection. Stool volume: 5 ml.
Familial Adenomatous Polyposis (FAP) (APC) Common mutations (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Familial Dysautonomia (Ashkenazi Jewish) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Familial Hypercholesterolaemia (LDLR) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Fanconi Anaemia (FANCA) (Afrikaner) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Fanconi Anaemia (FANCC) (Ashkenazi Jewish) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Fanconi Anaemia DNA test (FANCG 637-643 7bp deletion) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Fat globules	Random stool sample in a universal container	NOTE: Sudan staining of fat globules will be performed. Stool volume: 5 ml.
Ferritin	5 ml clotted (red or yellow top) blood	
Fibrinogen	5 ml sodium citrate (blue top) blood	NOTE: Samples must reach the laboratory within 6 hrs of collection or frozen plasma must be sent on dry ice.
Fibrinogen degradation product	5 ml sodium citrate (blue top) blood	NOTE: Sample must reach the laboratory within 4 hrs of collection. Please contact the referral laboratory if a delay is expected.
Fibroblasts (tissue culture)	Skin biopsy	NOTE: Send sample sterile in tissue culture medium (preferred) or saline. Do not freeze. Arrange with referral laboratory before sample collection.
FISH Constitutional: Cri-du-Chat Syndrome (5p15.2 microdeletion)	5ml blood in a lithium heparin (green top without gel) tube	NOTE: Do not use expired tubes and avoid clotting. Blood sample must reach the referral laboratory within 48 hrs of collection.
FISH Constitutional: DiGeorge Syndrome (22q11.2 microdeletion)	5ml blood in a lithium heparin (green top without gel) tube OR 10 ml amniotic fluid in a universal container	NOTE: Do not use expired tubes and avoid clotting. Blood sample must reach the referral laboratory within 48 hrs of collection.
FISH Constitutional: Kallmann Syndrome (Xp22.3 microdeletion)	5ml blood in a lithium heparin (green top without gel) tube	NOTE: Do not use expired tubes and avoid clotting. Blood sample must reach the referral laboratory within 48 hrs of collection.
FISH Constitutional: Miller-Dieker Syndrome (17p13.3 microdeletion)	5ml blood in a lithium heparin (green top without gel) tube	NOTE: Do not use expired tubes and avoid clotting. Blood sample must reach the referral laboratory within 48 hrs of collection.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
FISH Constitutional: Pallister-Killian (tetrasomy 12p)	5ml blood in a lithium heparin (green top without gel) tube OR 10 ml amniotic fluid in a universal container	NOTE: Do not use expired tubes and avoid clotting. Blood sample must reach the referral laboratory within 48 hrs of collection.
FISH Constitutional: Phelan-McDermid Syndrome (22q13 microdeletion)	5ml blood in a lithium heparin (green top without gel) tube	NOTE: Do not use expired tubes and avoid clotting. Blood sample must reach the referral laboratory within 48 hrs of collection.
FISH Constitutional: Prader-Willi / Angelman syndrome (15q11-q13 microdeletion)	5ml blood in a lithium heparin (green top without gel) tube	NOTE: Do not use expired tubes and avoid clotting. Blood sample must reach the referral laboratory within 48 hrs of collection.
FISH Constitutional: Pre-natal or Postnatal aneuploidy	5ml blood in a lithium heparin (green top without gel) tube OR 10 ml amniotic fluid in a universal container	NOTE: Do not use expired tubes and avoid clotting. Blood sample must reach the referral laboratory within 48 hrs of collection.
FISH Constitutional: Sexing (X / Y)	5ml blood in a lithium heparin (green top without gel) tube	NOTE: Do not use expired tubes and avoid clotting. Blood sample must reach the referral laboratory within 48 hrs of collection.
FISH Constitutional: Smith-Magenis Syndrome ( 17p11.2 microdeletion)	5ml blood in a lithium heparin (green top without gel) tube	NOTE: Do not use expired tubes and avoid clotting. Blood sample must reach the referral laboratory within 48 hrs of collection.
FISH Constitutional: SOTOS Syndrome (5q35.3 microdeletion)	5ml blood in a lithium heparin (green top without gel) tube	NOTE: Do not use expired tubes and avoid clotting. Blood sample must reach the referral laboratory within 48 hrs of collection.
FISH Constitutional: SRY gene (Yp11.2 microdeletion)	5ml blood in a lithium heparin (green top without gel) tube	NOTE: Do not use expired tubes and avoid clotting. Blood sample must reach the referral laboratory within 48 hrs of collection.
FISH Constitutional: Williams-Beuren Syndrome (7q11.23 microdeletion )	5ml blood in a lithium heparin (green top without gel) tube	NOTE: Do not use expired tubes and avoid clotting. Blood sample must reach the referral laboratory within 48 hrs of collection.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
FISH Constitutional: Wolf-Hirschhorn Syndrome (4p16.3 microdeletion)	5ml blood in a lithium heparin (green top without gel) tube	NOTE: Do not use expired tubes and avoid clotting. Blood sample must reach the referral laboratory within 48 hrs of collection.
FISH Oncology: 10q23 deletion <i>PTEN</i>	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: 11q13 rearrangement <i>CCND1</i>	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes. For solid tumors, FFPE tissue block or sections mounted a positively charged slide	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: 11q22 deletion <i>ATM</i>	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: 11q23 rearrangement <i>KMT2A (MLL)</i>	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: 13q14 / 17p13 deletion D13S319/TP53	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: 13q14 deletion <i>RB1</i>	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
FISH Oncology: 13q14.3 deletion (D13S319)	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: 14q32 rearrangement IGH@	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes. For solid tumors, FFPE tissue block or sections mounted a positively charged slide	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: 16p11 rearrangement FUS	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: 17p13.1 / 11q22.3 deletion TP53/ATM	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: 17p13.1 deletion TP53	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes. For solid tumors, FFPE tissue block or sections mounted a positively charged slide	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: 17q21 rearrangement RARA	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: 18q21 rearrangement MALT1	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
FISH Oncology: 20q12 deletion (D20S108)	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: 2p24 / CEP 2 for amplification of MYCN gene	FFPE tissue block or sections mounted a positively charged slide	NOTE: Ringed Haematoxylin and Eosin stain should be submitted.
FISH Oncology: 3q27 rearrangement BCL6	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes. For solid tumors, FFPE tissue block or sections mounted a positively charged slide	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: 6q23 deletion MYB	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: 7q22 and 7q35 deletion	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: 7q31 deletion	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: Acute Lymphocytic Leukaemia, Acute Myeloid Leukaemia 11q23 rearrangement KMT2A (MLL)	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
FISH Oncology: Acute Myeloid Leukaemia (Acute Promyelocytic Leukaemia) t(15;17) <i>PML/RARA</i>	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: Acute Myeloid Leukaemia esp FAB M2 t(8;21) <i>RUNX1/RUNX1T1 (AML1/ETO)</i>	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes. For solid tumors, FFPE tissue block or sections mounted a positively charged slide	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: Acute Myeloid Leukaemia Inversion 16 <i>CBFB/MYH 11</i>	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: Aneuploidy in bladder cancer (CEP3 / CEP7 / CEP17 / 9p21)	Cytology Prepared slides	
FISH Oncology: B lymphoblastic leukaemia/lymphoma t(1;19) <i>TCF3/PBX1 (E2A/PBX1)</i>	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: Burkitt's lymphoma t(8;14) <i>MYC/IGH@</i>	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes. For solid tumors, FFPE tissue block or sections mounted a positively charged slide	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: <i>CCND1</i> for amplification of Cyclin D1	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes. For solid tumors, FFPE tissue block or sections mounted a positively charged slide	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
FISH Oncology: CEP 12 for aneuploidy	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes. For solid tumors, FFPE tissue block or sections mounted a positively charged slide	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: CEP 18 / CEP X for copy numbers of chromosome 18 / X	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes. For solid tumors, FFPE tissue block or sections mounted a positively charged slide	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: CEP 3 for aneuploidy	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes. For solid tumors, FFPE tissue block or sections mounted a positively charged slide	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: CEP 8 for aneuploidy	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: Chronic Eosinophilic Leukaemia 4q12 rearrangement <i>FIP1L1/PDGFR</i> A	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: Chronic Lymphocytic Leukaemia profile ( <i>p53</i> , <i>ATM</i> , and 13q deletions, trisomy 12)	5 ml peripheral blood or bone marrow in lithium or sodium heparin (green top) tubes with transport medium OR 2 unstained blood or bone marrow slides.	NOTE: Samples must be kept at room temperature. Samples must reach the referral laboratory within 24 hrs of collection.
FISH Oncology: Chronic Myeloid Leukaemia, Acute Lymphocytic Leukaemia t(9;22) <i>BCR/ABL1</i>	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
FISH Oncology: CLL (13q34/13q14.3/CEP12)	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: CLL (17p13.1 / 11q22.3 deletion TP53/ATM, 13q34 / 13q14.3 (D13S319), CEP 12 for trisomy 12)	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: Deletion 1p36 & duplication of 1q21	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: EGFR for amplification of Epidermal Growth Factor Receptor	FFPE tissue block or sections mounted a positively charged slide	NOTE: For solid tumors, a ringed Haematoxylin and Eosin stain should be submitted.
FISH Oncology: ERBB2 (HER2/neu)	FFPE tissue block or sections mounted a positively charged slide	NOTE: For solid tumors, a ringed Haematoxylin and Eosin stain should be submitted.
FISH Oncology: ETV6 (TEL) 12p13 gene rearrangement	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions. In the eventuality of insufficient Bone Marrow sample, unstained blood/bone marrow slides can be used but cannot guarantee results.
FISH Oncology: Ewing's sarcoma 22q12 rearrangement EWSR1	FFPE tissue block or sections mounted a positively charged slide	NOTE: Ringed Haematoxylin and Eosin stain should be submitted.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
FISH Oncology: Follicular lymphoma t(14;18) <i>IGH@/BCL2</i>	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes. For solid tumors, FFPE tissue block or sections mounted a positively charged slide	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions. In the eventuality of insufficient Bone Marrow sample, unstained blood/bone marrow slides can be used but cannot guarantee results.
FISH Oncology: Inversion 16 <i>CBFB</i>	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions. In the eventuality of insufficient Bone Marrow sample, unstained blood/bone marrow slides can be used but cannot guarantee results.
FISH Oncology: Lymphoma / Lung cancer 2p23 rearrangement <i>ALK</i>	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes. For solid tumors, FFPE tissue block or sections mounted a positively charged slide	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions. In the eventuality of insufficient Bone Marrow sample, unstained blood/bone marrow slides can be used but cannot guarantee results.
FISH Oncology: Mantle Cell Lymphoma, Multiple myeloma t(11;14) <i>CCND1/IGH</i>	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes. For solid tumors, FFPE tissue block or sections mounted a positively charged slide	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions. In the eventuality of insufficient Bone Marrow sample, unstained blood/bone marrow slides can be used but cannot guarantee results.
FISH Oncology: Multiple myeloma t(14;16) <i>IGH/MAF</i>	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions. In the eventuality of insufficient Bone Marrow sample, unstained blood/bone marrow slides can be used but cannot guarantee results.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
FISH Oncology: Multiple myeloma t(4;14) IGH@/FGFR3/WHSC1	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions. In the eventuality of insufficient Bone Marrow sample, unstained blood/bone marrow slides can be used but cannot guarantee results.
FISH Oncology: MYC for amplification of MYC gene	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes. For solid tumors, FFPE tissue block or sections mounted a positively charged slide	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
FISH Oncology: MYC Translocations 8q24 rearrangement MYC	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes. For solid tumors, FFPE tissue block or sections mounted a positively charged slide	Paraffin embedded/Tissue section
FISH Oncology: Myelodysplastic syndrome, Acute Myeloid Leukaemia 5q31 deletion EGR1 locus	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions. In the eventuality of insufficient Bone Marrow sample, unstained blood/bone marrow slides can be used but cannot guarantee results.
FISH Oncology: NMYC/CEP2 2p24.1	FFPE tissue block or sections mounted a positively charged slide	NOTE: Ringed Haematoxylin and Eosin stain needs to be submitted.
FISH Oncology: Pediatric Acute Lymphocytic Leukaemia t(12;21) ETV6/RUNX1 (TEL/AML1)	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions. In the eventuality of insufficient Bone Marrow sample, unstained blood/bone marrow slides can be used but cannot guarantee results.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
FISH Oncology: Rhabdomyosarcoma 13q14 <i>FOXO1 (FKHR)</i> rearrangement	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes. For solid tumors, FFPE tissue block or sections mounted a positively charged slide	NOTE: Ringed Haematoxylin and Eosin stain needs to be submitted.
FISH Oncology: Sex-mismatched allografts CEP X / CEP Y for XX/XY ratios	Bone marrow aspirate OR leukaemic blood in lithium or sodium heparin (green top) tubes	As methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions. In the eventuality of insufficient Bone Marrow sample, unstained blood/bone marrow slides can be used but cannot guarantee results.
FISH Oncology: SS18 t(X;18)	FFPE tissue block or sections mounted a positively charged slide	NOTE: Ringed Haematoxylin and Eosin stain needs to be submitted.
FISH Oncology: Synovial sarcoma 18q11.2 rearrangement <i>SYT1</i>	FFPE tissue block or sections mounted a positively charged slide	NOTE: Ringed Haematoxylin and Eosin stain needs to be submitted.
FISH Oncology: t(11;19)MECT1-MAML2	FFPE tissue block or sections mounted a positively charged slide	NOTE: Ringed Haematoxylin and Eosin stain needs to be submitted.
FISH Oncology: t(17;22) <i>COL1A1/PDGFB</i>	FFPE tissue block or sections mounted a positively charged slide	NOTE: Ringed Haematoxylin and Eosin stain needs to be submitted.
FISH Oncology: <i>TFE3</i> Xp11	FFPE tissue block or sections mounted a positively charged slide	NOTE: Ringed Haematoxylin and Eosin stain needs to be submitted.
FISH Oncology: <i>TOP2A</i> /CEP17 for <i>TOP2A</i> amplification	FFPE tissue block or sections mounted a positively charged slide	NOTE: Ringed Haematoxylin and Eosin stain needs to be submitted.
<i>FLT3</i> (TKD, ITD mutations) (DNA analysis)	5 ml blood OR Bone Marrow in EDTA (purple top) tube	

