

LABORATORY USERS' MANUAL:
DEPARTMENT OF
MICROBIOLOGY

Oxford University Hospitals NHS Foundation Trust

Aims and remit of this document:

- This document aims to provide users with clear instructions for how to use microbiology services within Oxford University Hospitals NHS Trust.
- The document is structured to reflect the flow of a sample, from the point-of-care through to provision of results and clinical advice.

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REVISION HISTORY			
Version	Description of Change	Author	Effective Date
4.1	Reformat / Rewrite / Update	KJ & PM	09/08/2016
4.1	Removal of non-functioning WebLinks	KJ & PM	09/08/2016
4.1	Addition of Zika testing	KJ & PM	09/08/2016
4.2	Clinical Document Review	MA	25/06/2017
4.2	Inclusion of Revision History / Reformat	RPK & MA	19/07/2017

1.0	What Sample Should I Take?
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1.1	Blood Specimen Tubes
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- The vacutainer system is used in the Oxford University Hospitals.
- Please aim to fill specimen tubes completely.
- Paediatric bottles are available for collecting smaller volume samples from children, including blood cultures (single bottle instead of two).

Order of draw

<i>Order</i>	<i>tube</i>	<i>Stopper</i>	<i>Additives</i>	<i>Specimen</i>
1 st	Blood culture (order of bottles)		Culture media	Whole blood
2 nd	Plain (SST)	Yellow	None	Serum
3 rd	Citrate	Blue	Sodium citrate	Citrated whole blood
4 th	Heparin (PST)	Green	Lithium heparin	Heparinized whole blood
5 th	EDTA	Lavender	EDTA	EDTA whole blood/plasma
6 th	Fluoride/oxalate	Grey	Sodium fluoride/ potassium oxalate	Fluoride/oxalate whole blood/plasma

- See Appendix Table 2 for information on what tube to select for different samples.
- Never pour blood from one specimen container to another because transfer of inappropriate additives will cause misleading results.
- If you have any queries please contact the appropriate department before collection.

1.2	Other Types of Sample
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- Swabs with bacterial transport medium
- Swabs with virus/universal transport medium
- Swabs for genital sampling (principally Chlamydia species) – specialist swabs supplied by Becton Dickinson

- Universal containers (for CSF, urine, respiratory samples, stool, pus, tissues, fluids, prosthetic device samples etc.)

1.3	Identifying and Labelling High Risk Specimens
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What is a high-risk specimen?

This is specimen from a patient known to have been infected with:

- Hepatitis B or C virus
- Human immunodeficiency virus (HIV)
- HTLV-1
- Creutzfeldt-Jacob disease (CJD)
- Viral hemorrhagic fever (e.g. Ebola)
- Other hazardous pathogens such as TB, Typhoid or Brucella
- **Note: MRSA** colonization/infection is **not** high risk

OR a specimen from a patient suspected to have:

- Creutzfeldt-Jacob disease (CJD)
- Viral hemorrhagic fever (e.g. Ebola)
- Blood-borne virus infection (Hepatitis B / Hepatitis C / HIV)
- Other hazardous pathogens such as TB, Typhoid or Brucella but **not MRSA**
- **This includes all febrile travelers returning from areas high risk for Typhoid and Brucella**
- **For this reason, blood cultures received from the infectious diseases ward are all processed as high risk.**

Why is it important to identify high-risk specimens?

- Extra precautions are needed as these specimens may pose an additional risk to ward staff, porters and laboratory staff.

How should high-risk specimens be handled?

- Each specimen must be labelled 'DANGER of INFECTION' (yellow stickers are available from NHS supplies Order Code WHK 515), and sealed in its own separate plastic bag.
- The request card or tab at the top of the specimen bag should also state 'DANGER of INFECTION'. The request card should not be sealed in the same bag pocket as the specimen.

What precautions should be taken for a patient with risk factors for viral hemorrhagic fever?

- If viral hemorrhagic fever (e.g. Ebola) is suspected, the case should be **URGENTLY** discussed with the Infectious Diseases consultant on call (via switchboard) or Infectious Diseases SpR on bleep 5039 (during working hours) or via switchboard (out of hours).
- Samples from these patients require individual packaging and transportation based on a risk assessment that will be made on a case-by-case basis by the Infectious Diseases team in collaboration with the microbiology laboratory and Public Health England. **Samples should only be handled by these teams.**

If in doubt about risk status, please discuss with the laboratory first.

1.4	What samples will be rejected by the laboratory?
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In general the laboratory will not process the following samples:

- Leaking specimens
- Unlabeled specimens
- Sample not stable (long delay in reaching lab or received in inappropriate container).

NB. When the sample is clinically critical or irreplaceable, the laboratory may choose to process the sample, and will issue a final report indicating the nature of the problem, and where applicable, that caution is required when interpreting the result.

2.0	How Do I Make a Request for Sample Processing?
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2.1	Using the EPR System
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For patients in the OUH Trust the electronic patient record (EPR) must be used to request microbiology lab tests.

Please refer to the OUH Trust website for EPR support and training, and for EPR downtime procedures.

- Ensure you make the request for the correct patient, and select the correct patient episode. This provides the lab with patient identification (NHS number, hospital number, name and date of birth), patient location and consultant.
- Select 'Requests and Prescribing' option from menu on left-hand side of screen
- Click on 'Add' to make a new request
- Use MCS to search for types of culture request, PCR to search for molecular assays etc.
or
- Type the type of sample or culture request into the 'Find' search box, e.g.
 - Blood culture MCS
 - Urine MCS
 - Wound swab
 - Pus/deep wound/fluid/abscess/aspirate MCS
 - Mycobacteria culture MCS
 - HCV Ab screen
 - CMV IgGSurface swab MCS is the correct option for eye, ear, throat, ulcer and skin swabs
- Click on the appropriate option that appears in the box below, and select 'done' to add the test.
- Provide appropriate clinical details, including:
 - Brief clinical history and date of onset
 - risk factors for infection (e.g. immune-compromise, drugs, intra-venous drug use)
 - Travel history, if relevant
 - Any prior, present, or planned antimicrobial therapy.

- Provide your bleep or contact number so that you can be contacted if there are any problems or significant positive results.
- Confirm the request by clicking 'sign'.
- Label each sample with the label printed via EPR, but do not cover the bar code on blood culture bottles.

2.2	Requests from Primary Care
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For patients in Primary Care in Oxfordshire, SunQuest ICE should be used to request microbiology lab tests electronically.

2.3	Patient Collected Samples
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- Outpatient samples should generally be delivered to the laboratory via the general practice; patients should not be asked to deliver their own samples to the microbiology laboratory.
- In the event of a patient delivering their own sample, this should be received at the specimen reception hatch on level 7.

2.4	Consent for Testing
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- It is the responsibility of the requesting doctor to obtain appropriate informed consent for all investigations, including testing for blood-borne viruses.

2.5	Adding an Extra Request to an Existing Sample
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- To request additional tests on samples already received in the laboratory, please telephone (01865 2)21918 or liaise with the microbiology lab registrar (bleep 4077).
- The timeframe within which additional tests can be added depends on the nature of the sample.
 - Urine 2 days
 - Stool 7 days
 - Pus samples 7 days Respiratory samples 7 days
 - CSF samples are stored for a minimum of 2 weeks
 - Serum samples are stored for a minimum of 2 months.
 - Virology molecular assays are stored for a minimum of 2 months.
 - Prosthetic device sample 7 days
 - Significant blood culture isolates are frozen, and can be tested further if required.

3.0	Where is the Laboratory How Do I Transport My Sample There?
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3.1	Location of the Microbiology Laboratory
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- The microbiology laboratories are situated on levels 6 and 7 of the John Radcliffe Hospital.
- Main microbiology specimen reception is located on level 7, and can be found by following signs from the main lift lobby.

3.2	Storing Samples Prior to Transport To The Laboratory
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- Specimens should be transported as soon as possible to the laboratory after being obtained. The laboratory is able to receive routine samples 24 hours a day, including weekends.
- If specimen transport will be delayed, e.g. from primary care, specimens should be stored in a refrigerator until transported to the laboratory.
- The exception is blood cultures, which should be kept at room temperature.
- Do not freeze specimens.

