A User’s guide to
The Medical Microbiology
Department

An accredited laboratory, under the
Clinical Pathology Accreditation (CPA) scheme
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1. General Information

The Alder Hey Children's Medical Microbiology Department is a specialist paediatric Microbiology Laboratory which serves both the clinicians and patients of the hospital as well General Practitioners from Liverpool and the surrounding areas.

The aim of the laboratory is to provide an efficient patient-centred microbiology service which improves the investigation and management of infectious diseases in children.

Any samples that cannot be processed on-site are referred to other CPA approved laboratories.

1.1. Where To Find Us:

The entrance to the multi-story visitor car park is located off East Prescot Road. There is a drop off point for A&E patients at the Eaton Road entrance.

External visitors to the laboratory should exit the atrium via the rotating doors next to WHSmith, there is an intercom button that connects to specimen reception next to the double doors to the right.
Staff can access specimen reception on the first floor next to the large lecture theatre.

1.2. Routine Laboratory Hours

Monday – Friday  9am – 5.30pm

1.3. Out–Of–Hours Service for Urgent Tests

Biomedical Sciences Staff are on site:

- Monday – Friday  5.30pm – 11pm (Bleep 099)
- Weekends and Bank Holidays  9am – 11pm

An On-call service is available 11pm – 9am seven days a week.

The on-call Biomedical Scientist is contacted via the hospital switchboard.

Clinical cover:

The out–of–hours clinical service is currently provided jointly by the Consultant Medical Microbiologists and the Infectious Diseases Consultants.

A Consultant is available at all times for urgent clinical advice - Contact is via switchboard.
2. Contact Details

**Postal Address**  
Microbiology Department  
Alder Hey Children’s NHS Foundation Trust  
Eaton Road  
West Derby  
Liverpool  
L12 2AP

**Sat-Nav Postcode**  
L14 5AB

**Telephone**  
Main switchboard - 0151 228 4811 then request extension as indicated below

**Hays DX Address**  
DX6961702  
Old Swan 90L

**E-mail**  
microbiology@alderhey.nhs.uk

Members of staff are available on extension numbers given below during normal working hours.  
Consultant staff are contactable via switchboard.

Results / Enquiries

- **(Monday – Friday: 8.30am – 5pm)**
  
  Contact the pathology reception on ext.3591 - direct line – 0151 293 3591
  
  Any other time contact the laboratory on ext. 2268

**Please note:** Results cannot be given to or discussed with family members.

2.1. Key Personnel

2.1.1. Clinical Microbiology Consultants

<table>
<thead>
<tr>
<th>Staff member</th>
<th>Title</th>
<th>Ext.</th>
<th>Direct (0151)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr James Cargill</td>
<td>Consultant Microbiologist / Head of Department</td>
<td>2566</td>
<td>252 5566</td>
</tr>
<tr>
<td>Dr Richard Cooke</td>
<td>Director of Infection Prevention and Control / Consultant Microbiologist</td>
<td>2736</td>
<td>252 5736</td>
</tr>
<tr>
<td>Prof. Nigel Cunliffe</td>
<td>Consultant Microbiologist</td>
<td>2566</td>
<td>252 5566</td>
</tr>
</tbody>
</table>
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Please note Dr Cooke will be retiring in July 2017.

2.1.2. Senior Laboratory Scientists

<table>
<thead>
<tr>
<th>Staff member</th>
<th>Title</th>
<th>Ext.</th>
<th>Direct (0151)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mrs Christine Gerrard</td>
<td>Laboratory Manager</td>
<td>2267</td>
<td>252 5276</td>
</tr>
<tr>
<td>Mrs Teresa Barton</td>
<td>Senior Biomedical Scientist</td>
<td>2268</td>
<td>252 5268</td>
</tr>
<tr>
<td>Mrs Fiona Shaw</td>
<td>Senior Biomedical Scientist</td>
<td>4488</td>
<td></td>
</tr>
</tbody>
</table>

2.1.3. Infection Prevention and Control

<table>
<thead>
<tr>
<th>Staff member</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valya Weston</td>
<td>Associate Director of Infection Prevention and Control</td>
</tr>
<tr>
<td>Jo Keward</td>
<td>Lead Infection Control Nurse</td>
</tr>
<tr>
<td>Lisa Moore</td>
<td>Surgical Site Surveillance Coordinator / Clinical Nurse Specialist IPC</td>
</tr>
<tr>
<td>Claire Oliver</td>
<td>Clinical Nurse Specialist IPC</td>
</tr>
<tr>
<td>Carly Quirk</td>
<td>Data Analyst</td>
</tr>
<tr>
<td>Vickie Lam</td>
<td>Clinical Support</td>
</tr>
</tbody>
</table>

- The Infection Prevention and Control Team (IPCT) can be contacted by:
  - Email: infection.control@alderhey.nhs.uk,
  - Telephone: 4175 / 2485 / 2338 (Direct dial 0151 252 5485)
  - Bleep: 655 / 137
- Working hours 8am-5pm Monday-Friday
- The IPCT office is located on the 1st Floor of the clinical support block

On a daily basis the Microbiology service identifies the alert organisms that need IPCT intervention,
such as patients identified as carriers of MRSA. The IPCT liaises directly with the Microbiology Department in outbreak situations so the laboratory is aware of the volume of tests to expect. The department supports the IPC when the team needs to perform environmental testing for investigation into cases of organism transmission from patient to patient.

The Microbiology Department informs the IPC team of the positive blood cultures which fall under Public Health England's monitoring schemes, and work in conjunction when supporting the ward areas. Jointly participate in clinical validation meetings.

For patients who have been admitted for more than 3 days, stool samples must be discussed with the IPCT before they are sent to the laboratory for testing.
3. Principal Services

3.1. Clinical Service
Access to consultative and principal diagnostic services are available on a 24 hour basis.

3.2. Diagnostic Service
The department provides a comprehensive microbiological service in medical bacteriology, mycology, virology, parasitology and serological investigations. Advice on the selection of appropriate diagnostic specimens, their collection and transport is available.