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Fluid aspirate MC&S	5 ml fluid aspirate in a universal container or (clear top) collection tube without additives AND 3 ml fluid in an EDTA (purple top) tube if a cell count is required	
Fluoride	25 ml random urine in a universal container	Transport sample on ice.
<i>FMR1</i> -Related Disorders ( <i>POI</i> , <i>FXTAS</i> ) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Folate (red cell)	5 ml EDTA (purple top) blood	NOTE: Must be a separate specimen from other tests.
Folate (serum)	5 ml clotted (red or yellow top) blood	For transport separate serum and send frozen on dry ice.
Follicle stimulating hormone (FSH)	5 ml clotted (red or yellow top) blood	For transport separate serum and send at room temperature.
Fragile X Syndrome (FRAXA) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Fragile X syndrome (FRAXE) mild MR (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Free fatty acids	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Deliver sample to the laboratory on ice.
Free light chains	5 ml clotted (red or yellow top) blood	
Friedreich ataxia (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Frozen section (Anatomical pathology)	Fresh unfixed specimen	NOTE: Pre-arrange with laboratory before surgery where available.
Fructosamine	5 ml clotted (red or yellow top) blood	
Full Blood Count (FBC)	5 ml EDTA (purple top) blood	NOTE: Sample must reach the laboratory within 24 hrs of collection.
Fungal MC&S	Sample from potentially infected site in a universal container	
Gabapentin (Neurontin)	2 x 5 ml EDTA (purple top) blood	NOTE: Collect blood sample just before next dose.
Galactokinase enzyme activity (Galactosaemia type 2)	5 ml EDTA (purple top) blood	
Galactosaemia (GALT) S135L (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Galactosaemia DNA test (GALT) (Q188R European mutation) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Galactose-1 phosphate uridyl transferase enzyme activity (Galactosaemia type 1)	Contact laboratory for tube type	NOTE: Minimum 4 ml blood required. Requires control sample if specimen is to be sent away. Send samples on ice. Do NOT centrifuge. Recent (120 days) blood transfusion contra-indicates test. Patient to be on galactose (lactose) containing diet.
Gamma glutamyl transferase (GGT)	5 ml clotted (red or yellow top) blood	
Gastrin	5 ml clotted (red or yellow top) blood	NOTE: Deliver sample to the laboratory on ice. Separate and freeze serum within 2 hrs of collection. Patient must fast for 10 hrs before test. Discontinue interfering medication e.g. omeprazole, cimetidine.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Gaucher Disease (Afrikaner) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Gaucher Disease (Ashkenazi Jewish) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Gaucher Disease (Black) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Gaucher Disease (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Genital swab for MC&S	Genital swab in suitable transport medium	NOTE: Vaginal swabs are NOT suitable for the isolation of <i>Neisseria gonorrhoea</i> nor <i>Chlamydia</i> antigen detection.
Gentamicin	5 ml clotted (red or yellow top) blood	NOTE: Trough levels to be collected 30 min prior to next dose, peak levels to be collected 30 min after a 1 hr infusion. Please state the time of last dose on the request form.
Gilbert / Crigler-Najjar ( <i>UGT1A1</i> ) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Glucose (CSF)	0.5 ml CSF in a fluoride (grey top) tube	NOTE: Simultaneous blood glucose measurement is recommended.
Glucose (fluid)	1 ml fluid in a fluoride (grey top) tube	
Glucose (plasma)	5 ml blood in a fluoride (grey top) tube	NOTE: State on the request form whether random or fasting sample. Fasting requires no food for 8–12 hrs before collection. If patients cannot go without, water sips may be taken during the fast. See Section 17.2.1 for details of oral glucose tolerance testing.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Glucose (urine) (dipstix)	25 ml random urine in a universal container	NOTE: Deliver sample to the laboratory on ice within 4 hrs of collection.
Glucose-6-phosphatase enzyme activity (Glycogen storage disease type 1a)	Liver biopsy (preferably 2 specimens)	NOTE: Collect biopsy specimens into sterile plastic tubes and freeze to -80 °C immediately. Arrange test with referral laboratory before sample collection and transport on dry ice.
Glucose-6-phosphate dehydrogenase (G6PD) deficiency screen (DNA analysis)	5 ml EDTA (purple top) blood	NOTE: This is a qualitative screening test only. Please provide full clinical history. Refrigerate sample if kept overnight
Glutaric Aciduria Type 1 (GCDH) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Glutaric Aciduria type 1 (GCDH, A293T) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Glutathione Synthetase Deficiency (GSS) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Glycated haemoglobin (HbA1c)	5 ml EDTA (purple top) blood	
Glycine (CSF)	1 ml CSF in a (clear top) collection tube without additives AND 5 ml clotted (red or yellow top) blood.	NOTE: Submit simultaneous blood sample in a yellow or green top tube.
Glycogen Storage Disease 1A (Ashkenazi Jewish) (DNA analysis)	5 ml EDTA (purple top) blood	
Growth hormone	5 ml clotted (red or yellow top) blood	For transport separate serum and send frozen on dry ice.
Haematocrit (Hct)	5 ml EDTA (purple top) blood	NOTE: Refrigerate the sample if it is kept overnight.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Haemochromatosis (HFE) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Haemoglobin	5 ml EDTA (purple top) blood	NOTE: Refrigerate the sample if it is kept overnight.
Haemoglobin (Unstable) (Heat stability test)	5 ml EDTA (purple top) blood	NOTE: Sample must be tested within 24 hrs of collection.
Haemoglobin A2 (HbA2)	5 ml EDTA (purple top) blood	NOTE: Please arrange test with the referral laboratory before sample collection.
Haemoglobin electrophoresis (HPLC)	5 ml EDTA (purple top) blood	NOTE: Refrigerate the sample if it is kept overnight. The sample must be tested within 72 hours of sampling.
Haemoglobin F (HbF)	5 ml EDTA (purple top) blood	NOTE: Refrigerate the sample if it is kept over night. Please arrange test with the referral laboratory before sample collection.
Haemoglobin H inclusion bodies	5 ml EDTA (purple top) blood	NOTE: Sample must be tested within 72 hours of sampling.
Haemoglobin S (HbS)	5 ml EDTA (purple top) blood	NOTE: Refrigerate the sample if it is kept over night. Please arrange test with the referral laboratory before sample collection.
Haemophilia A (F8A intron 1 inversion) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Haemophilia A (F8A intron 22 inversion) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Haemophilia A (F8A mutation screen) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Haemophilia A (F8A, exon 14) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Haemophilia B (F9) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Haemosiderin	30 ml random urine in a universal container	NOTE: Fresh urine specimen is preferred.
Haloperidol (Serenace)	2 x 4 ml EDTA (purple top) blood	
Ham's Test	5 ml EDTA (purple top) AND 5 ml clotted (red or yellow top) blood	NOTE: Contact the referral laboratory before sample collection as the test must be booked.
Haptoglobin	5 ml clotted (red or yellow top) blood	For transport separate serum and send at room temperature.
Heinz bodies	10 ml EDTA (purple top) blood	NOTE: Sample must be tested within 24 hrs of collection. Refrigerate sample if kept overnight
Helicobacter pylori Antibodies	5 ml clotted (red or yellow top) blood	
Heparin-induced thrombocytopaenia	5 ml clotted (red or yellow top) blood	NOTE: Sample must be tested within 24 hrs of sampling. Keep the sample at 2–8 °C; do not freeze.
Hepatitis A IgG	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Hepatitis A IgM	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Hepatitis B core IgM	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Hepatitis B core Total (IgM & IgG)	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Hepatitis B e Antibody	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Hepatitis B e Antigen	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Hepatitis B surface Antibody	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Hepatitis B surface Antigen	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Hepatitis B virus (HBV) drug resistance testing (Lamivudine)	5 ml EDTA (purple top) OR clotted (red or yellow top) blood	NOTE: Only performed if HBV viral load is detectable. Transport specimen to the laboratory at 4 °C.
Hepatitis B virus (HBV) viral load	5 ml EDTA (purple top) OR clotted (red or yellow top) blood	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Hepatitis C Total Antibody	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Hepatitis C virus (HCV) genotyping	5 ml EDTA (purple top) blood	NOTE: Only performed if HCV PCR is positive. Transport the specimen at 4 °C.
Hepatitis C virus (HCV) PCR	5 ml EDTA (purple top) blood	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Hepatitis C virus (HCV) viral load	5 ml EDTA (purple top) blood	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Hepatitis E IgG	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Hepatitis E IgM	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Hepatitis E virus (HEV) PCR	5 ml EDTA (purple top) OR clotted (red or yellow top) blood	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Hepatitis E virus (HEV) viral load	5 ml EDTA (purple top) OR clotted (red or yellow top) blood	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Hereditary Hearing Loss <i>GJA1</i> (Connexin 43) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Hereditary Hearing Loss <i>GJB2</i> (Connexin 26) (Ashkenazi) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Hereditary Hearing Loss <i>GJB2</i> (Connexin 26) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Hereditary Hearing Loss <i>GJB6</i> (Connexin 30) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Heroin	25 ml random urine in a universal container	For transport send fresh urine on ice.
Herpes simplex virus (HSV) 1&2 IgG	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Herpes simplex virus (HSV) 1&2 IgM	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Herpes simplex virus (HSV) PCR	1 ml CSF in a (clear top) collection tube without additives; tissue biopsy material, fluid aspirate or lesion fluid in a universal container	NOTE: Biopsy material must be sent in normal saline (never in formalin). Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Herpes simplex virus EM	Vesicle fluid (between two glass slides)	NOTE: On special request only - contact the referral laboratory (Tshwane Academic) prior to sample collection. Test cannot distinguish between HSV & VZV.
Herpes simplex virus isolation (culture)	Lesion fluid OR swab from the ulcer base in viral transport medium (VTM)	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Hexosaminidase A enzyme activity (Tay-Sachs disease)	13 ml ACD solution B (light yellow top) blood	Sample must reach referral laboratory within 24 hrs of collection.
HHV-6 PCR	5 ml EDTA (purple top) blood OR 1 ml CSF in a (clear top) collection tube without additives	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
HHV-8 PCR	5 ml EDTA (purple top) blood; 5 ml pleural fluid OR tissue biopsy material in a universal container	NOTE: Biopsy material must be sent in normal saline (NEVER in formalin). Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
High Density Lipoprotein (HDL) Cholesterol	5 ml clotted (red or yellow top) blood	For transport separate serum and send on ice.
Hippuric acid (screen for toluene exposure)	25 ml random urine in a universal container	
Histology	Any tissue in fixative	NOTE: Please ensure that the specimen is completely embedded in the solution.
Histoplasma Antigen test	5 ml EDTA (purple top) blood OR random urine sample in a universal container	NOTE: Please keep the sample at 2–4 °C during transport.
Histoplasma serology	5 ml clotted (red or yellow top) blood	
HIV EIA (3rd generation)	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
HIV EIA confirmation (4th generation)	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
HIV EIA screening (4th generation)	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
HIV p24 antigen	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
HIV rapid (4th generation)	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
HIV-1 drug resistance testing	10 ml EDTA (purple top) blood	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
HIV-1 PCR	1 x DBS card (minimum 3 spots) OR 1 ml EDTA (purple top) blood	NOTE: Transport EDTA specimen to the laboratory at 4 °C, and refrigerate if transport is delayed.
HIV-1 viral load	5 ml EDTA (purple top) or PPT (pearl top) tube	NOTE: Sample must be separated within 6 hrs of collection, and reach the referral laboratory within 2–3 days of collection. Transport specimen at 4 °C.
HLA antibody screening	5–10 ml clotted (red or yellow top) blood	
HLA Cadaver group and cross-match	7 ml ACD solution B (light yellow top) tube blood AND 5 ml clotted (yellow or red top) blood	
HLA class I antibody identification	5–10 ml clotted (red or yellow top) blood	
HLA class I single Ab identification	5–10 ml clotted (red or yellow top) blood	
HLA class II antibody identification	5–10 ml clotted (red or yellow top) blood	
HLA class II single Ab identification	5–10 ml clotted (red or yellow top) blood	