3.3	Transport of Samples Within The John Radcliffe Hospital
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- All specimens should be sent to the laboratories in the large plastic bags provided, marked LABORATORY SPECIMENS, JOHN RADCLIFFE HOSPITAL.
- (i) POD SYSTEM:
The recommended way to transport samples (including blood cultures) is via the 'POD' system available in high through-put clinical areas. ALL laboratory medicine specimens are suitable for transportation using the POD system as long as they fit within the POD carrier. This works 24 hours a day.
On the John Radcliffe site the POD system 'address' for Microbiology Reception is code 777.
- (ii) SELF-DELIVERY:
On the John Radcliffe site you can deliver the samples to specimen reception (level 7) yourself – this may be quickest for urgent samples if you are within the John Radcliffe Hospital.
- (iii) BY PORTER:
If using a porter, specimens from all areas should be clearly marked 'URGENT – FOR MICROBIOLOGY JR LEVEL 7 Specimen Reception'.

3.4	Transport of Samples From NOC / Churchill / Horton Hospitals
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- Transfer from other medical units in Oxford is by vehicles operated by the Oxford Ambulance Services and a shuttle van between JRH and Churchill Hospitals.

- Specimens for urgent investigation out of core hours should be sent via the best available transport or porter service directly to the Joint Specimen Reception area on Level 4 at the John Radcliffe or to the Horton Pathology laboratories. From the **Horton**, urgent specimens should be taken to Pathology Reception and the biochemistry on call BMS notified immediately. They will arrange transport of the specimen to Oxford.

3.5	Transport of Samples From General Practice / Community
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A once or twice (depending on practice size) a day service to local G.P's operates for the collection of specimens and to deliver reports and equipment for specimen collection at the JR2. The Horton is served by a similar service.

All specimens that are transported by these services must be appropriately packaged and labeled. Transport should be such to guard against unauthorized access to specimens. Guidance Notes are available within the Laboratory Medicine [Specimen Transport Policy](#).

3.6	Onward Transport of Reference Laboratory Facilities
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A variety of Reference Laboratories are used for more complex work, and certain drug assays; see Table 4. Samples for testing in reference laboratories are packaged and sent away routinely every day Monday to Friday using the DX service. These samples need to be received in the laboratory ideally by mid-day for packaging for overnight transport. Any samples requiring urgent transport or same day analysis will require a special courier. This can be arranged by the Microbiology department but courier costs will be charged to the referring clinical team.

4.0	How Do I Contact the Laboratory?
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4.1	Laboratory Opening Hours
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Monday to Friday	0830 – 1700
Saturday	0830 - 1200
Sunday	0830 - 1200

N.B. specimens will be received in the laboratory at all hours, including overnight and weekends.

4.2	Contact Telephone Numbers (Bacteriology, Virology & Infection Control)
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Microbiology Laboratory	Point of contact	Extension	Bleep
Medical staff (Microbiology advice including advice to Primary Care) (daytime)	Microbiology SpR	20880	4077
Clinical advice/consultation on the John Radcliffe site and Women's centre (daytime)	Microbiology SpR		4076

Microbiology Laboratory	Point of contact	Extension	Bleep
Clinical advice/consultation on the West Wing/Trauma (daytime)	Microbiology SpR		4075
Clinical advice/consultation on the Churchill site (daytime)	Microbiology SpR		5039
Clinical advice/consultation for Children (daytime)	Paediatric ID SpR		4374
Clinical advice/consultation on the Horton site (daytime)	Contact ID SpR		9799
Clinical advice/consultation on the NOC site (daytime)	Contact ID SpR		7186
On-call clinical advice, needlestick and infection control advice	Microbiology SpR, via JR switchboard.		
Urgent requests (daytime)		21918	
Urgent requests (on call)	Biomedical scientist, via JR switchboard		
Results	Available on EPR or GP systems. In the event of EPR downtime results should be available on OUH Casenotes		
Needlesticks/splash exposure incidents	Daytime: For staff: call occupational health. Non staff and out of hours advice: contact microbiology SpR via JR switchboard.	OUH 23325 Mental Healthcare Trust: 23370 Primary Care, Nursing Homes and Community Hospitals: 23370 Oxford University: 282678	
Sarah Oakley	(Laboratory Manager)	20858	

Consultant staff		Extension	Bleep
Dr Bridget Atkins		20888/6	4056
Dr Monique Andersson	Clinical Lead	20881	4076
Prof Derrick Crook		21226	1358
Dr Katie Jeffery		20881/6	1329
Prof Paul Klenerman		20886	4073
Dr Lucinda Barrett			1472
Dr Matthew Scarborough		20850	1340
Infection Control Team			
(9am-5pm Monday-Friday)*			
		Extension	Bleep
John Radcliffe Hospital		22192	1747
Churchill Hospital		25546	4124
Horton Hospital		29033	9797

* outside these times, please contact the Microbiology registrar on call via switchboard for urgent infection control advice

5.0	How Do I Organize Processing of an URGENT Sample
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5.1	During working hours on weekdays (Monday – Friday 9am – 5pm)
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- Urgent specimens should be transported as rapidly as possible to Microbiology Specimen Reception, level 7 (for transport instructions, see section 3).
- Please ring the laboratory Ext. 21918 to request urgent specimen processing, or contact the laboratory registrar on bleep 4077 if clinical discussion is needed.

5.2	On-call (Weekdays before 9am / after 5pm, Weekends & Bank Holidays)
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- An emergency service for bacteriology and virology is available outside normal laboratory working hours. This service is for the processing of:
 - Urgent cultures from sterile sites (e.g. CSF, joint aspirates, pus/tissue collected at operation).
 - Virology investigations prior to organ transplantation
 - Urgent clinical advice is also available from the on-call SpR
- To arrange these tests please call the microbiology SpR on-call (via JR switch board) **AFTER** the sample has been collected. All calls to the microbiology SpR between 9pm and 9am will be screened by the Churchill Hospital at Night RMO.
- Blood cultures are processed routinely outside normal laboratory opening hours and there is no need to ring the laboratory to notify us of their arrival.

5.3	On-Call (midnight until 8am)
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- The urgent service is restricted to examining CSF for the diagnosis of meningitis, and virology investigations prior to organ transplantation only.
- Urgent CSF microscopy is not performed for ‘septic screens’ from SCBU unless specifically agreed with the microbiology medical staff.

6.0	How Do I Access Results?
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6.1	Reporting of Routine results (Including Reference Laboratory Results)
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- All results will be accessible via EPR or GP electronic systems as soon as they are ready.
- Results that are not on the EPR are not available out of hours.
- In the event of EPR downtime, results should be accessible via CaseNotes. Vancomycin, Tobramycin, Amikacin and Gentamicin results are available via the **biochemistry** section on CaseNotes.
- **Please do not contact the on-call microbiology SpR for results.**

6.2	Alerts Regarding URGENT Results
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- The primary responsibility for accessing and acting upon the result of any test rests with the requesting clinician.
- We endeavor to telephone the following urgent results to the clinical team:
 - All positive culture results from blood cultures and CSF
 - All positive culture results from other normally sterile sites (e.g. bone and joint debridement samples)
 - All positive stool culture results for in-patients or those with a clear public health implication (except *C.difficile* toxin testing)
 - All newly positive HIV, Hepatitis A (IgM), B, C and syphilis results
 - Significant virology and molecular diagnostic results that require discussion e.g. CMV DNA positive results in pregnancy or neonates or positive CSF virology screens.
- Usually these will be preliminary results requiring further work/confirmation.
- Tests that have been requested urgently out-of-hours will be phoned to the requesting team.
- Always provide your bleep number to facilitate this process.

6.3	Turnaround Times
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- See final column of table 2 (appendix) for anticipated turnaround times.
- Note this can be influenced by the time of day or week at which the sample is received, and the time at which cultures become positive.