3.3. Environmental Microbiology
In conjunction with the Infection Prevention and Control Department, the Microbiology department undertakes a number of screening programmes throughout the Trust. This includes water testing for the presence of *Pseudomonas aeruginosa* in water outlets and aerobiology of high risk areas.

Please note these procedures are not covered by Clinical Pathology Accreditation and are only available following discussion with the Infection Control Nursing Team and the Consultant Microbiologist.

3.4. Availability of Medical Consultant Services
Advice is available from either a Consultant Medical Microbiologist or a Consultant in Infectious Diseases and Immunology seven days a week. Consultants can be contacted using the telephone numbers above or via the hospital switchboard.

3.5. Epidemiology
The Microbiology Department reports Trust epidemiology on the Intranet (http://intranet/ClinicalSupport/SitePages/Microbiology.aspx); currently available are the results of respiratory viral PCR tests and urine susceptibilities. The department aims to expand this feature
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over time.

The laboratory also contributes to national epidemiological surveillance via Public Health England.

3.6. 'Urgent' Specimens for Microbiological Investigation

Biomedical Scientists (BMSs) are available in the laboratory between the hours of 9 am and 11 pm, 7 days a week to process any samples that are considered urgent. The BMS must be contacted in the laboratory on extension 2268 (or using bleep 099 after 5.30pm), with the details of the request and how the specimen is being transported to the laboratory.

3.7. Out of Hours On-Call Service

Every day 11pm to 9am

Requests for urgent specimens to be processed after 11pm should be directed to the on-call Biomedical Scientist through switchboard. The following requests will be processed out-of-hours:

- Urine samples on children less than 6 months of age for microscopy, culture ± direct sensitivity (if positive for leucocyte esterase or nitrites on dipstick).
  - NB. Urines should be screened by dipstick by the requestor.
  - BMS staff are only expected to process dipstick positive samples out of hours.
- Urine samples from patients with known renal problems if the dipstick is positive – no age limits apply.
- CSF microscopy and culture
  - Please ensure the sample is ready to send to the laboratory before you call the BMS in from home.
- Material from sterile sites, e.g. synovial fluid, peritoneal fluid
- Pus from deep seated abscesses

Other requests can be discussed on a case-by-case basis with the Consultant on duty.
3.8. Results of Particular Clinical Significance

Significant results are phoned through to the ward or relevant medical staff, irrespective of whether the original request is marked as urgent or routine.

3.9. Delays in the Examination Process

In the event of a significant delay in the examination of any sample, a comment will be added to the sample on Meditech and the Lead Biomedical Scientist or Consultant Microbiologist will inform the requesting doctor by email.

Delays may be due to technical failure, failure of equipment or failure to supply by the manufacturer. In the event of an extended delay samples will be sent to an accredited external laboratory for processing.

3.10. Antimicrobial Therapy

The department adheres to The European Committee on Antimicrobial Susceptibility Testing guidelines for the interpretation and reporting of antibiotic sensitivity results and antifungal sensitivity results.

Sensitivity results will be reported as:

- **S – Clinically Susceptible**: level of antimicrobial susceptibility associated with a high likelihood of therapeutic success.

- **I – Clinically Intermediate**: level of antimicrobial susceptibility associated with uncertain therapeutic effect. It implies that an infection due to the isolate may be appropriately treated in body sites where the drugs are physically concentrated or when a high dosage of drug can be used. It also indicates a buffer zone that should prevent small, uncontrolled technical factors from causing major discrepancies in interpretation.

- **R – Clinically Resistant**: level of antimicrobial susceptibility associated with a high
The microbiology results are reported to reflect both the Trust antimicrobial prescribing guidelines and the current antibiotic prescribing (if appropriate). Additional susceptibility results can be discussed with either the Microbiology or Infectious Diseases Consultants; please note however that amended reports can only be issued by the Microbiology Consultants.

The Infectious Diseases team maintain the Trust Antimicrobial and Infection Guidance on the Intranet (http://intranet/DocumentsPolicies/SitePages/Antimicrobials.aspx) for empirical guidance.

3.11. Teaching and Training

The Department of Microbiology supports scientific and professional training for its staff, as well as the teaching of science students attending local universities and colleges.

The department welcomes enquiries from staff members who require a basic insight into microbiology services. Please contact either the Laboratory Manager, Chris Gerrard, or the Head of Department, Dr James Cargill, with any enquiries.

3.12. Document Control

All bench guides and standard operating procedures used in Microbiology are controlled and managed electronically using iPassport (Genial Genetics Ltd). Laboratory standard operating procedures are based on the Public Health England Standards for Microbiological Investigations.

3.13. Patient Confidentiality

All Staff are aware of the importance of patient confidentiality; they are all required to complete the following Statuary and Mandatory training:

- Information Governance
- Safeguarding Level 1
Safeguarding Level 2

All access to Meditech and email is controlled by secure passwords which must not be shared, staff must log off shared PC’s when they leave or lock a personal PC if it is left unattended.

3.14. Requests for Results from External Agencies:
Staff must ensure that the caller is genuine; they must take a number and telephone the caller back to confirm identity. If the caller refuses no result may be given.

Any faxed results must be sent to a confidential secure fax to a named individual.

Patient data may be sent by email internally between @alderhey.nhs.uk email addresses or externally between secure @nhs.net accounts.

Personal information is not sent from Alder Hey accounts to external email accounts.

3.15. Complaints Procedure
Please contact a consultant microbiologist or the laboratory manager if you have any concerns or cause for complaint regarding any aspect of the service provided by this department.

We will endeavour to act on any concerns raised and will inform you of any actions taken.

If appropriate, an incident will be logged on the Trust Ulysses system.
4. **Labelling Requirements for Request Forms**

All requests from inpatients should be generated on the Meditech system, and will automatically state the required information. Hand written requests should only be used in Meditech down time, and must be filled in correctly.