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
HLA Donor blood group	7 ml ACD solution B (light yellow top) tube blood	
HLA Recipient group and cross-match	7 ml ACD solution B (light yellow top) tube blood AND 5 ml clotted (yellow or red top) blood	
HLA SABMR donor screening (DNA-based)	10 ml EDTA (purple top) blood	
HLA serological typing	7 ml ACD solution B (light yellow top) tube blood	
HLA-A* (Class I Molecular typing)	10 ml EDTA (purple top) blood	
HLA-B* (Class I Molecular typing)	10 ml EDTA (purple top) blood	
HLA-B27 (Class II Molecular Typing)	10 ml EDTA (purple top) blood	
HLA-C* (Class I Molecular typing)	10 ml EDTA (purple top) blood	
HLA-DQB1* (Class II Molecular Typing)	10 ml EDTA (purple top) blood	
HLA-DRB1* (Class II Molecular Typing)	10 ml EDTA (purple top) blood	
HLA-DRB3* (Class II Molecular Typing)	10 ml EDTA (purple top) blood	
HLA-DRB4* (Class II Molecular Typing)	10 ml EDTA (purple top) blood	
HLA-DRB5* (Class II Molecular Typing)	10 ml EDTA (purple top) blood	

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NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
HNPP (Hereditary Neuropathy with Liability to Pressure Nerve Palsy) ( <i>PMP22</i> deletion analysis) (DNA analysis)	10 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Homocysteine (plasma)	5 ml EDTA (purple top) blood	NOTE: For methionine load: record patient weight on request form. Overnight fast (last meal low in protein) required. Take baseline and 6 hr post methionine load (0.1g/kg in 200 ml orange juice). Deliver samples to the laboratory on ice within 30 min of collection. Separate samples immediately and transport plasma on ice.
Homocysteine (urine)	25 ml random urine in a universal container	Transport sample on ice.
Homovanillic acid (HVA)	24 hour urine sample in a collection container with HCl (best practice); 20 ml random urine for children	NOTE: Acidify urine collection with 10 ml conc. HCl. Urine sample must be refrigerated during collection.
HTLV I/II antibodies	5 ml clotted (red or yellow top) blood OR 1 ml CSF in a (clear top) collection tube without additives	NOTE: Blood sample should be separated within 48 hrs of collection. Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
HTLV-1 PCR	5 ml EDTA (purple top) blood OR 1 ml CSF in a (clear top) collection tube without additives	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Human papilloma virus (HPV) genotyping	Cervical swab OR cytobrush in liquid transport medium	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Human placental lactogen	5 ml clotted (red or yellow top) blood	
Huntington Disease ( <i>HTT</i> ) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Huntington disease-like 2 ( <i>JPH3</i> ) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Immunoglobulin A (IgA)	5 ml clotted (red or yellow top) blood	
Immunoglobulin D (IgD)	5 ml clotted (red or yellow top) blood	
Immunoglobulin E (IgE Total)	5 ml clotted (red or yellow top) blood	
Immunoglobulin G (IgG)	5 ml clotted (red or yellow top) blood	
Immunoglobulin G (IgG) subclasses	5 ml clotted (red or yellow top) blood	NOTE: Test includes IgG1, IgG2, IgG3 & IgG4.
Immunoglobulin M (IgM)	5 ml clotted (red or yellow top) blood	
Immunofixation, serum	5 ml clotted tube (yellow top)	NOTE: Immunofixation is done on all newly detected paraproteins (see protein electrophoresis, serum)
Immunofixation, urine	Specimen collection: Timed or random (50 ml) urine collection	No preservative required. Immunofixation is done on newly detected paraproteins (see protein electrophoresis, urine).
Immunophenotyping (Flow): Acute Lymphocytic Leukemia	5–10 ml EDTA (purple top) or heparinised (green top) blood OR 2 ml bone marrow aspirate in an EDTA (purple top) tube	NOTE: Please provide full clinical history. Specimen must reach the referral laboratory on same day as sampling. Specimen must NOT be refrigerated during transport.
Immunophenotyping (Flow): CD34 (stem cell enumeration)	5–10 ml EDTA (purple top) or heparinised (green top) blood; 2 ml bone marrow aspirate in an EDTA (purple top) tube OR fluid from an apheresis bag	NOTE: Specimen must reach the referral laboratory on same day as sampling. Specimen must NOT be refrigerated during transport.
Immunophenotyping (Flow): CD4	5 ml EDTA (purple top) blood	NOTE: Specimen must reach the referral laboratory on same day as sampling. Specimen must NOT be refrigerated during transport.
Immunophenotyping (Flow): Chronic Lymphocytic Leukaemia	5–10 ml EDTA (purple top) or heparinised (green top) blood OR 2 ml bone marrow aspirate in an EDTA (purple top) tube	NOTE: Please provide full clinical history. Specimen must reach the referral laboratory on same day as sampling. Specimen must NOT be refrigerated during transport.
Immunophenotyping (Flow): DNA Ploidy	5 ml EDTA (purple top) blood	NOTE: Specimen must reach the referral laboratory on same day as sampling. Specimen must NOT be refrigerated during transport.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Immunophenotyping (Flow): Leukaemia Profile	5–10 ml EDTA (purple top) or heparinised (green top) blood OR 2 ml bone marrow aspirate in an EDTA (purple top) tube	NOTE: Please provide full clinical history. Specimen must reach the referral laboratory on same day as sampling. Specimen must NOT be refrigerated during transport.
Immunophenotyping (Flow): Lymphocyte function	5 ml EDTA (purple top) blood	NOTE: Please arrange the test with the referral laboratory BEFORE sample collection. Specimen must reach the referral laboratory on same day as sampling. Specimen must NOT be refrigerated during transport.
Immunophenotyping (Flow): Multiple Myeloma Profile	5–10 ml EDTA (purple top) or heparinised (green top) blood OR 2 ml bone marrow aspirate in an EDTA (purple top) tube	NOTE: Please provide full clinical history. Specimen must reach the referral laboratory on same day as sampling. Specimen must NOT be refrigerated during transport.
Immunophenotyping (Flow): Neutrophil function	5 ml EDTA (purple top) blood	NOTE: Please arrange the test with the referral laboratory BEFORE sample collection. Specimen must reach the referral laboratory on same day as sampling. Specimen must NOT be refrigerated during transport.
Immunophenotyping (Flow): Paroxysmal Nocturnal Haemoglobinuria (PNH)	5 ml EDTA (purple top) blood	NOTE: Specimen must reach the referral laboratory on same day as sampling. Specimen must NOT be refrigerated during transport.
Immunophenotyping (Flow): Platelet Profile	5 ml EDTA (purple top) blood	NOTE: Specimen must reach the referral laboratory on same day as sampling. Specimen must NOT be refrigerated during transport.
Immunophenotyping (Flow): T-, B- & NK-cell counts	10 ml EDTA (purple top) blood OR bronchoalveolar lavage fluid in a universal container	NOTE: Test must be arranged with the referral laboratory before sample collection.
Immunophenotyping (Flow): T-Lymphocyte Subset analysis	5 ml EDTA (purple top) blood	NOTE: Specimen must reach the referral laboratory on same day as sampling. Specimen must NOT be refrigerated during transport.
Infection Control testing	Various samples	NOTE: Please see Section 21 for specific guidelines on sample collection and Infection Control tests offered.
Insulin	5 ml clotted (red or yellow top) blood	NOTE: Fasting specimen is preferred.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Insulin-like growth factor 1	5 ml clotted (red or yellow top) blood	NOTE: State age and gender of patient on the request form.
Interleukin (1–6)	5 ml clotted (red or yellow top) blood	
International Normalised Ratio (INR)	5 ml sodium citrate (blue top) blood	NOTE: Samples must reach the laboratory within 6 hrs of collection or frozen plasma must be sent on dry ice.
Intravascular device tips for MC&S	Place tip in a universal container	
Intrinsic Factor Blocking Antibodies	5 ml clotted (red or yellow top) blood	
Iodine	24 hr urine collection (preferred) OR 25 ml random urine in a universal container	NOTE: Protect sample from light during collection and transport. Transport specimen on ice.
Iron	5 ml clotted (red or yellow top) blood	
Iron studies (iron, transferrin, transferrin saturation, ferritin)	5 ml clotted (red or yellow top) blood	NOTE: Avoid haemolysis during venesection.
Isopropanol stability test	5 ml EDTA (purple top) blood AND 5 ml EDTA (purple top) blood from a healthy control	NOTE: Specimen must reach the referral laboratory within 4 hrs after collection.
JAK2 exon 12 mutations (DNA analysis)	5 ml EDTA (purple top) blood	
JAK2 G1849T (V617F) mutation (DNA analysis)	5 ml EDTA (purple top) blood	