6.4	Factors Known to Influence The Performance of Laboratory tests
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A number of factors can affect the accuracy of the results generated by the microbiology laboratory. Examples are included in the table below

Factor adversely influencing outcome of test	How to optimize the accuracy of data reported by the laboratory
<ul style="list-style-type: none"> • Delayed transportation to the laboratory • Contamination at source or during transportation • Insufficient volume of sample • Incorrect sample container • Inappropriate sample or request • Inappropriate timing of sample 	<ul style="list-style-type: none"> • Transport samples as promptly as possible to the lab. • Discuss urgent samples with the lab / on-call microbiology registrar to alert the lab to their arrival. • For storage of samples prior to transportation, see section 3.2 • Pay close attention to optimum sampling techniques, including aseptic technique. • Ensure samples are sealed appropriately to avoid subsequent contamination • Aim to fill blood bottles as far as possible • Guidelines for taking blood cultures in adults and neonates are available on the Clinical Intranet. Eight-10mls of blood/bottle recommended for a adults, 1ml for neonates • For serological and blood molecular assays the EPR system will print the correct number of labels for the number of blood tubes required. Please ensure these are well filled. • Send multiple separate samples to confirm the presence of infection in deep-seated surgical sites (e.g Minimum 5 samples recommended for bone and joint infection) • Ensure blood samples are sent in appropriate tubes; check with the lab first if in doubt. Specimen labels produced by the EPR system specify the correct container. • Never pour blood from one container to another. • Avoid sending samples for which clinical interpretation will be difficult, e.g. surface swabs from chronic ulcers, where results will reflect colonization only • Provide correct and up-to-date information on the patient’s clinical history, including consideration of travel/occupation/drug history/risk factors where relevant. • Whenever possible, send samples to microbiology prior to initiation or change of antibiotic therapy. When this is not possible, prioritise sample collection as soon as possible after the first dose of antibiotics. • <i>Septic shock is a clinical emergency and urgent antibiotic treatment should always be initiated; do not delay if it is difficult or unsafe to obtain cultures.</i>

6.5	Protection of Personal Information
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- All OUH staff undergoes statutory and mandatory training in clinical governance and data protection.
- Access to the laboratory computer system is password controlled and data is held in accordance with OUH policy on data protection, following the rules set by the Data Protection Act (1998).
- Results from the microbiology laboratory will only be disclosed to other relevant medical professionals providing direct patient care.

7.0	How Do I Access Specialist and Clinical Advice?
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7.1	Contact by Telephone
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- See list of contact numbers in section 4.2 above. For clinical advice, please try to contact the correct team overseeing care of patients in your clinical area.
- Out-of-hours, contact the microbiology SpR by switchboard to seek urgent advice or the On Call BMS to arrange for processing of urgent samples.

7.2	Contact by Email
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- GP's and primary care providers can contact the microbiology department for non-urgent advice via email, at microbiology.advice.OUH@nhs.net.
- Please note confidential patient information should only be sent from nhs.net accounts
- We aim to provide a response within 2 working days.

7.3	Needle Stick Injuries
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- Outside working hours, the microbiology department acts on behalf of Occupational Health to document needle stick and splash-exposure injuries, and to provide advice for staff in these situations.
- Please contact the microbiology SpR on call via switchboard. The details of the incident and the 'donor' patient (if known) will be logged in order to make a risk assessment.
- If immediate emergency action is required, advice will be given by telephone. In all other instances, further follow-up of the incident will be initiated via Occupational Health on the next working day.
- All such incidents should be reported via a Datix form / incident report.
- For needle stick incidents occurring in the community / nursing homes / dentists / primary care, Public Health England (PHE) should be contacted. The Microbiology SpR is available to provide clinical advice if the recipient becomes a patient of the OUH, e.g. by arriving in the Emergency Department.

7.4	Access to Specific Immunoglobulins
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- In certain specific circumstances, post-exposure prophylaxis to a given pathogen may be warranted.
- HBIG, ZIG and Rabies immunoglobulins are all kept in Pharmacy.
- These can only be dispensed with the agreement of the Microbiology SpR/Consultant in normal working hours or the on-call Micro SpR/Consultant out of hours.

8.0	How Do I Provide Feedback or Report A Complaint?
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Complaints procedure:

- We aim to be constantly looking for opportunities to improve and update our service, and to learn from experience. On these grounds, please get in touch and let us know if you have had any problems in working with the microbiology laboratory.
- Complaints, errors, mistakes and near-misses within the laboratory are logged as non-conformity reports; each of these is handled by a senior member of laboratory staff in order to optimize the process in future.

Feedback:

- If you have comments on how future editions of this guide could be improved please contact Dr Monique Andersson (monique.andersson@ouh.nhs.uk)

9.0	Appendices
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Appendix 1: Antibiotic and Anti-fungal assays.	
<p><i>Why assay?</i> Assays of serum drug concentrations are indicated in the following situations:</p> <ul style="list-style-type: none"> • drugs with a known or suspected relationship between concentrations in blood and toxicity • drugs with a known or suspected relationship between concentrations in blood and efficacy • where there is pharmacokinetic variation such that concentrations in blood cannot be predicted • to confirm oral absorption • to test compliance <p>Blood in yellow top SST preferred or paediatric tube. It is essential to give details of times and dosage of antibiotic to be assayed, the date and time specimens collected and whether peak or trough. Vanc and Gent results are not usually phoned, and should be looked up on the Intranet (Biochemistry section). For advice on results, contact microbiology SpR.</p> <p>Vancomycin, Tobramycin, Amikacin and Gentamicin assays are processed on the day of receipt (24/7). Other antibiotic assays (e.g. Teicoplanin,) have to be sent away so the turnaround time is 2-3 days.</p>	
<p><i>Aminoglycosides</i> Gentamicin Tobramycin Amikacin Streptomycin</p>	<p>These are best given once daily except in renal failure and endocarditis.</p> <p><i>When to assay?</i> After 48 hours therapy (unless being discontinued). Single assay in renal failure and for once daily dosing.</p> <p><i>How to assay?</i> for bd or tds dosing, paired trough and peak (immediately pre-dose and 60 minutes post completion iv dose)</p>
<p><i>Glycopeptides</i> Vancomycin Teicoplanin</p>	<p>Vancomycin: trough before third dose or random assay if renal impairment or using continuous infusion: See '<i>Dosing of Gentamicin and Vancomycin</i>' in the <i>Adult Microguide: OUH application available via App store or http://microguide.horizonsp.co.uk/viewer/ouh/adult</i></p> <p>Teicoplanin: after 3-5 doses, trough only to ensure therapeutic levels.</p>

	<i>Assay results:</i>	Target serum levels (mg/L)	
		Trough	Peak
	Gent/ Tobra (once daily 7mg/kg or 5mg/Kg)	Use nomogram <i>See 'Dosing of Gentamicin and Vancomycin' in the Adult Microguide: OUH application available via App store or http://microguide.horizonsp.co.uk/viewer/ouh/adult</i>	
	Gent/ Tobra (bd or tds)	<2	>5
	Gent/ Tobra (infective endocarditis)	<1	3-5
	Amikacin (bd or tds)	<10	>20
	Amikacin (once daily)	<5	N/A
	Streptomycin	<5	15-40
	Vancomycin (od or bd) <i>See 'Dosing of Gentamicin and Vancomycin' in the Adult Microguide: OUH application available via App store or http://microguide.horizonsp.co.uk/viewer/ouh/adult</i>	10-20	N/A
	Vancomycin infusion (ITU only)	15-25	N/A
	Teicoplanin		
	Severe <i>Staph aureus</i> infections including endocarditis	≥20 but ≤ 60	N/A
	Other severe infections	≥10 but ≤ 60	N/A

Antifungal	Pre-dose	Post-dose	Target Levels (mg/L)
Flucytosine	Just before dose*	Oral: 2 hours* IV: 30 minutes*	Adult: Pre-dose 30-40 Post-dose 70-80 Neonatal: Pre-dose 20-40 Post-dose 50-80 Levels >100 are potentially toxic.
Itraconazole	Oral: not needed IV: just before dose	Oral: random* IV: 1hr <u>and</u> 4-6 hrs	<ul style="list-style-type: none"> ▪ Target 5 – 17. ▪ Steady state reached after 1-2 weeks on oral therapy, with little variation throughout the day.
Voriconazole	Just before dose*	Oral: not needed IV: not needed	<ul style="list-style-type: none"> ▪ < 1.3 : low pre-dose level ▪ 1.3 - 5.7 : satisfactory level ▪ >5.7 : high level
Posaconazole			Levels not recommended.

Appendix 2: Microbiological Specimens.

Separate samples should be sent for bacteriology, virology and molecular diagnostics.

The recommended way to transport samples (including blood cultures) is via the 'POD' system available in high through-put clinical areas. ALL laboratory medicine specimens are suitable for transportation using the POD system as long as they fit within the POD carrier. This works 24 hours a day.