Samples from General Practitioners and Walk-in-Centres must be accompanied by a hand written request form or a GP’s letter. The form/letter should clearly state the following information for unequivocal identification of the patient and specimen:

- Patient name (in full – no abbreviations)
- GP name and address and Clinic name if applicable
- Date of Birth
- Sex
- Type of specimen
- Date and time specimen taken

**NB** It is **ESSENTIAL** that the laboratory knows the date on which a specimen is taken: processing delayed specimens can yield unhelpful or misleading results and they may be discarded (e.g. urine samples dated 2 days prior to day of receipt).

If patients are given a request form and asked to provide a specimen from home **they should be asked to write the date on which the specimen was collected on both the container and the form and to return the sample to the Alder Hey Out-Patients department and NOT the GP surgery.** The results of samples not returned to and processed at Alder Hey may not have interpretation from a paediatric microbiologist.

Also required:

- All relevant clinical details including any recent antibiotic treatment
- History of recent foreign travel, if applicable
The Medical Microbiology Department

- Risk status, if applicable
- Date of onset and duration of illness, particularly for serology
- Specify anatomical site from which "wound" specimens were taken.
- An indication of parental / legal guardian consent must be given for HIV testing, samples cannot be processed without consent in writing.

If the laboratory cannot unequivocally identify the sample and match it to a form, then it will be discarded.

4.1. Additional Test Requests

Please telephone the laboratory before ordering additional tests to ensure that the sample is available and still suitable for examination.

Requests for extra tests must be received within the sample storage period and must have an associated Meditech request. These requests must then be e-mailed to microbiology@alderhey.nhs.uk to comply with accreditation requirements.

Requests for additional tests on referred samples must be made to the microbiology department in the same manner, and not to the referral laboratory directly.

The table below indicates how long samples are kept in the laboratory before they are discarded.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Time Kept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faeces – C&amp;S and Virology</td>
<td>2 weeks after primary culture</td>
</tr>
<tr>
<td>Faeces – <em>C. difficile</em></td>
<td>2 weeks after primary test, positive samples are stored for 3 months.</td>
</tr>
<tr>
<td>Respiratory samples for C&amp;S</td>
<td>2 weeks after primary culture</td>
</tr>
<tr>
<td>Swabs, fluids and aspirates</td>
<td>2 weeks after primary culture</td>
</tr>
<tr>
<td>Urines</td>
<td>1 week after primary culture</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Sample</th>
<th>Time Kept</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSF Samples – routine</td>
<td>2 weeks after primary culture at 4-8°C then 12 months at -80°C</td>
</tr>
<tr>
<td>Tissue</td>
<td>If there is any sample remaining after processing it will be stored for 2 weeks after primary culture.</td>
</tr>
<tr>
<td>Stained slides from positive Blood Cultures</td>
<td>A minimum of 1 week after bottle identified as positive.</td>
</tr>
<tr>
<td>Post mortem tissue</td>
<td>Any remaining sample will be stored for 2 weeks after primary culture or if requested can be returned to histopathology for humane disposal.</td>
</tr>
<tr>
<td>Mycology samples</td>
<td>Not stored as samples are processed in KOH</td>
</tr>
<tr>
<td>Samples for Respiratory Virus PCR</td>
<td>12 months at -80°C</td>
</tr>
</tbody>
</table>

Samples that are sent to referral laboratories are stored under local procedures and may not be available for additional tests, these samples are generally sent for serology or PCR analysis.

Requests for additional tests will be accommodated if at all possible but in some instances samples are not suitable for additional analysis, these include:

<table>
<thead>
<tr>
<th>Initial request</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRSA Screen swabs</td>
<td>Swabs are cultured on selective media that may compromise the recovery of additional pathogens</td>
</tr>
<tr>
<td>Stool samples for C&amp;S</td>
<td>Additional bacterial culture will only be performed within 3 days of receiving the sample due to potential overgrowth of normal flora.</td>
</tr>
<tr>
<td>Rapid Strep A Screen swabs</td>
<td>These swabs are not suitable for additional procedures due to the enzyme extraction process required for the rapid screen</td>
</tr>
<tr>
<td>Serology samples</td>
<td>The ability to add additional tests is dependent upon the test required and the initial volume of blood received.</td>
</tr>
<tr>
<td>Respiratory PCR</td>
<td>These samples are stored at -80°C and are not suitable for bacterial culture, additional PCR tests may be added after discussion with the consultant Microbiologist</td>
</tr>
<tr>
<td>CSF Viral PCR</td>
<td>PCR tests may be added after discussion with the consultant Microbiologist if sufficient sample is received.</td>
</tr>
</tbody>
</table>
5. Labelling Requirements for Specimens

When using the computer generated labels the patient details on the specimen must match those on the request form. Please contact the laboratory on Ext 2268 if there are any problems in selecting the correct order.

Samples received with a hand written request form must be labelled in block capitals with:

- Full Name as registered on Meditech
- AH Number
- DOB
- Ward
- Specimen source
- Date and time of collection

Please note that unlabelled and mislabelled repeatable specimens cannot be processed and will be discarded.

If a staff member on the ward accepts responsibility for an unrepeatable specimen (e.g. CSF) the sample may be relabelled. The staff member must come down to the laboratory to identify the sample and sign the request form. The following disclaimer will be added to the report.

“Specimen received incorrectly labelled.

No responsibility will be taken by the Microbiology Department for incorrectly labelled samples.”

Please Note: If the laboratory cannot unequivocally identify the sample and match it to a form, then it will be discarded. The laboratory will inform senders by means of an electronic or printed report when a specimen has been discarded for the above reasons.

Electronically produced requests may not be altered by hand; incorrect orders must be cancelled and re-ordered correctly.
6. **Transport of Clinical Specimens**

The air tube system is available for delivering samples directly to the Pathology Reception Area.