JC virus PCR	1 ml CSF in a (clear top) collection tube without additives	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Kanamycin	5 ml clotted (red or yellow top) blood	NOTE: Trough levels to be collected 30 min prior to next dose, peak levels to be collected 30 min after a 1 hr infusion. Please state the time of last dose on the request form.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Kennedy's Disease (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Ketones (acetoacetate) (quantitative)	Contact laboratory for tube type	NOTE: Deliver sample to the laboratory on ice within 30 min of collection. Contact the referral laboratory for sample processing details.
Ketones (serum) (qualitative)	5 ml clotted (red or yellow top) blood	
Ketones ( $\beta$ -hydroxybutyrate) (quantitative)	Contact laboratory for tube type	NOTE: Deliver sample to the laboratory on ice within 30 min of collection. Contact the referral laboratory for sample processing details.
Kleihauer test	5 ml EDTA (purple top) blood (maternal blood)	NOTE: Please arrange test with the referral laboratory before sample collection.
Lactate (CSF)	Contact laboratory for tube type	NOTE: Deliver sample to the laboratory on ice. Contact referral laboratory for collection details.
Lactate (plasma)	5 ml blood in a fluoride (grey top) tube	NOTE: Avoid use of tourniquet during venesection. See Section 17.2.7 for detailed instructions and precautions.
Lactate dehydrogenase (LDH) (fluid)	5 ml fluid in a (clear top) collection tube without additives	
Lactate dehydrogenase (LDH) (serum)	5 ml clotted (red or yellow top) blood	
Lactate dehydrogenase isoenzymes	5 ml clotted (red or yellow top) blood	NOTE: Avoid haemolysis during venesection.
Lamellar body count (amniotic fluid)	15 ml amniotic fluid in a collection tube without additives	NOTE: Avoid contamination with blood and meconium during sampling.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Lamotrigine (Lamictin)	5 ml clotted (red or yellow top) blood	NOTE: Please indicate weight and age of patient, and time of last dose prior to specimen collection on the request form.
Larvae of Strongyloides stercoralis	Sputum, vomitus or other body fluids from a potentially infected site in a universal sputum container	NOTE: Handle sample with care as the larvae may be infective.
Lead (urine)	25 ml random urine in a universal container	
Lead (whole blood)	5 ml EDTA (purple top) blood	
Leber hereditary optic neuropathy (LHON) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Legionella Antibodies	5 ml clotted (red or yellow top) blood	
Legionella Culture	Bronch-alveolar lavage fluid or lung biopsy material in a universal container	
Legionella urine antigen test	Random urine sample in a universal container	
Leigh syndrome (LS) <i>SURF1</i> (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Leigh syndrome (mitochondrial DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Leigh syndrome <i>PDHA1</i> (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Leishmania Microscopy	Bone Marrow or skin biopsy	NOTE: Skin biopsy material should be transported in saline. Transport all samples at room temperature. Please contact the referral laboratory for special instructions.
Leptospira Antibodies	5 ml clotted (red or yellow top) blood	
Lesch-Nyhan syndrome ( <i>HPRT1</i> ) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Leucocyte Alkaline Phosphatase	5 ml EDTA (purple top) blood	NOTE: Test must be arranged with the laboratory in advance as the test must be performed within 30 min of sampling.
Liddle syndrome (ENaC) ( <i>SCNN1B</i> exon 13) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Liddle Syndrome (ENaC) ( <i>SCNN1B</i> R563Q) (African) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Lipase	5 ml clotted (red or yellow top) blood	
Lipid electrophoresis	5 ml clotted (red or yellow top) blood	NOTE: Fasting blood sample required. For transport separate serum send on ice (do not freeze).
Lipogram (HDL, LDL, total cholesterol & triglycerides)	5 ml clotted (red or yellow top) blood	NOTE: Fasting blood sample required.
Lipoid Proteinosis (funder) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Lipoprotein (a)	Contact your laboratory for tube type	For transport separate serum and send on ice.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Lithium	5 ml clotted (red or yellow top) blood	NOTE: Use lithium-free collection tubes. Draw trough level 12 hrs after evening dose. Follow up at the same time of day. If toxicity is suspected, please mark as STAT and arrange for immediate analysis by the laboratory.
Low Density Lipoprotein (calculated)	5 ml clotted (red or yellow top) blood	NOTE: Calculated using the Friedewald equation.
Low-density lipoprotein (measured)	5 ml clotted tube (yellow top)	NOTE: Separate serum for transport < 24-hours send at room temperature. If >24-hours send on ice.
LPL (Lipoprotein Lipase Type 1 Hyperlipoproteinaemia) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Lupus Anticoagulant	15 ml sodium citrate (blue top) blood	NOTE: This test is not suitable for heparinised patients. Samples must reach the laboratory within 6 hrs of collection or frozen plasma must be sent on dry ice.
Luteinizing hormone (LH)	5 ml clotted (red or yellow top) blood	For transport separate serum and send on ice.
Lymphocytotoxic Antibodies	5 ml clotted (red or yellow top) blood	
Lysergic acid diethylamide (LSD) (urine screen)	25 ml random urine in a universal container	
Magnesium (red cell)	5 ml lithium-heparin (green top) blood	
Magnesium (serum)	5 ml clotted (red or yellow top) blood	
Magnesium (urine)	24 hr urine collection	NOTE: Collect 24 hr urine sample in a collection container with HCl (urine pH < 3)
Malaria rapid screen	5 ml EDTA (purple top) blood	
Malaria smear	5 ml EDTA (purple top) blood	NOTE: Sample must be tested within 24 hrs after collection.

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NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Mandelic acid	5 ml random urine in a universal container	
Mandrax (methaqualone)	25 ml random urine in a universal container	For transport send fresh urine on ice.
Manganese	5 ml EDTA (purple top) OR lithium-heparin (green top) blood	
Manganese (urine)	24 hr urine collection without preservatives	NOTE: Urine sample must be refrigerated during collection.
Mast cell tryptase (suspected anaphylaxis)	5 ml clotted (red or yellow top) blood	For transport separate serum and send on ice.
Maternal Cell Contamination Screen (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
MCAD (ACADM, A985G) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
McArdle's Disease (PYGM R50X) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Measles (IgM) surveillance	5 ml clotted (red or yellow top) blood	NOTE: Please see Section 23.5.2 for specific guidelines on this notifiable condition.
Measles IgG	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Measles PCR	5 ml EDTA (purple top) blood; 1 ml CSF in a (clear top) collection tube without additives; random urine sample OR respiratory tract sample in a universal container	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
MELAS (Mitochondrial Encephalopathy with Lactic Acidosis and Stroke-like Episodes) (DNA analysis)	Frozen muscle biopsy OR 10ml random urine sample in a universal container	NOTE: DNA may also be extracted from blood or other body tissues, but urine and muscle are most reliable.
Mercury (red cell)	5 ml EDTA (purple top) or lithium-heparin (green top) blood	
Mercury (urine)	25 ml random urine in a universal container	
MERRF (Myoclonal Epilepsy with Ragged-Red Fibers) (DNA analysis)	Frozen muscle biopsy OR 10ml random urine sample in a universal container	NOTE: DNA may also be extracted from blood or other body tissues, but urine and muscle are most reliable.
Metabolic screen	25 ml random urine in a universal container	NOTE: Minimum 10 ml urine required. Deliver sample immediately to the laboratory on ice. For transport send urine frozen on dry ice.
Metanephrines (fractionated)	24 hr urine collection	NOTE: Collect urine in acid (urine pH < 3). Supply patient height and weight on the request form. See Section 17.2.4 for detailed instructions and precautions.
Methadone (qualitative)	25 ml random urine in a universal container	For transport send fresh urine on ice.
Methaemoglobin	Contact laboratory for collection details	NOTE: Please arrange the test with the laboratory before sample collection. The collection tube must be filled completely, leaving no residual air. The sample must be delivered immediately to the laboratory on ice.
Methamphetamine (Screen for ecstasy, MDMA)	25 ml random urine in a universal container	For transport send fresh urine on ice.
Methanol	25 ml random urine in a universal container	
Methotrexate	5 ml clotted (red or yellow top) blood	