On the John Radcliffe site the POD system 'address' for Microbiology Reception is code 777.

Sample type	Specimen requirements	Comments	*Turnaround time for negative results (working days)
Ascitic fluid	Sterile universal container and single blood culture bottle.	State how aspirate was collected i.e. via drain in situ or sterile aspirate. Request TB if relevant.	3
Biopsy specimens	Needle aspirate, needle biopsy, tissue – sterile universal. Operate strict sterile precautions. DO NOT ADD FIXATIVE OR FORMALIN	State anatomical site and suspected cause. Request TB/fungal cultures if relevant.	Up to 14 7+ weeks for TB
Blood cultures (B/C)	Inoculate 5-10 mls of blood into each of an aerobic and anaerobic bottle. If only a small amount is available, divided equally between bottles. For paediatric patients a single paediatric bottle is used. Guidance on how to take blood cultures is available on the Clinical Intranet.	Arrange for bottles to be taken to Microbiology Specimen Reception on level 7, JR2 a.s.a.p. It is NOT necessary to notify the laboratory. All blood culture results are notified to the clinician immediately they are found to be positive by the laboratory medical staff and also put on the Clinical Intranet. Guidance on how to take a blood culture is available:	5 (7 if prolonged culture required)
Blood for serology	Send SST (gold top) tube. See guide to specimen tubes. State relevant symptoms and duration.	Some samples may need to be referred to other laboratories. If serum for saving only is required, please request a short term store (3 months).	Variable
Blood for molecular diagnostics (PCR)	Send EDTA sample (NB 10mls required for HIV, HBV and HCV viral load testing)	CMV PCR performed twice/week EBV PCR performed once/week BKV PCR performed once/week HCV, HBV and HIV viral load performed 1-2x/week.	Variable

Cannulae/central line tips.	In sterile universal container. Send a simultaneous peripheral blood culture.	Send only if infection suspected. Indications: site inflamed or unexplained fever with central line in situ. Indicate site and duration line in situ before removal. Send line entry site swab if inflamed. Vascular line tips are only processed if the patient has a positive blood culture within +/- 7 days of line removal.	3
Cerebrospinal fluid (CSF)	Indicate whether this is from a lumbar or ventricular puncture, a shunt or a ventricular or lumbar drain.		3
<i>Microbiology</i> Cell count Gram stain Culture	In plastic sterile universal container.	After 12 midnight urgent CSF microscopy is not performed for SCBU "septic screens" unless a specific indication.	CSF PCR for viruses is performed 3x/week
<i>Biochemistry</i> Protein Glucose	CSF in gray fluoride tube (plus simultaneous blood in fluoride tube)	In specific clinical cases, further investigations may be necessary and should be discussed with the microbiology SpR. These may include India ink stain, TB stain and culture, fungal culture, cryptococcal antigen and PCR for certain viral pathogens.	
<i>Others as indicated</i> Molecular diagnostics (virology) Cytology Immunology	Send additional universal (0.2-0.5ml CSF) container See cytology and immunology user information.	For CJD studies please ring Ext 21918 prior to sending the CSF.	
Faeces	Send in sterile faeces collection container (with spatula). Rectal swabs are not useful for investigation of diarrhoea.	See appendix 3 'guide to microbiological investigations' below	3
Joint aspirates	In sterile universal container.	All samples are examined for crystals. State whether a prosthetic joint is in situ. In septic arthritis in children, also inoculate an aerobic blood culture bottle.	3 Up to 7 days if prosthesis in situ
Peritoneal dialysis fluid	Inoculate blood culture set (10mls in each bottle) and send with 20mls in sterile universal container	Request TB if relevant.	2 7+ weeks for TB
Pleural or pericardial fluid.	In sterile universal container.	State how specimen collected. Request TB culture if relevant.	3

Prosthetic device samples (intra-operative e.g. orthopaedic/vascular)	Take 4-5 samples from around the infected device using separate sterile instruments for each sample.	Label the sites that were sampled. Surface or sinus swabs are generally not useful.	Up to 10
Pus	In sterile universal container. Pus is always a preferable specimen to a swab.	State anatomical site of lesion and if collected at operation.	3
Respiratory samples			
Sputum	Ensure specimen comprises sputum (not saliva/food). Samples of saliva only will not be processed.	Of limited value except for <i>Mycobacteria spp</i> , <i>Nocardia spp</i> and <i>Legionella spp</i> . Sputum not usually processed from in-patients.	3
Induced sputum	Must be obtained by skilled personnel with appropriate protection/isolation facilities.	Pneumocystis detection is performed in Cytology Dept. Request TB/ fungi/ <i>Nocardia spp</i> if relevant	
Nasopharyngeal aspirate	Send in sterile universal.	For RSV direct antigen testing or RSV/influenza molecular assays depending on availability. PCR for a wide range of respiratory viruses is available for ventilated or immunocompromised individuals	2 variable
Pernasal swab	Obtain fine wire swab; for JR hospital, from Microbiology L7 ext. 20874, other locations from Haematology stores L4 (ext. 20368)	For <i>Bordetella pertussis</i> (whooping cough). Discuss with Microbiology SpR/consultant if PCR indicated.	7
Bronchoscopic lavage fluid (BAL)	Must be obtained by skilled personnel with appropriate protection/isolation facilities.	See BAL caresets on EPR. Pneumocystis is tested in the Cytology Department. PCR for CMV and respiratory viruses and further assays for the diagnosis of fungal infection may be available after discussion with Microbiology SpR.	variable
Skin scrapings. Nail scraping/clippings Hair cuttings.	Put in clean folded black paper in sterile universal container or sealed envelope.	For dermatophyte investigations. State site of lesion and any animal contact. Subungual scrapings preferred in nail disease	4 weeks

Semen	Semen samples for infertility examination should be discussed with the Oxford Infertility Unit 01856 782800. They must not be sent to Microbiology		
Swabs			
Mouth	Use Amies charcoal transport medium (in bacteriology swab tubes)	for Candida only	2
Bacteriology (e.g. eye, ear, nose, throat, wound, vaginal)	Use Amies charcoal transport medium (in bacteriology swab tubes)	State site sampled, recent surgery and antibiotic treatment.	2 days if negative 4 days if positive
Carbapenemase producing enterobacteriaceae (CPE) screen	Rectal or faeces/stool swab	See infection section of Trust intranet_for more details. http://orh.oxnet.nhs.uk/InfectionControl/Pages/Default.aspx	2 days if negative 4 days if positive
MRSA screen	Take nose, throat, axillae, groin, wounds swabs and catheter urine. Place a single request on EPR and state the number of swabs taken – the appropriate number of labels will print.	See infection section of Trust intranet_for more details. http://orh.oxnet.nhs.uk/InfectionControl/Pages/Default.aspx	2 days if negative 4 days if positive
Virology (throat/eye /vesicle fluid)	Flocked swab in viral transport medium: for JR hospital, from Microbiology L7 ext. 20874, other locations from Haematology stores L4 (ext. 20368)	Contact Microbiology SpR for advice on vesicle fluid samples. Eye swabs in virus transport medium will be tested for adenovirus/HSV/VZV and Chlamydia	variable
Gonorrhoea culture (Gonorrhoea NATS testing available for GU-medicine only)	Endocervical /urethral/rectal swabs (not HVS). Transport in Amies charcoal transport medium (in bacteriology swab tubes).		3
Chlamydia in women	Obtain endocervical or vulvovaginal swab using Chlamydia collection kit.	Chlamydia collection kit available from Haematology stores Ext20341. GPs who need supplies should fax their order through on 01865 221778	Performed up to 5x/week
Chlamydia in men	Send first pass after holding urine for 2 hours.	Request Chlamydia (PCR)	Performed up to 5x/week

Chlamydia in eyes (usually neonates)	Flocked swab in viral transport medium: for JR hospital, from Microbiology L7 ext. 20874, other locations from Haematology stores L4 (ext. 20368)	As above. Remove all exudate prior to sampling. Eye swabs in virus transport medium will be tested for adenovirus/HSV/VZV and Chlamydia	Performed 3-5x/week
TB cultures	3 sputa 3 early morning urines Other relevant specimens (discuss with Microbiology SpR)		7 weeks
Urine: state whether mid stream urine (MSU), catheter urine (CSU), urine from bag, nephrostomy ileal conduit, clean catch (infants), suprapubic aspirate.	Send in a sterile universal container. Label with type of specimen. Urine should be tested for leucocyte esterase and nitrite before sending to the laboratory. These have equivalent sensitivity/specificity for the diagnosis of UTI as microscopy. If these are negative then culture is of limited value.	Microscopy is only performed for ?glomerulonephritis, SLE, endocarditis, haematuria, casts, crystals, candiduria and schistosomiasis and must be specifically requested with the relevant clinical details. Urine microscopy is not performed out of hours for the diagnosis of UTI. Link to http://ouh.oxnet.nhs.uk/RenalUnit/Pages/Pharmacy-Renal,TransplantandUrology.aspx GPs should refer to http://www.oxfordshireccg.nhs.uk/professional-resources/clinical-guidelines.htm	2
Early morning urine (EMU)		For TB	7 weeks
Terminal urine	Send for microscopy no sooner than 4 weeks after exposure	For ova of schistosomiasis	1

* Please note that turnaround times may be longer over the weekend and bank holidays.