Samples may also be delivered by hand to the Specimen Reception Area in the Pathology department. To maintain patient confidentiality and Infection control procedures samples delivered this way must be transported in the red specimen boxes provided.

Please date stamp the samples when you drop them off, there is a machine next to the specimen box in the reception area.

9am – 11pm - Please telephone the department if you are sending an **URGENT** specimen.

Outside of this time the biomedical scientist On-Call can be contacted via the switchboard.

**Note:**

Samples of fresh tissue or frank pus collected during surgery should always be treated as urgent samples.

Following guidance from Public Health England (PHE) gastric biopsies for the detection of *Helicobacter pylori* must be received and processed as soon as possible after collection (preferably within 6 hours) to maximise the likelihood of detection.

**6.1. Storage of Non-Urgent Samples**

Non-urgent samples, with the exception of blood cultures and surgical CSF’s, should be refrigerated and sent to the department as soon as possible the next morning.

Blood cultures and CSF’s should never be refrigerated; the samples may either be kept at room temperature for transport to the laboratory the next morning or sent to the laboratory via the pod system on collection.
6.2. Packaging and Transport

ALL specimens should be placed in a separate plastic bag and sealed.

The Meditech request label should be stuck to the attached card.

Samples delivered to the laboratory by hand must be transported in the red boxes provided.

**Please contact the department if your ward/department’s box is damaged or missing**

N.B. The plastic transport bags, if properly sealed, are designed to contain accidental specimen leakage from the container. Most incidents of specimen leakage are due to the fact that neither the container nor the integral bag strips have been closed properly. If both container and transport bag are closed correctly, the practice of ‘double-bagging’, even when an infection with a Hazard Group 3 pathogen is suspected, does not confer any additional safety advantage and is, therefore, unnecessary. The specimen bags supplied have a patented leak proof sealing method and the Red Transport boxes comply with the UN3373 standard for the transportation of biological material.

Using a separate bag for individual specimens reduces the risk of contamination if a leak does occur. In the event of a spillage in the box, please contact a member of laboratory staff.

6.3. Leaking or damaged samples

Upon receipt of a sample whose integrity was compromised or which could have jeopardized the safety of the carrier or the general public the sender is contacted immediately. The sender will be informed of any measures that should eliminate recurrence; all incidents will be recorded on the Trust’s recording system, Ulysses.

The laboratory will attempt to salvage any sample for processing from leaking non-repeatable specimens such as CSF, wherever possible repeat samples will be required from repeatable samples such as urine.
7. **Standard Procedures for the Safe Collection of Specimens**

These procedures concern all clinical staff, who are qualified to collect diagnostic specimens from patients.

**N.B.** *Staff must always follow aseptic techniques when handling blood, body fluids, excretions, or secretions, even when these have not been specified as infectious.*

### 7.1. Potential Hazards

All staff must be aware of the potential physical and infectious hazards, associated with the collection of samples for microbiological investigation.

- Follow all local procedures to protect personal safety, prevent injury and exposure to biological hazards.
- Follow all local procedures to reduce the risk to colleagues who are involved with the handling, transport and laboratory investigation of specimens.

### 7.2. Safety Precautions

- Staff collecting specimens must take care to prevent contaminating themselves, their environment, the external surfaces of the specimen containers, or the accompanying test request forms.
- If gross contamination of the hands with blood, faeces or other biological fluids is anticipated, then gloves should be worn. Hands should always be washed after taking specimens. If splashing into the eyes or on to mucous membranes is anticipated goggles should be worn.
- In addition, specimens should be collected aseptically, without allowing contamination by extraneous and, therefore, irrelevant micro-organisms.

Contaminated specimens can adversely affect the validity of many laboratory results. For example,
the microbiological investigation of contaminated blood or other materials from sites, which are normally sterile, can commit patients to unwarranted courses of expensive and potentially toxic treatment.

All waste generated from obtaining a specimen should be disposed of according to the Trust's Waste Disposal Protocols.

Please disinfect the outside of any specimen containers if they are contaminated during sample collection.

7.3. Procedures for the Collection of Samples

7.3.1. Blood Culture

The Trust has a guideline for the collection of blood cultures separate to this handbook: 

The department provides three types of blood culture bottles:

- BacT/Alert PF Plus (yellow top) are designed for paediatric patients, one bottle is suitable for both aerobic and anaerobic culture.
- BacT/Alert FA Plus (green top) are for older patients, they are intended for aerobic culture only.
- BacT/Alert FN Plus (orange top) are for older patients, they are designed for anaerobic culture only.

7.3.1.1. Selecting which blood culture bottle to use

- Please do not mix and match the blood culture sets (i.e. do not send a paediatric bottle alongside either the aerobic or anaerobic bottles).
- The single paediatric PF Plus bottle is optimised for inoculum volumes of 0.5-4 ml of blood;
there is no advantage to overfilling the blood culture bottle (this may over-dilute the culture medium and affect the recovery of bacteria).

- The aerobic FA and anaerobic FN “adult” paired blood culture bottles are optimised for 8-10 ml of blood per bottle. As such, their routine use in all patients is not recommended. It is anticipated that they may be best used as routine in teenage patients, but may also be of benefit in the investigation of intra-abdominal sepsis or of pyrexia of unknown origin in other age groups. For the best bacterial yield, the inoculum volume should be as close as possible to 10 ml; there is no advantage to overfilling the blood culture bottle (this may over-dilute the culture medium and affect the recovery of bacteria).

- If infection with Mycobacterium tuberculosis is suspected please contact the laboratory as special bottles will be requested from Liverpool Clinical Laboratories for this investigation.

7.3.1.2. Collecting blood cultures

- Inspect blood culture bottles prior to use
  - The plastic lid is must be intact, check that the expiry date is valid and ensure that the culture broth is clear. The sensor in the base of the bottle should be a blue-green colour.
  - DO NOT USE A BOTTLE IF THE SENSOR IS YELLOW.