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NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Methylhippuric acid (screen for xylene exposure)	25 ml random urine in a universal container	
Microarray DNA copy number microarray: Panel for CLL (913q14.3, TP53, ATM, Trisomy 12)	10 ml EDTA (purple top ) blood OR 1 ml Bone Marrow Aspirate in an EDTA (purple top) tube	NOTE: Specimen must be transported at room temperature, and should reach the referral laboratory within 48 hrs of collection.
Microdeletion / duplication syndromes (MLPA) (DNA analysis) (1p36 deletion syndrome; 2p16 microdeletion; 2q23 microdeletion/MBD5; 2q33 microdeletion/SATB2; 3q29 microdeletion; 9q22.3 microdeletion; 15q24 deletion syndrome; 17q21 microdeletion; 22q13 / Phelan-McDermid; Cri du Chat syndrome, 5p15; DiGeorge syndrome 22q11; Distal 22q11 region; DiGeorge region 2, 10p14; Langer-Giedion syndrome, 8q; Miller-Dieker syndrome, 17p; NF1 microdeletion syndrome; Prader-Willi / Angelman; MECP2 / Xq28 duplication; Rubinstein-Taybi syndrome; Smith-Magenis syndrome; Sotos syndrome 5q35.3; Williams syndrome; Wolf-Hirschhorn 4p16.3)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Microfilaria Microscopy	5 ml EDTA (purple top) blood	NOTE: Please contact the referral laboratory for special sampling instructions.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Microsatellite Instability analysis (MSI) (DNA analysis)	FFPE tissue sections OR 5 ml EDTA (purple top) blood	See special instructions in Section 24.2.2.4 under Genetic Testing.
Mitochondrial deletion screen (Kearn Sayers, Pearsons disease, CPEO) (DNA analysis)	Frozen muscle biopsy OR 10ml random urine sample in a universal container	NOTE: DNA may also be extracted from blood or other body tissues, but urine and muscle are most reliable.
Mitochondrial DNA mutation screen (DNA analysis)	Frozen muscle biopsy OR 10ml random urine sample in a universal container	NOTE: DNA may also be extracted from blood or other body tissues, but urine and muscle are most reliable.
Mitochondrial Non-Syndromic Deafness (MNSD) ( <i>MT-RNR1</i> and <i>MT-TS1</i> ) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Molluscum contagiosum EM	Lesion fluid (between two glass slides)	NOTE: On special request only — contact the referral laboratory (Tshwane Academic) prior to sample collection.
Morphine (screen for opiates)	25 ml random urine in a universal container	For transport send fresh urine on ice.
MTHFR C677T mutation (DNA analysis)	5 ml EDTA (purple top) blood	
Mucopolidosis IV (Ashkenazi Jewish) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Mucopolysaccharides (glycosaminoglycans)	25 ml random urine in a universal container	NOTE: Minimum 5 ml urine required. Deliver sample immediately to the laboratory on ice. For transport send urine frozen on dry ice.
Mucormycosis	Nasal scraping or tissue specimen in a universal container	NOTE: Test must be arranged with the laboratory before sample collection.
Multiple Endocrine Neoplasia Type I (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Mumps IgG	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Mumps IgM	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Mumps PCR	1 ml CSF in a (clear top) collection tube without additives; 5 ml random urine sample in a universal container	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Mycophenolic acid (Cellcept)	5 ml clotted (red or yellow top) blood	NOTE: Separate serum within 4 hrs of collection.
Mycoplasma IgG & IgM Antibodies	5 ml clotted (red or yellow top) blood	
Myoadenylate deaminase deficiency (AMPD1, C34T) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Myoglobin (plasma)	Contact laboratory for tube type	NOTE: Deliver sample to the laboratory immediately after collection.
Myoglobin (urine) (qualitative)	25 ml random urine in a universal container	NOTE: Deliver sample immediately to the laboratory on ice.
Myotonic Dystrophy (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
N-Acetyl Transferase 2 (NAT2) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
NARP (Neurogenic Weakness with Ataxia and Retinitis Pigmentosa) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Neuron specific enolase	5 ml clotted (red or yellow top) blood	For transport separate serum and send frozen on dry ice.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Neutrophil Oxidative burst test	5 ml heparinised (green top) blood	NOTE: Arrange test with referral laboratory before sample collection.
Nickel (blood)	5 ml heparinised (green top) blood	
Nickel (urine)	25 ml random urine in a metal-free container without preservative	
Niemann Pick Disease Type A (Ashkenazi Jewish) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Nitroprusside	2 x 5 ml EDTA (purple top) blood	NOTE: Thiocyanate levels are used to monitor nitroprusside therapy.
Nocardia Culture	Sample from potentially infected site in a universal container	NOTE: Please state clearly on the request form that Nocardia Culture is requested.
NPM1 (DNA analysis)	5 ml EDTA (purple top) blood OR Bone Marrow	
Oculocutaneous Albinism type 2 (OCA2 deletion) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Oestradiol	5 ml clotted (red or yellow top) blood	For transport < 48 hrs separate serum and send on ice; otherwise if delayed > 48 hrs separate serum and send frozen on dry ice.
Oligoclonal bands	5 ml clotted (red or yellow top) blood AND 1 ml CSF in a (clear top) collection tube without additives	NOTE: Please submit with concomitant serum sample for meaningful result interpretation.
Opiates (qualitative)	25 ml random urine in a universal container	For transport send fresh urine on ice.
Orf virus EM	Lesion fluid (between two glass slides)	NOTE: On special request only – contact the referral laboratory (Tshwane Academic) prior to sample collection.
Organic acids	25 ml random urine in a universal container	NOTE: Minimum 5 ml urine required. Deliver sample immediately to the laboratory. For transport send urine frozen on dry ice.

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NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Orotic acid (urea cycle disorder)	5 ml EDTA (purple top) or heparinised (green top) blood	NOTE: Deliver sample immediately to the laboratory on ice. For transport separate plasma and send frozen on dry ice.
Osmolality (serum)	5 ml clotted (red or yellow top) blood	NOTE: Deliver sample to the laboratory on ice. For transport separate serum and send on ice.
Osmolality (stool)	Watery stool sample in a universal container	NOTE: Deliver sample to the laboratory on ice.
Osmolality (urine)	25 ml random urine in a universal container	NOTE: Deliver sample to the laboratory on ice.
Osmotic fragility	Contact laboratory for tube type	NOTE: Test must be arranged with the referral laboratory before sample collection.
Osteocalcin	5 ml clotted (red or yellow top) blood	NOTE: Deliver sample to the laboratory on ice. Separate immediately and transport frozen.
OTC (Ornithine Carbamoyltransferase Deficiency) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Oxalate	24 hr urine collection (best practice)	NOTE: Collect urine in a collection container with acid (conc. HCl). Transport sample on ice.
Oxcarbazepine (Trileptal)	5 ml EDTA (purple top) blood	
Pandemic influenza A(H1N1) PCR	Respiratory tract sample in viral transport medium (VTM)	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Paraneoplastic Antibodies	5 ml clotted (red or yellow top) blood	
Parasites Microscopy	Random stool sample, random urine sample, fluid aspirate OR tissue sample in a universal container	
Parathyroid hormone (PTH) (intact)	5 ml EDTA (purple top) blood	NOTE: Deliver sample to the laboratory on ice. For transport separate plasma and send on frozen on dry ice.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Parentage Testing (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Partial thromboplastin time (PTT)	5 ml sodium citrate (blue top) blood	NOTE: Samples must reach the laboratory within 6 hrs of collection or frozen plasma must be sent on dry ice.
Parvovirus B19 IgG	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Parvovirus B19 IgM	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Parvovirus B19 PCR	5 ml EDTA (purple top) blood OR biopsy material from an amniocentesis or cordocentesis in a universal container	NOTE: Biopsy material must be sent in normal saline (never in formalin). Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Paul-Bunnell Screen (EBV Monospot)	5 ml clotted (red or yellow top) blood	
PCR for B-cell immunoglobulin gene rearrangement (IgH)	5 ml blood, bone marrow aspirate, CSF, pleural or ascitic fluid in an EDTA (purple top) collection tube OR unstained peripheral blood or bone marrow slides	Refrigerate blood and bone marrow if kept overnight. Transport slides at room temperature.
PCR for T-cell gene rearrangement	5 ml blood, bone marrow aspirate, CSF, pleural or ascitic fluid in an EDTA (purple top) collection tube OR unstained peripheral blood or bone marrow slides	Refrigerate blood and bone marrow if kept overnight. Transport slides at room temperature.
PCR: t(11;14) CCND1/IGH@	5 ml EDTA (purple top) blood	
PCR: t(14;18) IGH@/BCL2	5 ml EDTA (purple top) blood	
Pethidine (screening or confirmation)	25 ml random urine in a universal container	

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
pH	5 ml urine, body fluids or stool	NOTE: Performed with dipstix.
Phenobarbital (Gardenal)	5 ml clotted (red or yellow top) blood	NOTE: Trough sample recommended. Separate serum from cells within 2 hrs of collection. For transport < 48 hrs send on ice; otherwise if delayed > 48 hrs send frozen on dry ice.
Phenylcyclidine (PCP) (qualitative)	25 ml random urine in a universal container	For transport send fresh urine on ice.
Phenytoin (Epanutin)	5 ml clotted (red or yellow top) blood	NOTE: A trough level (just before the next dose) is used to assess adequate therapy. A peak level (4–5 hrs after dose and delayed up to 8 hrs if taken with food) is used to assess toxicity.
Phosphate (serum)	5 ml clotted (red or yellow top) blood	
Phosphate (urine)	Random (2nd morning void) or timed urine	NOTE: Collect urine in container with HCl (pH < 3). For tubular reabsorption of phosphate: a simultaneous clotted (red or yellow top) blood sample is required.
Phosphatidyl glycerol (amniotic fluid)	15 ml amniotic fluid in a collection tube without additives	NOTE: Avoid contamination with blood and meconium during sampling.
Platelet count	5 ml EDTA (purple top) blood	NOTE: Sample must reach the laboratory within 24 hrs of collection.
Platelet function tests	5 x 5 ml sodium citrate (blue top) blood	NOTE: Test must be arranged with the referral laboratory before sample collection. Do not transport samples on ice.
Pneumocystis jirovecii (PCP) antigen detection (IFA)	Induced sputum or bronchoalveolar (BAL) washings in a firmly closed screw-top universal container	
POLG (Alpers Syndrome) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Polio Types 1 - 3 neutralising antibody titres	5 ml clotted (red or yellow top) blood	NOTE: Two samples taken 14 days apart is needed for meaningful interpretation.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Porphobilinogen	25 ml random urine in a universal container	NOTE: Protect samples from light during collection and transport. See Section 17.2.8 for detailed instructions.
Porphyria (plasma emission spectra)	5 ml EDTA (purple top) blood	NOTE: Protect samples from light during collection and transport. See Section 17.2.8 for detailed instructions.
Porphyria Cutanea Tarda (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Porphyria screen (total porphyrins: acute or chronic)	5 ml EDTA (purple top) blood; 25 ml early morning urine sample in a universal container AND fresh random stool sample in a universal container	NOTE: Protect samples from light during collection and transport. See Section 17.2.8 for detailed instructions.
Porphyria Variegata (PPOX R59W) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Porphyrins (fractionation)	5 ml EDTA (purple top) blood; 25 ml early morning urine sample in a universal container AND fresh random stool sample in a universal container	NOTE: Protect samples from light during collection and transport. See Section 17.2.8 for detailed instructions.
Potassium (serum)	5 ml clotted (red or yellow top) blood	NOTE: Avoid haemolysis during venesection.
Potassium (stool)	Watery stool sample in a universal container	
Potassium (urine)	Random or timed urine	
Prader-Willi / Angelman Syndrome Methylation Study (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Pre-albumin	5 ml clotted (red or yellow top) blood	Transport sample at room temperature.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Primary Hyperoxaluria Type 1 (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Primary Immune-deficiency testing	Please contact the referral laboratory for tube type	NOTE: Please arrange the test with the referral laboratory before sample collection.
Pro-BNP (NT)	Contact laboratory for tube type	NOTE: Avoid haemolysis during venesection. Deliver sample immediately to the laboratory on ice. For transport separate serum and send on ice.
Procalcitonin (PCT)	5 ml clotted (red or yellow top) blood	For transport separate serum and send frozen on dry ice.
Progesterone	5 ml clotted (red or yellow top) blood	For transport separate serum and send on ice.
Prolactin	5 ml clotted (red or yellow top) blood	NOTE: See Section 17.2.6 for detailed instructions and precautions. For transport separate serum and send on ice.
Prostatic specific antigen (free) (ratio)	5 ml clotted (red or yellow top) blood	For transport separate serum and send frozen on dry ice.
Prostatic specific antigen (PSA) (total)	5 ml clotted (red or yellow top) blood	For transport separate serum and send frozen on dry ice.
Protein (total) (CSF)	0.5 ml CSF in a (clear top) collection tube without additives	
Protein (total) (fluid)	5 ml fluid in a (clear top) collection tube without additives	
Protein (total) (serum)	5 ml clotted (red or yellow top) blood	
Protein (total) (urine)	Random or timed urine	