Appendix 3: Guide to Microbiological Investigations.

This table is NOT a substitute for clinical decision-making and use of the consult service. It is merely a guide to the repertoire of tests used in the preliminary assessment of a patient.

Clinical guidelines for Primary care can be found on the CCG website:

<http://occg.oxnet.nhs.uk/GeneralPractice/ClinicalGuidelines/Forms/AllItems.aspx>

Clinical guidelines (**Microguide**) for the Oxford University Hospital can be found on:

<http://microguide.horizonsp.co.uk/viewer/ouh/adult>

or

Adult/Paediatric Microguide – applications available for the OUH via the App store

SYNDROME	SPECIMEN / INVESTIGATION	COMMENTS
SCREENING		
MRSA	See infection control section on Trust IntraNet	http://orh.oxnet.nhs.uk/InfectionControl/Pages/Default.aspx
CPE (Carbapenemase producing <i>Enterobacteriaceae</i>)	See infection control section on Trust IntraNet	http://orh.oxnet.nhs.uk/InfectionControl/Pages/Default.aspx
Urine	Pregnancy, and prior to urinary tract surgery.	
Neonatal	Ear/throat swabs if neonatal or maternal fever/sepsis.	
Antenatal infection screen	Blood in SST yellow top tube for HIV-Ab, Syphilis total antibody and HBsAg	Use BLUE antenatal screening form for initial antenatal screen. Known HIV, hepatitis B or syphilis positive patients should be re-screened for these infections.
DIAGNOSTIC		
ACUTE SYSTEMIC SEPSIS (cause unknown)	Blood cultures, urine, consider CSF, line tips etc.	Careful clinical assessment for the source should guide investigations.

NEUTROPAENIC SEPSIS	Central (a culture from each lumen) and peripheral blood cultures, line tips if appropriate. For allogeneic and autologous BMTs see CMV surveillance protocol.	If a pulmonary infiltrate is present see pneumonia in immunocompromised below.
FEBRILE RETURNED TRAVELLER	Blood cultures, malarial film (EDTA to haematology)	Refer to Infectious Diseases For suspected Viral Haemorrhagic Fevers see Adult Microguide http://microguide.horizonsp.co.uk/viewer/ouh/adult and infection control manual. http://orh.oxnet.nhs.uk/InfectionControl/Pages/Default.aspx NB label samples ‘ high risk ’
PYREXIA OF UNKNOWN ORIGIN (PUO) (fever for more than 14 days)	Consult ID / Microbiology.	
GENERALISED LYMPHADENOPATHY	EDTA blood to Haematology Dept for GF test and blood film. If negative (and atypical lymphocytes present) consider viral serology (EBV, CMV IgM, Toxoplasma IgM). Consider HIV seroconversion.	Informed consent for tests including HIV is the responsibility of the requesting doctor.
MUMPS	Salivary kits for the diagnosis of acute mumps are available from the Health Protection Team (0845 279 9879).	Mumps antibody testing to support the childhood immunization program is not generally advised.
CNS INFECTIONS		
Brain abscess	Blood cultures, biopsy / pus if available.	
Meningitis	Blood cultures, CSF (include virology if relevant), EDTA blood for <i>Meningococcal</i> PCR. Send throat swab for meningococci. Consider HIV testing in unexplained lymphocytic meningitis.	Lumbar puncture should not be performed if there is evidence of raised intracranial pressure. Inform Health Protection Team (0345 279 9879) immediately for probable/confirmed meningococcal meningitis. They will arrange prophylaxis of contacts.

Encephalitis	CSF including viral PCR. Blood serology for storage.	Discuss with Microbiology/Infectious Diseases particularly if there is a history of foreign travel.
Immunosuppressed (meningitis /encephalitis /encephalopathy)	Blood culture, CSF for <i>Cryptococcus</i> (India Ink stain, culture and antigen test), other fungi, TB, bacterial culture, blood serology for storage, Cryptococcal antigen and other relevant serology. CSF for virology PCR (consider Toxoplasma, JC viruses, CMV PCR, EBV).	Discuss with relevant Microbiology SpR.
Progressive multifocal leucoencephalopathy (PML)	CSF for JC virus PCR, blood for serology.	
HTLV-1-associated myelopathy	Blood for serology.	
Guillain Barre syndrome	CSF for CMV PCR, blood for EBV, <i>Campylobacter jejuni</i> , CMV (IgM and IgG) serology, HIV serology and storage.	Discuss with Microbiology SpR.
CARDIAC		
Endocarditis	Blood culture (3 separate venepunctures) off antibiotics if possible. Request prolonged incubation. If culture-negative consider blood serology for Q Fever (<i>Coxiella</i>), <i>Chlamydia</i> , <i>Bartonella</i> .	Consult Microbiology SpR.
Myocarditis / Cardiomyopathy	Myocardial tissue for Enterovirus PCR. Blood serology for Enterovirus IgM.	Date of onset is important for interpretation. Discuss with Microbiology SpR/Consultant.
Pericarditis	Viral investigations in acute pericarditis do not usually alter clinical management (NEJM 2004:351;2195). If relevant (e.g. chronic), pericardial fluid/biopsy for bacteria/ TB (microscopy and culture). Send separate samples for enteroviral PCR and cytology/histology.	Discuss chronic cases with Microbiology SpR.
RESPIRATORY		

Sore throat	Most do not require investigation. If required send throat swab for bacteriology. Consider ASOT. See glandular fever syndrome.	
Glandular fever syndrome	EDTA blood to Haematology Dept for GF test and blood film. If negative (and atypical lymphocytes present) consider viral serology (EBV, CMV IgM, Toxoplasma IgM). Consider HIV seroconversion.	Informed consent for tests including HIV is the responsibility of the requesting doctor.
Lower respiratory tract infections.		
Adults	Blood cultures. Send urine for legionella antigen if suspected. Sputum/BAL for legionella culture can be done but has low sensitivity, particularly after antibiotics. Culture empyema fluid. Samples requesting atypical pneumonia serology are not usually processed.	A history of foreign travel is important. Discuss with Microbiology/Infectious Diseases SpR. For guidance on hospital management of community acquired pneumonia, see Microguide
Children	Blood cultures. NPA for RSV/influenza PCR. Immunocompromised/ITU – full respiratory panel includes RSV, Metapneumovirus, Influenza, Adenovirus, Parainfluenza, Mycoplasma, Rhinovirus, Bocavirus, Coronaviruses (not MERS-CoV). Samples requesting atypical pneumonia serology are not usually processed – if indicated discuss with Microbiology SpR.	