- Please return any out of date or potentially contaminated bottles to the laboratory for disposal.

- Please follow the Trust’s Blood sampling and ANTT Policies when collecting blood for culture.

- To minimise the risk of contamination please inoculate Blood Culture bottle before any other sample tubes.

- Discard from flushing CV Lines is not a suitable sample for blood cultures.

- When collecting paired blood cultures, the manufacturer’s recommendations are:
  - If collecting via a butterfly needle and adapter, inoculate the aerobic bottle first, to
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avoid adding the air from the tubing to the anaerobic bottle.

- If collecting via a syringe draw, inoculate the anaerobic bottle first to avoid injecting air from the syringe into the anaerobic bottle.

- Plastic blood culture bottles may be sent to the laboratory using the air tube system. If glass bottles arrive with the patient when transferred from another hospital they cannot be transported using the air tube and must be delivered to the laboratory by hand.

7.3.2. **CSF**

CSF samples may require processing in multiple laboratories depending on the clinical findings, e.g. meningococcal/pneumococcal PCR sent to Public Health England in Manchester. Each test requires an optimal sample volume and this should be considered when collecting the sample.

An in-house CSF PCR is currently under evaluation and is available to Critical Care and General Paediatrics (not for macroscopically blood-stained samples).

<table>
<thead>
<tr>
<th>Test</th>
<th>Sample volume (optimal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microscopy and culture</td>
<td>As much as available</td>
</tr>
<tr>
<td>In-house PCR</td>
<td>200 μl</td>
</tr>
<tr>
<td>Referred viral PCR</td>
<td>400 μl (Liverpool Clinical Laboratories)</td>
</tr>
<tr>
<td>Meningococcal/Pneumococcal PCR</td>
<td>400 μl (Meningococcal Reference Laboratory)</td>
</tr>
<tr>
<td>Mycobacteria culture</td>
<td>&gt;10 ml</td>
</tr>
</tbody>
</table>

7.3.2.1. **CSF sample aliquots**

It is usual to collect LP samples in consecutively numbered sterile universal tubes. The first tube is used to prepare the Gram stain for bacteria, while the last (typically third) tube is used for molecular testing where required. (The second tube is typically used for protein measurement in blood sciences.)
7.3.2.2. **CSF sample volumes**

<table>
<thead>
<tr>
<th>Age</th>
<th>Mean CSF Production (ml/h)</th>
<th>CSF volume (ml)</th>
<th>Safe CSF volume to take at LP (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term neonate</td>
<td>1</td>
<td>20-40</td>
<td>2-4</td>
</tr>
<tr>
<td>Infant</td>
<td>10</td>
<td>60-90</td>
<td>6-9</td>
</tr>
<tr>
<td>Young child</td>
<td>12</td>
<td>100-150</td>
<td>10-15</td>
</tr>
<tr>
<td>Adolescent</td>
<td>18</td>
<td>120-170</td>
<td>12-17</td>
</tr>
<tr>
<td>Adult</td>
<td>22</td>
<td>150-170</td>
<td>15-17</td>
</tr>
</tbody>
</table>

- Thwaites et al. Journal of Infection 59: 167 (2009); data based on studies of
  - 100 Infants & children with external ventricular drains (2002)
  - 11 adults with CNS neoplasms undergoing CSF perfusion chemo (1966)
  - 23 healthy adults undergoing 2D cine-phase contrast MRI (2004)

(with thanks to Dr Rachel Kneen.) One drop of CSF is approximately 60 μl in volume; 15 drops is therefore around 1 ml of CSF and should be adequate for the majority of molecular microbiology tests (i.e. collect at least 15 drops in the final universal tube wherever possible).

7.3.3. **Wound Samples**

7.3.3.1. **Wound swabs**

- Decontaminate the skin to remove as much of the superficial flora.
- Taking a Transwab (blue top), remove the swab and gently but firmly rotate it on the surface directly where infection is suspected.
- Do not take swabs from slough or necrotic tissue.
- Place the swab into the transport medium.
- If pus is present send as much as possible in a sterile universal container.

7.3.3.2. **Pus and exudates**

Where there are clinical signs of infection i.e. inflammation, oedema, pyrexia, pain or purulent
exudates, it is preferable to obtain a specimen of pus rather than to take a swab.

- Pus or exudates can be drawn up in a syringe and transferred to a universal container.
- If taking a Transwab (blue top), remove the swab and gently but firmly rotate it on the surface directly where infection is suspected. Do not take swabs from slough or necrotic tissue. Place the swab into the transport medium.

7.3.3.3. **Rapid Group A streptococcal screen**

A rapid test for the detection of *Streptococcus pyogenes* (Group A *Streptococcus*) is available to the Emergency Department.

- A red topped transport swab is required – blue topped swabs are not suitable.
- Once processed the red topped swabs cannot be used for additional culture.

7.3.3.4. **Helicobacter pylori culture**

If culture of a gastric biopsy for H. pylori is required, please notify the laboratory in advance; cultures must be set up promptly on receipt and not all appropriate media is kept as routine laboratory stock.

7.3.3.5. **Eye swabs**

Eye swabs for routine culture will be processed from in-patients only. All swabs from suspected ophthalmia neonatorum will be processed. A separate swab is required for each eye.

- Collect before antimicrobial therapy, where possible, and preferably before application of local anaesthetic or dye.
- Prior to collecting any samples for processing remove the exudate from the eye.
- Moisten the swab tip with normal saline to provide optimum collection for bacterial/viral/chlamydial detection.

**From infants:**

- Lay the child flat (on a bed or a parent’s knee)
- Gently fold down lower eyelid and run swab across the inner surface rotating swab to ensure optimum specimen collection.

**From older children:**
- Sit or lay the patient with the head well supported, ask the patient to look up and gently pull down the lower lid exposing the conjunctiva.
- Gently sweep the swab stick along the lower eye from the inside out taking care not to touch the eyelids. Place swab immediately into the transport tube.