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Protein C	5 ml sodium citrate (blue top) blood on ice	NOTE: Please provide full clinical history. Samples must reach the laboratory within 6 hrs of collection or frozen plasma must be sent on dry ice.
Protein electrophoresis (Bence-Jones protein) (urine)	Timed or random (50 ml) urine collection	NOTE: No preservative required. Immunofixation is done on all newly detected paraproteins.
Protein electrophoresis (serum)	5 ml clotted (red or yellow top) blood	NOTE: Immunofixation is done on all newly detected paraproteins.
Protein S	5 ml sodium citrate (blue top) blood on ice	NOTE: Please provide full clinical history. Samples must reach the laboratory within 6 hrs of collection or frozen plasma must be sent on dry ice.
Prothrombin (DNA analysis)	5 ml EDTA (purple top) blood	
Prothrombin time (PT)	5 ml sodium citrate (blue top) blood	NOTE: Sample must reach the laboratory within 24 hrs of collection.
Pseudoxanthoma Elasticum (ABCC6) (Afrikaner) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Public Health testing	Various samples	Please see Section 22 for sampling guidelines for Public Health testing. The nearest Public Health Laboratory can also be contacted for further assistance.
Pus for MC&S	Pus swab or aspirate in a universal container	NOTE: Pus aspirate is the preferred specimen. Please indicate the site of the pus collection as selective media may be required.
Pyruvate (blood)	Contact your laboratory for tube type	NOTE: Samples must be delivered to the laboratory on ice within 15 min of collection. Perchloric acid precipitation should be performed immediately. Arrange test with the referral laboratory before sample collection.
Pyruvate (CSF)	Contact the referral laboratory	NOTE: Contact the referral laboratory before sample collection.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Pyruvate Carboxylase (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Pyruvate kinase enzyme activity (haemolytic anaemia)	Minimum 2 ml EDTA (purple top) or heparinised (green top) blood	NOTE: At least 2 healthy control samples must be taken simultaneously. Send samples on ice. Arrange test with the referral laboratory before sample collection.
QF-PCR: Aneuploidy (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
QR-PCR: Inversion 16 CBFB AML (Quantitative RNA test)	5 ml EDTA (purple top) blood OR Bone Marrow	All specimens for RNA-based testing should reach the laboratory within 24 hrs of collection. However, as methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
QR-PCR: t(1;19) TCF3/PBX1 (E2A/PBX1) ALL (Quantitative RNA test)	5 ml EDTA (purple top) blood OR Bone Marrow	All specimens for RNA-based testing should reach the laboratory within 24 hrs of collection. However, as methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
QR-PCR: t(12;21) ETV6/RUNX1 (TEL/AML1) ALL (Quantitative RNA test)	5 ml EDTA (purple top) blood OR Bone Marrow	All specimens for RNA-based testing should reach the laboratory within 24 hrs of collection. However, as methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
QR-PCR: t(15;17) PML/RARA APL (Quantitative RNA test)	5 ml EDTA (purple top) blood OR Bone Marrow	All specimens for RNA-based testing should reach the laboratory within 24 hours of collection. However, as methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
QR-PCR: t(8;21) RUNX1/AML1T1 (AML1/ETO) AML (Quantitative RNA test)	5 ml EDTA (purple top) blood OR Bone Marrow	All specimens for RNA-based testing should reach the laboratory within 24 hrs of collection. However, as methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
QR-PCR: t(9;22) BCR/ABL1 mbcr ALL (Quantitative RNA test)	5 ml EDTA (purple top) blood OR Bone Marrow	All specimens for RNA-based testing should reach the laboratory within 24 hrs of collection. However, as methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
QR-PCR: t(9;22) BCR/ABL1 Mbcr CML (Quantitative RNA test)	5 ml EDTA (purple top) blood OR Bone Marrow	All specimens for RNA-based testing should reach the laboratory within 24 hours of collection. However, as methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
QR-PCR: t(9;22) BCR/ABL1 p230 CML (Quantitative RNA test)	5 ml EDTA (purple top) blood OR Bone Marrow	All specimens for RNA-based testing should reach the laboratory within 24 hrs of collection. However, as methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Quinine	2 x 4 ml EDTA (purple top) blood in foil.	NOTE: Samples must be wrapped in foil and delivered to the laboratory immediately after collection for separation of plasma from cells.
Rabies (suspected)	Please see the Rabies: Ante-mortem & Post-mortem Specimen Collection Guide in Section 23.6 on page 198	NOTE: Please see Section 23.6.1 for specific guidelines on this notifiable condition.
Rectal Biopsy	Biopsy material in 10% formalin (for histology) OR normal saline (for MCS) in a universal container	NOTE: Samples must be kept at 2–8 °C. Please state clearly which transport medium was used on the specimen container.
Rectal swab for MC&S	Rectal swab in transport medium	NOTE: Swab must be placed in transport medium and taken to the laboratory immediately after collection.
Red cell membrane studies (hereditary red cell membrane disorders)	2 x 6 ml ACD solution B (light yellow) blood from patient AND 1 ACD solution B (yellow top) tube blood from healthy control	NOTE: Test must be arranged with referral laboratory before sample collection. Results from FBC and reticulocyte count, haemolytic markers, Coombs test, Hb electrophoresis, osmotic fragility, cryohaemolysis etc. must be available in advance.
Reducing substances (Benedict's screening test) (stool)	Random stool sample in a universal container	NOTE: Minimum 5 ml sample required. Deliver sample to the laboratory on ice. A positive Benedict's test is followed, in some centres, by thin-layer chromatography to identify specific sugars. For transport send frozen on dry ice.
Reducing substances (Benedict's screening test) (urine)	25 ml random urine in a universal container	NOTE: Minimum 5 ml sample required. Deliver sample to the laboratory on ice. A positive Benedict's test is followed, in some centres, by thin-layer chromatography to identify specific sugars. For transport send frozen on dry ice.
Related living donor (RLD) flow crossmatch	Donor: 2 x 5 ml ACD solution B (light yellow top) blood AND 2 x 5 ml clotted (red or yellow top) blood; Recipient: 2 x 5 ml ACD solution B (light yellow top) blood AND 2 x 5 ml clotted (red or yellow top) blood	NOTE: Test must be arranged with the referral laboratory before sample collection. Samples must be stored and transported at room temperature and must reach the laboratory within 24 hrs of collection.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Renal Biopsy	Fresh tissue on ice	NOTE: Prior notification is required, then contact laboratory 5–10 min in advance for specimen collection.
Renin (active) (mass)	5 ml EDTA (purple top) blood	NOTE: Do NOT refrigerate sample. See Section 17.2.3 for detailed instructions and precautions.
Respiratory syncytial virus (RSV) EIA Rapid	Respiratory tract sample in viral transport medium (VTM)	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Respiratory virus isolation (culture)	Respiratory tract sample in viral transport medium (VTM)	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed. The following viruses are included in the panel: CMV, RSV, Adenovirus, Influenza A & B, Parainfluenza virus types 1–3 and Human Metapneumovirus.
Respiratory virus panel PCR	Respiratory tract sample in viral transport medium (VTM)	NOTE: Specific panel members depend on the assay used by the different referral laboratories. Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Reticulocyte count	5 ml EDTA (purple top) blood	NOTE: Sample must reach the laboratory within 4 hrs of collection.
Rett Syndrome (MECP2) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Rheumatoid factor	5 ml clotted (red or yellow top) blood	
Rickettsia conori (tick-bite fever) Antibodies (IFA)	5 ml clotted (red or yellow top) blood	
Rotavirus antigen Rapid	1–2g fresh stool sample in a universal container	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
RT-PCR: t(1;19) TCF3/PBX1 (E2A/PBX1) (Qualitative RNA test)	5 ml EDTA (purple top) blood OR Bone Marrow	All specimens for RNA-based testing should reach the laboratory within 24 hrs of collection. However, as methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
RT-PCR: t(15;17) PML/RARA APL (Qualitative RNA test)	5 ml EDTA (purple top) blood OR Bone Marrow	All specimens for RNA-based testing should reach the laboratory within 24 hrs of collection. However, as methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
RT-PCR: t(4;11) MLL/AF4 (Qualitative RNA test)	5 ml EDTA (purple top) blood OR Bone Marrow	All specimens for RNA-based testing should reach the laboratory within 24 hrs of collection. However, as methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
RT-PCR: t(9;22) BCR/ABL1 p190 (Qualitative RNA test)	5 ml EDTA (purple top) blood OR Bone Marrow	All specimens for RNA-based testing should reach the laboratory within 24 hrs of collection. However, as methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
RT-PCR: t(9;22) BCR/ABL1 p210 (Qualitative RNA test)	5 ml EDTA (purple top) blood OR Bone Marrow	All specimens for RNA-based testing should reach the laboratory within 24 hrs of collection. However, as methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
RT-PCR: t(9;22) BCR/ABL1 p230 (Qualitative RNA test)	5 ml EDTA (purple top) blood OR Bone Marrow	All specimens for RNA-based testing should reach the laboratory within 24 hrs of collection. However, as methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
Rubella IgG	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Rubella IgG avidity index	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Only done if both Rubella IgG and IgM are positive.
Rubella IgM	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Rubella PCR	5 ml EDTA (purple top) blood; respiratory tract sample in viral transport medium (VTM); random urine sample OR biopsy material from an amniocentesis or cordocentesis in a universal container	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Ryanodine receptor for AR centronuclear myopa (RYR1) (common mutations) DNA analysis	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
S100B protein	5 ml clotted (red or yellow top) blood	
Salicylate (Aspirin)	5 ml clotted (red or yellow top) blood	
Salmonella and Shigella Culture	8–10 ml blood in a blood culture bottle; 5 ml random urine sample; random stool sample OR rectal swab in a universal container	

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Selenium (serum)	5 ml blood in a trace metal (royal blue top, additive free) tube	
Selenium (urine)	25 ml random urine in a universal container	
Seq CML: t(9;22) BCR/ABL1 Mbc (RNA test)		All specimens for RNA-based testing should reach the laboratory within 24 hrs of collection. However, as methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
Seq GIST: KIT and PDGFRA (DNA analysis)	FFPE tissue block OR 5–10 sections AND an H&E slide with the tumour area ringed	NOTE: If sections are sent on slides please use normal glass slides. Please ring tumour area on H&E slide so that only tumour tissue is dissected for DNA extraction.
Serotonin	Contact laboratory for tube type	For transport separate serum/plasma and send on ice.
Sex hormone binding globulin (SHBG)	5 ml clotted (red or yellow top) blood	NOTE: Used to determine free androgen index (see testosterone). For transport < 72 hrs separate serum and send on ice; otherwise if delayed > 72 hrs separate serum and send frozen on dry ice.
Sexing / Y chromosome marker (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Sickle Cell Anaemia (DNA analysis)	5 ml EDTA (purple top) blood OR 5 ml amniotic fluid in a universal container	NOTE: Genetic testing for sickle cell anaemia is usually performed as part of a prenatal investigation. HPLC is the appropriate first line investigation for haemoglobinopathies.
Sickling test (sickle cell anaemia)	5 ml EDTA (purple top) blood	
Sirolimus (Rapamune)	2 x 5 ml EDTA (purple top) blood	
Sodium (serum)	5 ml clotted (red or yellow top) blood	