Immunosuppressed	Blood cultures, sputum for AFB, Legionella culture. Induced sputum for Pneumocystis, Nocardia, AFB. BAL for conventional respiratory pathogens, Pneumocystis, AFB, Legionella, Nocardia, fungi, and virus PCR for respiratory pathogens/CMV PCR. EDTA blood for CMV PCR.	See also CMV surveillance protocol agreed with the Department of Haematology and the Renal Transplant Unit CMV protocol. Other viral PCR may be relevant – discuss with microbiology SpR/Consultant.
Ventilator-associated	Blood cultures, BAL (for quantitative microbiology)	
LINE INFECTIONS	Central and peripheral blood cultures. Line tips.	
RENAL		
Transplant	Follow agreed pre-transplant screen and post-transplant monitoring protocols.	
CAPD peritonitis	Send PD fluid (as in specimens table above)	
BK virus (post-transplantation)	Send a urine sample to CYTOLOGY If >10 decoy cell/hpf visible, send a serum/EDTA sample to Microbiology for BK viral load.	Contact Dr Ian Roberts Consultant Histopathologist on 20498 for advice
POST OPERATIVE WOUND INFECTIONS	Blood cultures, if febrile. Deep pus. Deep debridement samples. Superficial samples are not helpful unless the wound has just discharged for the first time.	Guidance on how to take a wound swab is available at http://orh.oxnet.nhs.uk/InfectionControl/Pages/Default.aspx
SKIN AND SOFT TISSUE INFECTIONS.		
Abscess	Blood cultures if febrile. Send pus.	
Bites	Blood cultures, swab, pus/debridement samples.	
Cellulitis	Blood cultures, any pus. Biopsy if relevant. Deep debridement samples (necrotising fasciitis).	
Leg ulcers	Blood cultures if febrile. Superficial samples are not usually helpful except in chronic mycobacterial infection (send biopsy).	Guidance on how to take a wound swab is available at http://orh.oxnet.nhs.uk/InfectionControl/Pages/Default.aspx

Tetanus-prone injuries.	See Emergency Dept junior doctor handbook website or 'Immunisation against Infectious Disease' website	https://www.gov.uk/government/collections/immunisation-against-infectious-disease-the-green-book
RASHES		
Vesicular	Fluid/swab or scrape from vesicle for HSV and VZV PCR in viral transport medium.	
Hand, foot and mouth Disease.	Vesicular fluid for enteroviral PCR.	Discuss with Microbiology SpR. Diagnosis is usually clinical.
T cell lymphoma	Blood serology for HTLV-1	
Maculopapular	Blood serology for rubella and parvovirus IgM as appropriate. Consider EBV serology, CMV IgM, syphilis serology and HIV seroconversion. Salivary kits for the diagnosis of acute measles are available from the Health Protection Team 0845 279 9879.	Vesicular rashes often start maculopapular. Informed consent for tests including HIV is the responsibility of the requesting doctor.
Erythema multiforme/ Stevens Johnson syndrome	Needs clinical information to guide investigations.	
Erythema chronicum migrans	Lyme Disease serology.	Check exposure history.
MUSCULOSKELETAL		
Septic arthritis	Blood cultures, joint aspirate, washout fluid. Consider STD samples if risk factors/symptoms suggest <i>Neisseria gonorrhoeae</i> .	
Prosthetic joint/device related infection	Blood cultures if acute. Joint aspirate (taken in radiology or by orthopaedics / rheumatology) State 'prosthetic' on request form), send multiple samples using separate sterile instruments from theatre.	
Osteomyelitis	Blood cultures if acute. Bone biopsy, operative samples.	
Reactive arthritis/arthritis	Consider <i>Chlamydia</i> swab/urine for <i>Chlamydia</i> if risk factors/symptoms. Blood serology for rubella, Parvovirus IgM and Hepatitis B surface antigen.	
Myalgia	Serology for Toxoplasma IgM	

	and influenza (in season). Only if relevant clinical picture and exposure/travel history, send blood cultures and serology for <i>Leptospira</i> and/or serology for dengue.	
Bornholm's disease (Coxsackie virus)	Serological testing is not offered, as it does not usually alter clinical management. Happy to discuss.	
GASTROINTESTINAL		
Acute hepatitis	Blood serology for HBsAg, HAV IgM. Hepatitis E, EBV, CMV IgM serology if indicated.	Consider HCV PCR if risk factors
Chronic Hepatitis/abnormal LFTs	HBsAg, HCV ab.	
Community acquired diarrhoea	Send faeces. Collect during the period of diarrhoea. Please give clear travel/exposure history (with dates) . If part of an outbreak investigation please give details	Routine culture is for <i>Salmonella</i> , <i>Shigella</i> , <i>Campylobacter</i> , <i>E coli</i> O157, only. Only if diarrhoea prolonged (>10 days), weight loss, bloating, recent tropical travel, HIV risk - request in addition to culture, ova, cysts and parasites. If amoebic dysentery suspected, discuss with microbiologist. If patient has received antibiotics in the past month request <i>C.difficile</i> toxin testing.
Hospital acquired diarrhoea (more than 3 days into admission)	If part of an outbreak/cluster of cases contact infection control. See guidance on Microguide	Usually request <i>C.difficile</i> toxin testing only. Request culture if <ul style="list-style-type: none"> • Age >65 or <16 and permanent co-morbidity (CVA, renal failure etc) • HIV disease • Neutropaenia • Suspected non-diarrhoeal manifestation of enteric infection
Peritonitis	Blood cultures, peritoneal aspirate, intra-operative samples if relevant.	
Liver abscess	Blood cultures, pus, <i>Entamoeba histolytica</i> serology, stool for <i>Entamoeba histolytica</i> .	

EYE		
Conjunctivitis/Keratitis	Swab for bacterial culture Corneal scrape inoculated onto culture plates Swab/scrape in viral transport medium for viral PCR (adenovirus/HSV/VZV plus <i>Chlamydia</i>).	Contact lens keratitis may require <i>Acanthamoeba</i> culture arranged with the lab by ophthalmic surgeons if relevant. Please advise if testing for enterovirus indicated.
Retinitis	Swab and/or vitreous for HSV/VZV/CMV PCR.	Discuss with Microbiology SpR.
Endophthalmitis	Aqueous/vitreous as relevant for bacterial culture.	
URINARY SYMPTOMS		
	Perform dipstick on ward. If positive for leucocytes and/or nitrites send urine.	See guidance on Microguide <i>GPs should refer to</i> http://occg.oxnet.nhs.uk/GeneralPractice/ClinicalGuidelines/Forms/AllItems.aspx
GENITO-URINARY		
	Consult GUM, Churchill Hospital	Contact: 01865 231231
Ulcer	Viral swab for HSV PCR.	
Vaginal discharge	HVS cultured for candida, molecular testing swab for <i>Trichomonas</i> , <i>Chlamydia</i> and <i>Neisseria gonorrhoeae</i> .	<i>GPs should refer to guidelines for investigating vaginal discharge:</i> http://occg.oxnet.nhs.uk/GeneralPractice/ClinicalGuidelines/Forms/AllItems.aspx
NSU (male)	Send first pass urine for <i>Chlamydia</i> and <i>Neisseria gonorrhoeae</i> .	
Pelvic inflammatory disease (females)	Send endocervical and urethral swab for chlamydia (can use single request form). Send endocervical swab for <i>Neisseria gonorrhoeae</i> PCR and culture	
Contact tracing	Refer to GUM department	Contact: 01865 231231

GYNAE		
Cervical or endometrial infection.	Cervical swab. If obtained – endometrial sample.	If only an HVS is obtainable, please state clear clinical details for culture to be performed.
CONGENITAL /PERINATAL INFECTION		
	Review prior maternal blood serology and send further sample if relevant. Blood serology from infant plus NPA/urine for viral PCR.	Clinical details and discussion with Microbiology SpR vital. Avoid the acronym TORCH.
IMMUNE STATUS INVESTIGATION		
	There are agreed protocols with the Haematology and Renal units.	