Unless otherwise stated, blue Transwabs should be used for bacterial culture, any available pus should be sampled as well as the lesion of interest.

**Chlamydia detection**
- For chlamydial examination the cells from the inner canthus must be sampled.
- Separate samples must be collected into appropriate transport media for detection of viruses or chlamydiae.

7.3.4. **Urine Samples**
7.3.4.1. **Mid-stream or clean catch urine**
This includes a mid-stream specimen of urine (MSSU) or clean catch urine (CC) for culture and sensitivity and other laboratory tests
- Please ensure that the patient’s peritoneal / genital area is physically clean before collecting a urine sample for culture.
  - **For Girls**
    Clean from the front to the back and gently pat dry with clean dry sterile gauze.
  - **For Boys**
    Gently retract the foreskin and clean the entire surface with gauze soaked in the sterile water. Replace the foreskin and dry with clean sterile gauze.
- Catch the middle portion of the urine in a clean wide-mouth receptacle. Such a receptacle need not be sterile: any container, previously washed thoroughly with detergent and hot
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water and stored dry, is suitable.

- A sample of the middle portion of the urine must be poured into a 20ml universal container (white top). The pot should be labelled with the patient’s details.

7.3.4.2. Catheter urine

- When small volumes of fresh urine are required for laboratory investigations, the distal end of the catheter, or preferably the sampling port if present, must be disinfected with 70% isopropyl alcohol and urine aspirated with a sterile syringe.
- The urine must then be transferred to a 20ml universal container (white top).

7.3.5. Faeces Samples

7.3.5.1. Community-associated gastroenteritis

Routine faeces culture detects the typical causes of food poisoning; for this reason bacterial culture will not be undertaken if the child has been in hospital for three days or more. If bacterial culture is required after this period the laboratory must be notified (stool samples are routinely stored for 14 days); cases can either be discussed with one of the Consultants or with Infection Control. The culture procedure is in line with Public Health England’s protocol.

When collecting a specimen of faeces it should be obtained in a convenient container (potty, bedpan or nappy) and transferred into a blue Fecon™ container with a plastic spoon attached. The laboratory requires a “grape sized” sample for each procedure requested.

All faecal samples submitted from children with gastroenteritis will be subject to the following investigations:

- Routine microscopy for parasites*
- Routine bacterial culture for *Salmonella, Shigella, Campylobacter* and *E. coli O157***
- Routine virology for rotavirus and adenovirus will be restricted to children under 5 years of
Due to the substantial reduction of rotavirus diarrhoea cases since rotavirus vaccine introduction in the UK in 2013, rotavirus testing will be performed only during the months from January to June inclusive.

Adenovirus testing will be performed year-round.

* If parasitic infection is seriously considered three stool samples are required on alternate days. (Please note stored samples are not suitable for some parasitic investigations.)

Additional bacterial culture for *Vibrio cholerae* and *Yersinia enterocolitica* will be undertaken if clinical details suggestive e.g. for *Vibrio* sp. recent travel to an endemic area (Asia, Africa or Latin America); and mesenteric adenitis for *Yersinia* sp.

### 7.3.5.2. Viral gastroenteritis

Enteric virus PCR is available following discussion with a consultant microbiologist. Suspected cases of norovirus infection should be notified to the Infection Prevention and Control Team who will arrange appropriate testing with the laboratory.

### 7.3.5.3. Clostridium difficile

C. difficile testing will be undertaken on request only on children over two years of age.

- Samples will only be accepted for *Clostridium difficile* toxin (CDT) detection from Children over two years of age and if the sample takes the shape of the container.
- Samples from CDT positive patients will not be re-tested within 28 days unless approved by the consultant microbiologist.
- Rectal swabs are not accepted as a substitute for faeces for the above tests.

### 7.3.5.4. Threadworm detection

Cellotape collection kits are available from the department for the detection of *Enterobius*
*vermicularis* (threadworm). Stool samples are not suitable for Threadworm detection.

Ova are seldom seen in faeces therefore stool samples are not suitable for the detection of threadworm. The female worm emerges from the anus at night to lay its eggs so diagnosis of threadworm infection is by anal sampling in the morning BEFORE the patient has bathed and in girls before urination if possible.

The worm can sometimes be persuaded to emerge to lay eggs by wrapping the child in a blanket and keeping still for around 30 minutes. Negative results obtained by this method are not totally reliable.

Using the slide:

- Peel back the cellotape
- Spread the anal folds apart and firmly press the sticky side of the tape against the anus.
- Return the tape to its original position on the slide, keeping the tape as flat as possible.
- Return the slide to the petri dish provided.
- WASH YOUR HANDS
- Label the slide with a Meditech request label and send to the laboratory with the appropriate request form

7.3.6. **Respiratory Samples**

7.3.6.1. **Respiratory culture**

The laboratory will accept samples of sputum (either induced or non-induced), BAL, tracheal or endo-tracheal aspirates and cough swabs for routine culture. These should be sent in sterile universal containers, BAL traps (BAL samples only) or Transwabs (cough swabs only).

Naso-pharyngeal aspirates will not be processed for routine culture,
7.3.6.2. *Cystic fibrosis*

Additional culture for Cystic Fibrosis-associated pathogens is routinely performed for these patients.

7.3.6.3. *Bordetella pertussis*

*Bordetella pertussis* may be detected by culture, PCR, or serology.

**Culture**

- Gently insert the fine, flexible per-nasal swabs (charcoal media) swab horizontally to the back of the nose. If an obstruction is encountered, withdraw and re-insert through the other nostril.

**PCR**

Nasopharyngeal aspirates are the preferred sample for pertussis PCR

- Pertussis PCR is routinely available from PHE for acutely ill children less than 12 months of age who are admitted with respiratory illness compatible with pertussis.
  - Any PCR sample on an older child not sanctioned by a consultant microbiologist will be discarded.
- If pertussis PCR is requested two separate samples are required as swabs used for culture will not be accepted by the reference laboratory.
- Nasopharyngeal aspirates are also suitable specimens for pertussis PCR and culture; in this case a single specimen is sufficient.
- *Bordetella pertussis* may be detected on the FilmArray Respiratory PCR panel but positive samples are referred to the PHE for confirmation.