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Sodium (stool)	Watery stool sample in a universal container	
Sodium (urine)	Random or timed urine	
Soluble transferrin receptor	5 ml clotted (red or yellow top) blood	For transport separate serum and send on ice.
Specific gravity	25 ml random urine in a universal container	NOTE: Deliver sample to the laboratory on ice within 4 hrs of collection. Performed with dipstix.
Spinal Muscular Atrophy (MLPA) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Spinal Muscular Atrophy (SMN1 exon 7 deletion) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Spinocerebellar Ataxias (SCA1, 2, 3, 6, 7, 12, 17) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Sputum for MC&S	Fresh sputum sample in a universal container	NOTE: Please refer to Section 19.6.1 for guidelines on sputum sample collection. Please submit separate specimens if GeneXpert or PCP antigen detection is requested additionally.
SQRT-PCR: t(15;17) PML/RARA APL (Semi-quantitative RNA test)	5 ml EDTA (purple top) blood OR Bone Marrow	All specimens for RNA-based testing should reach the laboratory within 24 hrs of collection. However, as methodologies and sample requirements differ between the laboratories nationally, the specific testing laboratory should be contacted for information regarding the correct sample type, volume, sample container/tube and transport conditions.
Squamous cell cancer antigen	5 ml clotted (red or yellow top) blood	

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Stargardt Disease (ABCA4) (Afrikaner) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Steatocrit	Random stool sample in a universal container	NOTE: Minimum 10 g of stool required.
Steroid profile	Preferably a 24 hr urine collection (Contact referral laboratory for further information if required)	NOTE: Please list on request form current hormonal therapy; state whether the patient is pregnant or significantly obese; and where possible the phase of menstrual cycle (if applicable).
Steroid-resistant Nephrotic syndrome (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Stool Culture	Random stool sample in a universal container	NOTE: Routine culture includes salmonella and shigella. Culture for <i>Vibrio cholerae</i> , enterohaemorrhagic <i>E. coli</i> and any other stool pathogen is only performed on specific request and depending on patient demographics.
Stool Microscopy	Random stool sample in a universal container	NOTE: If a concentration is required to look for specific parasites, please indicate clearly on request form. Please indicate if patient is HIV-positive or has a travel history.
Subtelomeric deletions / duplications (MLPA) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Succinylacetone (tyrosinaemia type 1)	25 ml random urine in a universal container	NOTE: Collect urine in a container with HCl (pH < 2).
Sucrose lysis test	10 ml heparinised (green top) blood	NOTE: Test must be arranged with the referral laboratory before sample collection.
Sulfonylureas	2 x 5 ml EDTA (purple top) blood	NOTE: Test requires 10 ml blood (2 x 5 ml tubes). Separate plasma and transport on ice wrapped in foil.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Sweat test	Pre-arrange with laboratory where available	
Syphilis serology	5 ml clotted (red or yellow top) blood	NOTE: Please contact the laboratory to determine if the traditional or reverse screening algorithm is followed.
Syphilis: Fluorescent treponemal antibody (FTA) IgG test	5 ml clotted (red or yellow top) blood OR 1 ml CSF in a (clear top) collection tube without additives	
Syphilis: Fluorescent treponemal antibody (FTA) IgM test	5 ml clotted (red or yellow top) blood OR 1 ml CSF in a (clear top) collection tube without additives	
Syphilis: Rapid plasma reagin (RPR)	5 ml clotted (red or yellow top) blood	
Syphilis: Treponemal pallidum haemagglutination (TPHA) test	5 ml clotted (red or yellow top) blood	
Syphilis: Venereal disease research laboratory (VDRL) test	1 ml CSF in a (clear top) collection tube without additives	NOTE: VDRL is the recommended non-treponemal serological test for CSF specimens.
T3 (Tri-iodothyronine) (free)	5 ml clotted (red or yellow top) blood	
T4 (Thyroxine) (free)	5 ml clotted (red or yellow top) blood	
Tacrolimus (FK506)	5 ml EDTA (purple top) blood	
Tay Sachs Disease (Ashkenazi Jewish) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
TB (tuberculosis): Culture, Identification (PCR) & Sensitivity	5–10 ml blood or bone marrow aspirate in BACTEC Myco F-Lytic bottle; 2 ml CSF in a (clear top) collection tube without additives; FNA (rinse FNA residue in needle in TB transport medium or sterile saline); fresh sputum sample, 10–15 ml fluid aspirate, fresh stool sample, tissue sample from potentially infected site OR first morning midstream urine sample in a universal container	NOTE: TB transport medium can be collected from the laboratory if available.
TB (tuberculosis): GeneXpert MTB	Sputum sample in a universal container OR FNA (rinse FNA residue in needle in TB transport medium or sterile saline)	NOTE: Please refer to Section 19.6.1 for guidelines on specimen collection. TB transport medium can be collected from the laboratory if available.
TB (tuberculosis): Microscopy (Direct)	Fresh sputum sample in a universal container	
Testosterone (free)	5 ml clotted (red or yellow top) blood	NOTE: Can be used to calculate the free androgen index: testosterone/SHBG ratio
Theophylline	5 ml clotted (red or yellow top) blood	NOTE: Oral treatment: peak level – 2 hrs after rapid release preparation or 4 hrs after slow release preparation. IV treatment: collect specimen 30 min after completion of IV dose. Separate serum from cells within 2 hrs of collection. For transport < 48 hrs send on ice; otherwise if delayed > 48 hrs send frozen on dry ice.
Throat and nose swab for MC&S	Throat or nose swab in suitable transport medium	NOTE: Please refer to Section 19.6.2.5.1 for specific instructions regarding testing for gonococcal pharyngitis.
Thrombin Time	5 ml sodium citrate (blue top) blood	NOTE: Samples must reach the laboratory within 6 hrs of collection or frozen plasma must be sent on dry ice.
Thymidine Kinase 2 (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Thyroglobulin	5 ml clotted (red or yellow top) blood	NOTE: Anti-thyroglobulin antibodies assayed concomitantly to assess for potential assay interference. For transport < 72 hrs separate serum and send on ice; otherwise if delayed > 72 hrs separate serum and send frozen on dry ice.
Thyroglobulin Antibodies	5 ml clotted (red or yellow top) blood	For transport < 72 hrs separate serum and send on ice; otherwise if delayed > 72 hrs separate serum and send frozen on dry ice.
Thyroid Cancer ( <i>BRAF</i> ) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Thyroid stimulating hormone (TSH)	5 ml clotted (red or yellow top) blood	For transport separate serum and send on ice.
Thyroid stimulating hormone (TSH) receptor Antibodies	5 ml clotted (red or yellow top) blood	For transport < 48 hrs separate serum and send on ice; otherwise if delayed > 48 hrs send frozen on dry ice.
Tissue sample for MC&S	Tissue sample in a universal container	NOTE: A small piece of tissue from the infected site should be submitted in normal saline. Do not send the whole surgical specimen. Please indicate on the request form if unusual or fastidious organisms are suspected.
Tobramycin	5 ml clotted (red or yellow top) blood	
Total light chains	5 ml clotted (red or yellow top) blood	
Toxocara canis serology	5 ml clotted (red or yellow top) blood	
Toxoplasma gondii IgG	5 ml clotted (red or yellow top) blood	
Toxoplasma gondii IgM	5 ml clotted (red or yellow top) blood	
Toxoplasma gondii PCR	1 ml CSF in a (clear top) collection tube without additives; 1 ml eye fluid, 3 ml fluid aspirate OR amniotic fluid in a universal container	NOTE: Samples must be transported at 4 °C.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
TPMT (Thiopurine S-Methyltransferase) genotyping (TPMT*3A AND TPMT*3C) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Tracheal aspirate for MC&S	Tracheal aspirate in a universal container	
Transferrin	5 ml clotted (red or yellow top) blood	NOTE: For transferrin % saturation request iron and transferrin.
Tricyclic antidepressants (serum)	Contact laboratory for tube type	
Tricyclic antidepressants (urine) (screen)	25 ml random urine sample in a universal container	
Triglyceride	5 ml clotted (red or yellow top) blood	NOTE: Fasting for 8–12 hrs is required.
Troponin I	Contact laboratory for tube type	Separate serum (ensure clotting complete) or plasma from cells within 2 hr of collection. For transport < 24 hrs send on ice; otherwise if delayed > 24 hrs send frozen on dry ice.
Troponin T	Contact laboratory for tube type	For transport separate plasma and send frozen on dry ice.
Trypanosomes	5 ml EDTA (purple top) blood	NOTE: In all patients who test positive for African trypanosomiasis, a CSF sample must be submitted to exclude CNS involvement.
Trypsin	Random stool sample in a universal container	NOTE: Fresh random stool sample required. Send sample at room temperature (do not refrigerate).
Tryptase (mast cell)	5 ml clotted (red or yellow top) blood	Recommended procedure for possible allergic reactions: 3 serial Tryptase tests: 1st sample at 1–2 hrs post event, then 2–3 hrs later and a baseline sample > 14 hrs post event.
Typhoid fever serology (Widal)	5 ml clotted (red or yellow top) blood	NOTE: The diagnosis of typhoid fever is best made by culture of blood, bone marrow, stool or urine. Serological tests are imprecise and difficult to interpret.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Uniparental Disomy 14 (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Urea (serum)	5 ml clotted (red or yellow top) blood	
Urea (urine)	Random or timed urine	
Uric acid (serum)	5 ml clotted (red or yellow top) blood	
Uric acid (urine)	Random or timed urine	NOTE: Urine sample must be alkalised with 1 M NaOH (urine pH > 7).
Urinalysis (dipstix)	25 ml random urine in a universal container	NOTE: Deliver sample immediately to the laboratory on ice.
Urine Culture	Midstream urine sample in a universal container	NOTE: Transport specimen at 2–4 °C. Specimen must be refrigerated if transport to the laboratory is delayed. Please indicate how sample was taken as this does affect specimen processing. Requests for parasites or casts must be clearly stated on the request form.
Urine Microscopy	Midstream urine sample in a universal container	NOTE: Collect a midstream specimen from a properly prepared patient. For patients who are catheterised, collect urine from port above the clamped catheter and not from the drainage bag.
Urobilinogen (qualitative)	25 ml random urine in a universal container	NOTE: Deliver sample immediately to the laboratory on ice. Performed with dipstix.
Uronic acid/creatinine ratio (mucopolysaccharidosis screening)	25 ml random urine in a universal container	NOTE: Sample must reach the laboratory within 24 hrs of collection.
Vaccination studies: <i>Bordetella pertussis</i> Antibodies	5 ml clotted (red or yellow top) blood	
Vaccination studies: <i>Clostridium tetani</i> Antibodies	5 ml clotted (red or yellow top) blood	