Appendix 4: Laboratory Repertoire		
Finding the assay you need in EPR		
In general culture based tests can be found by using the search term ‘MCS’, and molecular assays by using ‘PCR’		
There are Caresets for ‘Tropical and travel serology’, BALs, Cystic fibrosis, Specialist HIV, hepatitis and therapeutic drug monitoring – use the search term ‘Careset’		
Where possible the name of the assay in EPR has been given.		
BACTERIOLOGY CULTURE, PARASITE and FUNGAL WORK		
Investigation	Specimen type	Assay frequency
Acanthamoeba species MCS	Corneal scrape	By arrangement with laboratory
Acid fast bacilli /TB culture MCS	Respiratory/tissue samples	Daily
Actinomyces species MCS	Swab, fluid, tissue	Daily
Anaerobic Culture	Swab, fluid, tissue	Daily
Antenatal urine culture	Urine	Daily
Blood bottle culture (non-blood fluids) MCS	Fluid	Daily
Blood culture MCS	Blood	Daily
Burkholderia Culture	Respiratory sample	Daily
Clostridium difficile ELISA (GDH)	Stool	Daily
CNS Device Culture	CNS device	Daily
CPE screen MCS	rectal/stool swab	Daily
Cryptococcus antigen screen	CSF/serum	Daily
Cryptosporidium/Giardia detection	Stool	Daily
CSF MCS	CSF	Daily
Dermatophyte culture	Skin scrapings, nails, hair	Daily
Faeces MCS	Stool	Daily
Fungal MCS	Swab, fluid, tissue	Daily
Genital /semen MCS	Genital sample/swab	Daily
Insect/Parasite for identification	Specimen	Daily
Legionella MCS	Respiratory	Daily
MRSA screen MCS	Swab	Daily
Nocardia MCS	Swab, fluid, tissue	Daily
Ova, cysts and parasites, faeces	Stool	Daily
Pertussis MCS	Pernasal swab	Daily
Prosthetic/metal work MCS	Swab, fluid, tissue, device	Daily

Investigation	Specimen type	Assay frequency
Pus/deep wound/fluid/ abscess/biopsy/scrape/aspirate MCS	Swab, fluid, tissue	Daily
Respiratory MCS	Respiratory sample	Daily
Sterility check/perfusion fluid/donor graft culture MCS	Swab, fluid, tissue	Daily
Surface swab MCS (includes ear, eye, throat, skin, placenta)	Swab	Daily
Urine MCS	Urine	Daily
Urine microscopy	Urine	Daily
Vascular Culture	Valve, vascular graft	Daily
Vascular line tip	Vascular line tip	Daily
Vibrio Culture	Stool	Daily
Yersinia species MCS, faeces	Stool	Daily
VIROLOGY / SEROLOGY		
Investigation	Specimen type	Assay frequency
Antenatal HIV screen *(On EPR Antenatal Booking Caresets)	Serum / Plasma	Daily
*Antenatal HBV screen	Serum / Plasma	Daily
*Antenatal Rubella screen	Serum / Plasma	Daily
*Antenatal Syphilis screen	Serum / Plasma	Daily
Antistreptolysin O titre, blood	Serum	Minimum 1x/week
Borrelia burgdorferi Ab level, blood	Serum	Daily
Brucella species antibody level, blood	Serum	Minimum 1x/week
Cytomegalovirus IgG level	Serum / Plasma	Daily
Cytomegalovirus IgM level	Serum / Plasma	Daily
EBNA antibody (EBV serology)	Serum / Plasma	Daily
Epstein Barr virus IgG	Serum / Plasma	Daily
Epstein Barr virus IgM	Serum / Plasma	Daily
Helicobacter pylori antibody level	Serum / Plasma	Daily
Hepatitis A virus total Ab, blood	Serum / Plasma	Daily
Hepatitis A virus IgM screen, blood	Serum / Plasma	Daily
Hepatitis B virus surface Ab, blood	Serum / Plasma	Daily
Hepatitis B core total Ab, blood	Serum / Plasma	Daily
Hepatitis B virus (HBV) surface Ag, blood	Serum / Plasma	Daily
Hep B core IgM (reflex test if HBsAg screen positive)	Serum / Plasma	Daily
Hep Be antibody (reflex test if HBsAg screen positive)	Serum / Plasma	Daily
Hep Be antigen (reflex test if HBsAg screen positive)	Serum / Plasma	Daily

Investigation	Specimen type	Assay frequency
Hepatitis C virus Ab screen, blood	Serum / Plasma	Daily
Hep C antigen (reflex test if Ab screen positive)	Serum / Plasma	Daily
Hepatitis E IgG & IgM	Serum / Plasma	Weekly
HIV antibody/antigen screen	Serum / Plasma	Daily
HSV IgG screen, blood	Serum / Plasma	Daily
HTLV 1 and 2 Ab screen	Serum / Plasma	Daily
Legionella Ag, urine	Urine	Daily
Measles IgG level, blood	Serum	Daily
Mumps IgG level, blood	Serum	Daily
Norovirus detection (outbreak)	Stool	As required
Parvovirus B19 IgG, blood	Serum / Plasma	Daily
Parvovirus B19 IgM, blood	Serum / Plasma	Daily
Rubella virus IgG, blood	Serum / Plasma	Daily
Rubella virus IgM, blood	Serum / Plasma	Daily
Syphilis serology, blood	Serum / Plasma	Daily
RPR (known syphilis cases)	Serum / Plasma	Daily
Toxoplasma IgG, serology	Serum / Plasma	Daily
Toxoplasma IgM, serology	Serum / Plasma	Daily
Varicella Zoster (VZV) IgG, screen	Serum	Daily
MOLECULAR ASSAYS		
Investigation	Specimen type	Assay frequency
HSV/VZV/Adenovirus/Chlamydia (vesicles, eyes) (on EPR: VZV/HSV PCR, vesicle swab Chlamydia species PCR, non-genital swab Adenovirus PCR, swab)	Swab in virus transport medium	1-2x/week
CSF virus PCR (HSV/VZV/enterovirus) (Also includes parechovirus and mumps)	CSF, stool	Mo/We/Fr
Cytomegalovirus (CMV) viral load PCR	Whole blood, urine	Tue/Thur
Epstein Barr virus (EBV) viral load PCR	Whole blood	Tue/Thur
BK virus (BKV) viral load PCR	Sera/ Whole blood	weekly
Hepatitis C (HCV) RNA viral load PCR	Sera / Plasma	1-2x/week
Hepatitis B (HBV) DNA viral load PCR (on EPR contained in Hepatitis Careset)	Sera / Plasma	weekly
Hepatitis C genotyping (on EPR contained in Hepatitis Careset)	Sera / Plasma	2-4x/month
HIV viral load PCR (on EPR contained in Specialist HIV Careset)	Plasma	1-2x/week
Influenza/RSV PCR Respiratory virus screen PCR	BAL, NPA	seasonal variation
Chlamydia species PCR, genital swab	Becton-Dickinson Chlamydia swab	daily

Investigation	Specimen type	Assay frequency
Gonococcal PCR	Becton-Dickinson Chlamydia swab	daily
Trichomonas PCR	Becton-Dickinson Chlamydia swab	daily
HSV PCR, genital sample	Becton-Dickinson Chlamydia swab	daily

APPENDIX 5: Referred Examinations

For turnaround time of referred work, see individual reference laboratory User manuals, available on the Intranet

THERAPEUTIC DRUG MONITORING

Investigation	Specimen Type	Reference Laboratory
Aciclovir	Serum / Plasma	Southmead
Amikacin level, blood	Serum / Plasma	Southmead
Choramphenicol	Serum / Plasma	Southmead
Ciprofloxacin	Serum / Plasma	Southmead
Colistin level, blood	Serum / Plasma	Southmead
Fluconazole	Serum / Plasma	Manchester Mycology Unit
5-Flucytosine level, blood	Serum / Plasma	Manchester Mycology Unit
Ganciclovir	Serum / Plasma	Southmead
HIV therapeutic drug monitoring, blood (see Specialist HIV Careset in EPR)	Serum / Plasma See Lab21 website for request forms	Lab21, Cambridge
Itraconazole level, blood	Serum / Plasma	Manchester Mycology Unit
Posaconazole	Serum / Plasma	Manchester Mycology Unit
Rifabutin	Serum / Plasma	Southmead
Rifampicin	Serum / Plasma	Southmead
Septrin	Serum / Plasma	Southmead
Streptomycin	Serum / Plasma	Southmead
Teicoplanin level, blood	Serum / Plasma	Southmead
Tobramicin level, blood	Serum / Plasma	Southmead
Voriconazole level, blood	Serum / Plasma	Manchester Mycology Unit

MYCOLOGY / SEROLOGY / ID / SENSITIVITIES

Investigation	Specimen Type	Reference Laboratory
Beta-D-glucan antigen level, specimen	Serum	Mycology Reference Lab, Bristol
Blastomycosis Ab*	Serum	Mycology Reference Lab, Bristol
Coccidioides Ab*	Serum	Mycology Reference Lab, Bristol
Galactomanan Ag	Plasma/BAL	Mycology Reference Lab, Bristol
Investigation	Specimen Type	Reference Laboratory
Histoplasma Ab*	Serum	Mycology Reference Lab, Bristol