**Serology**

- For older children a clotted blood sample for pertussis antibodies may be sent or if PCR is required please contact the Consultant Microbiologist.

7.3.6.4. *Respiratory viral PCR*

The laboratory offers an in-house respiratory viral PCR; during the winter viral season (starting
when PHE recommend Palivizumab for RSV prophylaxis and ending when Influenza detection rates drop below 10% or submitted samples for two consecutive weeks) there is no restriction on testing of new patients. Outside of this period tests should be discussed with the Consultant Microbiologists or one of the Infectious Disease clinicians prior to sending (unless from a previously agreed high-risk area).

The laboratory will accept naso-pharyngeal aspirates, sputum (either induced or non-induced), BAL, tracheal or endo-tracheal aspirates sent in sterile universal containers, or combined nose and throat swabs sent in viral transport media, for PCR.

No repeat testing will be performed within a two week period unless agreed by a Consultant Microbiologist or an Infectious Diseases clinician. For PICU patients, a rapid RSV antigen test is available to identify patients who are no longer infectious (for other patient groups clearance is identified by either a minimum time period defined by the Trust policy C17 “Isolation of Patient Policy” on the Intranet, or by the resolution of clinical symptoms).

7.3.7. **Mycology Investigations**

7.3.7.1. **Skin**

Patients’ skin and nails can be swabbed with 70% alcohol prior to collection of the specimen, this is especially important if creams, lotions or powders have been applied. The edges of skin lesions yield the greatest quantities of viable fungus. Lesions should be scraped with a blunt scalpel blade. Dermapak™ collection kits are available from the department or a sterile universal is also suitable.

7.3.7.2. **Nails**

Good nail samples are difficult to obtain. It should be specified whether the sample is from the fingernails or toenails. Material should be taken from any discoloured, dystrophic or brittle parts of the nail. The affected nail should be cut as far back as possible through the entire thickness and should include any crumbly material. Nail drills, scalpels and nail elevators may be helpful but must
be sterilized between patients. If associated skin lesions are present, samples from these are likely to be infected with the same organism and are more likely to give a positive culture. Send samples to the department in a sterile universal container.

7.3.7.3. Hair
Samples from the scalp should include skin scales and plucked hairs or hair stumps. Cut hairs are not suitable for direct examination as the infected area is usually close to the scalp surface. Plastic hairbrushes, scalp massage pads or plastic toothbrushes may be used to sample scalps for culture where there is little obvious scaling but such samples do not replace a scraping for direct examination. Send samples to the department in a sterile universal container.

7.3.8. Referred tests
The laboratory refers a number of tests to external laboratories. These results are recorded on Meditech on receipt of the results; any clinical interpretation from the external laboratory is also recorded. Where additional interpretation is made by the Consultant Microbiologists this will be recorded in a separate Comment at the end of the report.

7.3.8.1. Virology
The majority of our virology testing is performed by Liverpool Clinical Laboratories; a small number of tests are sent to the Manchester Medical Microbiology Partnership or to Public Health England laboratories. The external laboratory where a test is performed is shown on the Microbiology report.

7.3.8.1.1. Choosing serology or PCR tests
Serology tests are usually required for immunocompetent individuals. The combination of IgM (for acute infection) and IgG (for immunity), can be used to determine if the infection was acquired recently or in the more distant past.

PCR testing can demonstrate the presence of genomic material (DNA or RNA) from a pathogen, but this
does not necessarily indicate an acute (primary) infection. Viral genomic material can be detected in immunocompetent individuals with no associated disease as a consequence of prolonged virus replication after acute infection, virus reactivation from latency (secondary infection) or reinfection.

In immunocompetent non-neonates, it is not appropriate to request both viral serology and PCR at the same time. For example, if screening for acute hepatitis B virus infection, by the time of presentation with hepatitis the infection is best detected by virus specific serology tests for antigens and antibodies (HBsAg and HBc antibodies). PCR tests may be appropriate following confirmation of infection to demonstrate (and quantify) ongoing viral replication (viral load tests) in chronic infections.

If PCR tests are requested it is also important to ensure that the correct samples are sent, e.g. if adenovirus infection is suspected, respiratory or faecal samples are more appropriate to test than blood for the presence of the virus, if congenital CMV infection is suspected then urine or saliva are the most appropriate samples.

Serology tests are usually poor tests for the immunocompromised (both iatrogenic or disease-related) and neonates (where maternal IgG will be present) because these individuals do not develop good antibody responses. Therefore PCR tests are generally required to both diagnose virus infection and to follow the virological response of any antiviral treatment given.

7.3.8.1.2. Viral loads
There are a number of "Viral Load" tests available; these should not be ordered unless the patient is known to be infected and you are monitoring the response to treatment. They are not appropriate tests to request for diagnosis.

7.3.8.1.3. Varicella zoster virus IgG and immunoglobulin
Public Health guidance for issuing VZ immunoglobulin is dependent on the level of VZ IgG detected. From July 2017 Liverpool Clinical Laboratories will be reporting VZ IgG results in line with
the PHE guidance:

- **VZV IgG antibodies DETECTED**
  
  Past VZV infection or vaccination: indicates immunity.

- **VZV IgG antibodies DETECTED (100-150 IU/ml)**
  
  Past VZV infection or vaccination: for immunocompetent individuals (including pregnant women) indicates protective immunity.

  If immunosuppressed or neonate AND exposed to chickenpox or shingles contact medical virologist urgently.

- **VZV IgG antibodies NOT detected**
  
  Susceptible to VZV infection (chickenpox).