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NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Vaccination studies: <i>Corynebacterium diphtheriae</i> Antibodies	5 ml clotted (red or yellow top) blood	
Vaccination studies: <i>Haemophilus influenzae</i> Antibodies	5 ml clotted (red or yellow top) blood	
Vaccination Studies: <i>Streptococcus pneumoniae</i> Antibodies	5 ml clotted (red or yellow top) blood	
Valproate, sodium (Convulex or Epilim)	5 ml clotted (red or yellow top) blood	NOTE: Draw trough level just before next dose. State time of last dose on the request form.
Vancomycin	5 ml clotted (red or yellow top) blood	NOTE: Trough levels to be collected 30 min prior to next dose. Please state the time of last dose on the request form.
Vanillyl mandelic acid (VMA) (quantitative)	24 hr acidified urine collection	NOTE: Collect urine in a container with concentrated HCl (urine pH < 3). Restrict caffeine and nicotine 2 days before and during urine collection. See Section 17.2.4 for detailed instructions and precautions.
Varicella zoster virus (VZV) EM	Lesion fluid (between two glass slides)	NOTE: On special request only—contact the referral laboratory (Tshwane Academic) prior to sample collection. Test cannot distinguish between HSV & VZV.
Varicella zoster virus (VZV) IgG	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Varicella zoster virus (VZV) IgM	5 ml clotted (red or yellow top) OR EDTA (purple top) blood	NOTE: Sample should be separated within 48 hrs of collection.
Varicella zoster virus (VZV) isolation (culture)	Vesicle fluid in viral transport medium	NOTE: Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Varicella zoster virus (VZV) PCR	1 ml CSF in a (clear top) collection tube without additives; tissue biopsy material, fluid aspirate or vesicle fluid in a universal container	NOTE: Biopsy material must be sent in normal saline (never in formalin). Vesicle fluid must preferably be sent in viral transport medium (VTM). Transport the specimen at 4 °C. Refrigerate specimen if transport is delayed.
Very long chain fatty acids	Contact laboratory for tube type	NOTE: Deliver sample immediately to the laboratory on ice. Separate serum/plasma immediately and send frozen on dry ice.
Viral haemorrhagic fever (VHF suspected)	Specimens depend on specific VHF virus suspected. Specialist consultation needed.	NOTE: Please see Section 23.6.2 for specific guidelines on this notifiable condition.
Virtual crossmatch	None	NOTE: Test must be arranged with the referral laboratory. Donor HLA type must be supplied to the laboratory.
Virus Isolation	Respiratory tract sample in viral transport medium (VTM); random urine sample OR tissue biopsy material in a universal container	NOTE: Please specify virus to be isolated on the request form. Transport specimen to the laboratory at 4 °C. Refrigerate specimen if transport is delayed.
Vitamin A	5 ml clotted (red or yellow top) blood	NOTE: Cover sample with foil to protect from light.
Vitamin B1 (thiamine)	5 ml EDTA (purple top) blood	NOTE: Cover sample with foil to protect from light.
Vitamin B12	5 ml clotted (red or yellow top) blood	
Vitamin D (1,25-dihydroxy) (calcitriol)	5 ml clotted (red top) blood	NOTE: Collection tubes without gel is preferred.
Vitamin D (25-hydroxy) (D2, D3 and total)	5 ml clotted (red top) OR EDTA (purple top) blood	NOTE: Collection tubes without gel is preferred.
Vitamin E (α-tocopherol)	5 ml clotted (red or yellow top) blood	NOTE: Cover sample with foil to protect from light.
Von Willebrand Factor activity	5 ml sodium citrate (blue top) blood	NOTE: Please arrange the test with the referral laboratory before sample collection.
Von Willebrand Factor antigen	5 ml sodium citrate (blue top) blood	NOTE: Please arrange the test with the referral laboratory before sample collection.

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NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Warfarin levels	5 ml clotted (red or yellow top) blood	
Weil-Felix agglutination test	5 ml clotted (red or yellow top) blood	NOTE: Non-specific test for detection of antibodies against several different rickettsiae. Can also test positive in non-rickettsial diseases.
White cell count	5 ml EDTA (purple top) blood	NOTE: Sample must be tested within 24 hrs after collection.
Worm and Tapeworm identification	Worm or proglottid in a universal container	NOTE: Please submit proglottids in normal saline.
XALD (X-linked adrenoleukodystrophy) (ABCD1) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Xanthochromia index	5 ml clotted (red top) blood AND 1.5 ml CSF in a red top tube	NOTE: CSF not to be sampled until at least 12 hrs after possible haemorrhage. Minimum of 1.5 ml CSF required. Protect samples from light and deliver to the laboratory immediately after collection.
X-linked mental retardation screen (non-syndromic) (MLPA) (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
Xylose absorption test 25 g (urine and plasma)	5 ml blood in a fluoride (grey top) tube AND 5 hr timed urine in a dark (amber) bottle	NOTE: Adults: 25 g xylose in 250 ml water orally. Children: 0.5 g/kg (max 25 g). Collect urine for 5 hrs after xylose load and draw blood fasting and at 2 hrs in adults and fasting and at 1 hr in children. Avoid haemolysis during venesection. See Section 17.2.11 for detailed instructions.
Xylose absorption test 5 g (plasma)	5 ml blood in a fluoride (grey top) tube	NOTE: 5 g xylose in 250 ml water orally. Obtain patient length and mass and draw blood fasting and at 1 hr after load. Avoid haemolysis during venesection. See Section 17.2.11 for detailed instructions.
Y-Chromosome Microdeletion (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
Yersinia enterocolitica serology	5 ml clotted (red or yellow top) blood	
Yersinia pseudotuberculosis serology	5 ml clotted (red or yellow top) blood	
Zinc (serum)	5 ml blood in a trace metal (royal blue top, additive free) tube	NOTE: Avoid haemolysis during venesection.
Zinc (urine)	24 hr urine collection	NOTE: No preservative required.
$\alpha$ -1-antitrypsin clearance	Timed (24 hr) stool collected into a pre-weighed container AND 5 ml clotted (red or yellow top) blood	NOTE: Clotted blood sample to be taken during stool collection. See Section 17.2.9 for detailed instructions.
$\alpha$ -1-antitrypsin	5 ml clotted (red or yellow top) blood	
$\alpha$ -1-antitrypsin Deficiency ( <i>Serpina1</i> ) (DNA analysis)	5ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
$\alpha$ -1-iduronidase enzyme activity (Hurler's disease)	Adult: 12–15 ml ACD solution B (light yellow top) tube blood (3 tubes); Children: 5 ml ACD solution B (light yellow top) tube (1 full tube)	
$\alpha$ -foetoprotein (amniotic fluid)	5 ml amniotic fluid in a (clear top) collection tube without additives	
$\alpha$ -foetoprotein (serum)	5 ml clotted (red or yellow top) blood	
$\alpha$ -galactosidase enzyme activity (Fabry's disease)	10 ml clotted blood in red top (no gel) tube	
$\alpha$ -Thalassaemia (DNA analysis)	5ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.

NAME	SPECIMEN TYPE	SPECIAL INSTRUCTIONS
$\alpha$ -Thalassaemia Mental Retardation Syndrome (DNA analysis)	5ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.
$\beta$ -2 microglobulin (serum)	5 ml clotted (red or yellow top) blood	For transport < 72 hrs separate serum and send on ice. If transport delayed > 72 hrs separate serum and send frozen on dry ice.
$\beta$ -2 microglobulin (urine)	25 ml random urine in a universal container	NOTE: If sample pH < 6, add 1 M NaOH to adjust to pH 7–9 and send fresh. Freezing not recommended.
$\beta$ -2 transferrin (CSF)	Fluid in a (clear top) collection tube without additives	NOTE: Preferably collect 1 ml of fluid in question from ear/nose.
$\beta$ -D Glucan	5 ml clotted (red or yellow top) blood	NOTE: Samples must be kept at 2–8 °C.
$\beta$ -galactocerebrosidase enzyme activity (Krabbe's disease)	Adult: 12–15 ml ACD solution B (light yellow top) tube blood (3 tubes); Children: 5 ml ACD solution B (light yellow top) tube (1 full tube)	
$\beta$ -glucocerebrosidase enzyme activity (Gaucher's disease)	Adult: 12–15 ml ACD solution B (light yellow top) tube blood (3 tubes); Children: 5 ml ACD solution B (light yellow top) tube (1 full tube)	
$\beta$ -human chorionic gonadotrophin (serum) (quantitative)	5 ml clotted (red or yellow top) blood	For transport < 72 hrs separate serum and send on ice. If transport delayed > 72 hrs separate serum and send frozen on dry ice.
$\beta$ -human chorionic gonadotrophin (urine) (qualitative)	5 ml random urine in a universal container	
$\beta$ -Thalassaemia (DNA analysis)	5 ml EDTA (purple top) blood	DNA may be extracted from various specimen types, depending on the test, the patient and reason for testing. See Section 24 for additional information.



# **SECTIONS 26.0 – 29.0**

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## **27.0 RESULTS**

## **28.0 TIME LIMITS FOR REQUESTING ADDITIONAL TESTS**

## **29.0 REFERRAL OF SPECIMEN**

## 27.0 RESULTS

There are a number of mechanisms for a health facility to receive laboratory results.

The routine system employed includes printed laboratory reports delivered directly to the by the NHLS courier. The NHLS courier will deliver a sealed envelope with laboratory reports for your health facility. Please open the envelope and ensure that all the laboratory reports are for your health facility. Return any laboratory reports that are not for your health facility to the courier. Where applicable, sign the worksheet that was provided by the courier to confirm receipt of the laboratory reports.

Should you require assistance to interpret any results, please contact your local Laboratory Manager.

Results are available at <https://labresults.nhls.ac.za>. A login name and password is required for this service and application forms are available on request.

## 28.0 TIME LIMITS FOR REQUESTING ADDITIONAL TESTS

Additional tests can (if certain conditions are met) be requested after a specimen has been sent to the laboratory. The majority of the tests can only be done once, when originally requested. Should additional testing be needed on a specimen previously submitted to a laboratory, call the laboratory to determine whether or not the additional tests can be performed.

## 29.0 REFERRAL OF SPECIMENS

A list of tests offered in NHLS laboratories is found in Table 5 on page 239. In rare cases where the NHLS cannot offer the tests requested, these will be sent to a referral laboratory. In order to ensure that good quality results are provided to the clients, the selection of the referral laboratory will be done according to the NHLS procedure number GPQ0054, performance of these laboratories is regularly reviewed.

## References

1. ISO 15189
2. NHLS Quality Manual
3. NHLS Dried Blood Spots Specimen Collection and Transport
4. Other NHLS handbooks available on Q Pulse
5. NHLS Guidelines on Poliovirus specimens

## Acknowledgements

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## Changes to the Handbook

- This document will be printed once a year if needed or possible.
- The document will be reviewed at least once a year according to Procedure number GPQ0003.
- Should there be no changes then printing will not be done.
- In cases where there are changes to the document in between prints, this will be done on Q Pulse and the laboratories will be notified of the changes.
- The laboratories will inform the clients of the changes and keep record of this until the next printing is done.