Fungal ID	Isolate	Mycology Reference Lab, Bristol
Fungal Sensitivities	Isolate	Mycology Reference Lab, Bristol
Fungi	Isolate	Mycology Reference Lab, Bristol
*See Fungal Serology Careset on EPR		
PARASITOLOGY SEROLOGY / ID		
See 'Tropical and Travel Serology' Careset on EPR		
Investigation	Specimen Type	Reference Laboratory
Amoebic serology, blood	Serum	Dept. of Clinical Parasitology, HTD
Cryptosporidium	Stool for PCR or isolate for ID	Cryptosporidium Ref. Unit, Swansea
Cysticercosis (confirmation only, or request from Immunology)	Serum	Dept. of Clinical Parasitology, HTD
Fasciola serology, blood	Serum	Dept. of Clinical Parasitology, HTD
Filaria species Ab level, blood	Serum	Dept. of Clinical Parasitology, HTD
Hydatid Ab level, blood	Serum	Dept. of Clinical Parasitology, HTD
Leishmania Ab level, blood	Serum	Dept. of Clinical Parasitology, HTD
Malaria IFAT	Serum	Dept. of Clinical Parasitology, HTD
Schistosomal Ab level, blood	Serum	Dept. of Clinical Parasitology, HTD
Strongyloides species Ab level, blood	Serum	Dept. of Clinical Parasitology, HTD
Toxocara species Ab level, blood	Serum	Dept. of Clinical Parasitology, HTD
Trichinella species Ab level, blood	Serum	Dept. of Clinical Parasitology, HTD
Trypanosoma sp Ab level, blood	Serum	Dept. of Clinical Parasitology, HTD

MOLECULAR		
Investigation	Specimen Type	Reference Laboratory
Adenovirus PCR	EDTA	PHE Regional Laboratory, Bristol
Bacterial 16s RNA Fungal 18s RNA	Valve Tissue and other specimens by arrangement with lab.	Great Ormond Street
CMV PCR (Guthrie)	Guthrie Card	Royal Free Hospital, London
JC virus PCR	CSF	Virus Reference Laboratory, PHE Colindale
GastroPlex* (Rota, adeno, sapo, astroviruses)	Faeces	PHE Regional Laboratory, Bristol
Hepatitis A genotype/ref lab work	Serum/faeces	Virus Reference Laboratory, PHE Colindale
Hepatitis B genotypic Resistance (see Hepatitis B positive careset in EPR)	Plasma	Virus Reference Laboratory, PHE Colindale
Hepatitis D virus RNA PCR (see Hepatitis B positive careset in EPR)	Plasma	Virus Reference Laboratory, PHE Colindale
HCV Q80K polymorphism	Plasma	Royal Free (request from Hepatology only)
HIV-1 Proviral DNA screen, blood (see Specialist HIV Careset in EPR)	EDTA	Virus Reference Laboratory, PHE Colindale
HIV genotyping and Resistance blood (see Specialist HIV Careset in EPR)	Plasma	UCLH Molecular Diagnosis, London
HIV tropism testing blood (see Specialist HIV Careset in EPR)	EDTA	UCLH Molecular Diagnosis, London
HSV PCR	EDTA	PHE Regional Laboratory, Bristol
HIV 2 Viral Load	Plasma	UCLH, London
HIV 2 Resistance	Plasma	UCLH, London
Human herpes virus 6	EDTA/CSF	PHE Regional Laboratory, Bristol

Investigation	Specimen Type	Reference Laboratory
(HHV6) viral load PCR		
Human herpes virus 7 (HHV7) viral load PCR	Specimen	VRL, PHE Colindale
Human herpes virus 8 (HHV8) viral load PCR	Specimen	VRL, PHE Colindale
HTLV viral load	Plasma	St Mary's, London, NB special arrangements apply – see St Mary's website
Leishmania MCS and DN, specimen (Tropical and travel serology careset)	Biopsy	Dept. of Clinical Parasitology, HTD
Leptospira culture	Blood Culture	RIPL, Porton Down
Meningococcal PCR (Includes Pneumococcal)	EDTA/CSF	Manchester Medical Microbiology Partnership
LGV	BD Specimen	Sexually Transmitted Bacteria Ref. Lab, PHE Colindale
Norovirus (Outbreaks)	Faeces	PHE Southampton
Norovirus (Individual)	Faeces	PHE Regional Laboratory, Bristol
Parvovirus B19 viral load PCR	Serum/EDTA	Virus Reference Laboratory, PHE Colindale
Pertussis PCR	NPA/PNS	PHE Regional Laboratory, Bristol
Pneumococcal PCR	EDTA/CSF	Manchester Medical Microbiology Partnership
Rotavirus Test = GASTROPLEX	Stool (d/w lab)	PHE Regional Laboratory, Bristol
Toxoplasma PCR	CSF/amniotic fluid	Toxoplasma Reference Unit, Swansea
Whipple's PCR	EDTA/CSF	University of Leeds Molecular Pathology
BACTERIAL & VIRAL SEROLOGY		
Investigation	Specimen Type	Reference Laboratory
Bartonella species serology, blood	Serum	Bacterial Reference Department, PHE Colindale
Borrelia Western blot (confirmation)	Serum	RIPL, Porton Down
Brucella antibody (confirmation)	Serum	Brucella Special Diag. Unit, Liverpool
BK antibody	Serum	Virus Reference Laboratory, PHE Colindale

Investigation	Specimen Type	Reference Laboratory
Campylobacter serology, blood	Serum	Preston Microbiology
Chlamydia psittaci/pneumonia CFT	Serum	PHE Regional Laboratory, Bristol Send convalescent +/- acute
CMV IgG Avidity*	Serum	Royal Free Hospital, London
Coxiella burnetti antibody level, blood	Serum	PHE Regional Laboratory, Bristol Send convalescent +/- acute
Enterovirus IgM	Serum	Epsom Collaboration Centre
Diphtheria antibody	Serum	Bacterial reference Department, PHE Colindale
Hepatitis D virus serology, blood (In EPR find in Hepatitis B positive careset)	Serum	As above
HHV-6 Ab level, specimen	Serum	Virus Reference Laboratory, PHE Colindale, London
HTLV antibody (confirmation)	Serum	As above
JC antibody (usually pre-Natalizumab)	Serum	As above
Legionella antibody	Serum	Bacterial Reference Departemnt, PHE Colindale
Leptospira Ab level, blood (PCR on request for early samples)	Serum	RIPL, Porton Down
Measles Salivary kits available from HPU.	Serum CSF (?SSPE)	Virus Reference Laboratory, PHE Colindale
Mycoplasma Ab level, specimen	Serum	PHE Regional Laboratory, Bristol Send convalescent +/- acute
Mumps Salivary kits available from HPU	Serum	Virus Reference Laboratory, PHE Colindale
Bordetella pertussis antibody level, blood	Serum	Bacterial Reference Department, PHE Colindale
Polio antibody	Serum	Virus Reference Laboratory, PHE Colindale

Investigation	Specimen Type	Reference Laboratory
Rabies IgG level, blood	Serum	APHA, Weybridge
Syphilis (confirmation)	Serum	PHE Regional Laboratory, Bristol
Toxoplasma antibody(confirmation)*	Serum	Toxoplasma Reference Unit, Swansea
VZV IgG eg ?low-titre antibody responses post-vaccine	Serum	GOSH, London
Yersina antibody (Not available as of May 2015)	Serum	Bacterial Reference Department, PHE Colindale
EXOTIC VIRUSES		
See 'Tropical and Travel Serology' Careset on EPR		
Investigation	Specimen Type	Reference Laboratory
Chikungunya antibody level	Serum	RIPL, Porton Down
Dengue virus serology, blood	Serum	As above
Hantaan Virus	Serum	As above
Hendra Virus	Serum	As above
Japanese B encephalitis	Serum	As above
Nipah Virus	Serum	As above
Phlebovirus	Serum	As above
Rickettsia Ab level, blood	Serum	As above
Rift Valley Fever	Serum	As above
Ross River Fever Virus serology, blood	Serum	As above
Sinbis	Serum	As above
Tick Borne Encephalitis, serology	Serum	As above
West Nile Fever virus serology, blood	Serum/CSF	As above
Viral Haemorrhagic fever screen (includes Ebola, yellow fever, lassa, CCHF) and MERS-CoV	Whole blood/serum as requested by RIPL	As above NB discuss with Microbiology prior to obtaining samples
Zika virus	Serum/urine	As above