  If immunosuppressed, pregnant or neonate AND exposed to chickenpox or shingles contact medical virologist urgently.

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7.3.8.1.4. **Immunoglobulins**

Immunoglobulin for chickenpox (VZVG), hepatitis B virus (HBIG) and rabies virus (RIG) requests should be discussed directly with the virologists at Liverpool Clinical Laboratories.

7.3.8.1.5. **Blood for virology and serology**

- Clotted blood samples are required for serology tests.

- Collect 1-2 ml of blood in a plain collection tube (white/clear top).

- Heparinised blood (orange top bottles) or EDTA (pink top bottles) may cause nonspecific reactions and are not suitable for testing and will be discarded.

- For DNA/RNA PCR tests from blood samples EDTA samples are required (pink top tubes).

7.3.8.1.6. **Swabs / Media for viral investigations**

<table>
<thead>
<tr>
<th>Investigation</th>
<th>Specimen container</th>
</tr>
</thead>
<tbody>
<tr>
<td>All serology tests</td>
<td>Plain sterile tube</td>
</tr>
</tbody>
</table>
### Investigation | Specimen container
--- | ---
PCR on blood samples | EDTA (pink topped bottle)
Nose/Throat swabs for respiratory virus PCR | Remel Viral Transport Media (VTM)
Respiratory aspirates for PCR | Sterile universal / Aspirate collection kits
Rapid RSV tests (ICU clearance testing only) | Aspirate collection kits
PCR from other sites such as lesions / eyes | Remel Viral Transport Media (VTM)
PCR from urine, CSF, other fluids, pus or tissue | Sterile universal
Rotavirus / Adenovirus | Fecon pot
Enteric virus PCR | Fecon pot

VTM is available from the Pathology Reception Area.

#### 7.3.8.2. Mycobacterial investigations

Specimens collected for the diagnosis of mycobacterial infection should be taken (whenever possible) before anti-tubercular treatment is started. Please note ‘Other’ antimicrobials may also have significant anti-mycobacterial activity, notably fluoroquinolones and macrolides.

Specimens other than blood or bone marrow should be refrigerated if transport to the laboratory or specimen processing is delayed for >1hr.

#### 7.3.8.2.1. Sputum specimens

Sputum specimens should be relatively fresh (less than 1 day old) to minimise contamination. Purulent specimens are best but induced samples may be helpful if the cough is dry. Three samples (including one early morning specimen) should be collected approximately 8-24 hours apart.

#### 7.3.8.2.2. Bronchoalveolar lavage/bronchial washings

These may be sent if spontaneous or induced sputum is unavailable or if such specimens are AFB
smear negative.

7.3.8.2.3. **Gastric washings**

Gastric washings are usually used for children where there are problems obtaining sputum. Young children will often swallow their respiratory secretions rather than cough them up. Induced sputum is considered preferable to gastric washings.

7.3.8.2.4. **Blood and bone marrow cultures**

Blood and bone marrow aspirate cultures should be pre-arranged with the microbiology department.

7.3.8.2.5. **Sterile site body fluids**

Please provide as much sample as possible. CSF, pleural fluid etc. should be collected into a sterile universal container. If only a small volume of CSF is available from the initial lumbar puncture, and the findings of cell counts and protein suggest TB meningitis, a second procedure should be considered to obtain a larger volume to improve the chances of achieving a positive culture.

Please note that pleural or pericardial fluids are not very sensitive samples for the detection of *M. tuberculosis*, and a pleural or pericardial biopsy should where possible be taken with the fluid.

7.3.8.2.6. **Urine specimens**

Urine specimens should be collected in the early morning on three consecutive days into a universal container (that does not contain boric acid). If there are no appropriate containers for a whole Early Morning Urine (EMU) sample, a midstream EMU sample is an acceptable, but not ideal alternative.

7.3.8.2.7. **Pus or pus swabs**

Pus, or pus swabs, should be collected aseptically, and the largest practical sample submitted for
testing. Pus is the sample type of choice. Swabs are less preferable as mycobacteria, if present, may adhere to the swab rather than be transferred successfully to the culture media.

7.3.8.3. Interferon Gamma Release Assays (IGRA)

The T-Spot TB test and Quantiferon TB test detect both active tuberculosis (TB) in patients who are not yet showing symptoms and latent TB in contacts during an outbreak situation or immunocompromised patients before reactivation occurs.

IGRA tests are referred to Liverpool Clinical Laboratories. IGRA tests can be ordered on Meditech as Quantiferon tests, the age-appropriate test will be selected by the Immunology Department at the Royal Liverpool Hospital.

IGRA tests are not accepted on Bank Holiday Mondays or any day before a bank holiday.

7.3.8.3.1. The T-Spot TB Test

- Children under 5 years of age and immunocompromised patients
- Only available on a Tuesday.
- Must be pre-arranged via the microbiology laboratory with the Immunology Department at Liverpool Clinical Laboratories.
- The sample must be received in the laboratory before 11am on the agreed date.
- 20ml of heparinised blood is required for this test.
  - If less than 15ml is received the sample may be rejected by the referral laboratory as an indeterminate result is most likely from small volume specimens.

  - **Samples must not be refrigerated.**

7.3.8.3.2. Quantiferon Test

- Children over 5 years of age and Occupational Health samples.
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- Available Monday to Thursday
- Does not need to be pre-arranged but must be in the laboratory before midday.
- 6ml of heparinised blood is required for this test.
- Samples are not suitable for testing the following day, and will be discarded if they miss the transport.

7.3.8.4. Zoonotic infection (e.g. Lyme disease) and imported diseases

Requests for zoonotic infection or imported pathogens are referred to the PHE Rare and Imported Diseases Laboratory at Porton. Referral forms for such tests require clinical information that is often not present on the Meditech request; for this reason some requests have a statement on the Meditech order referring the requester to the laboratory, e.g. for Lyme serology requests:

Lyne (Borrelia burgdorferi) serology is often not appropriate for diagnosis of an acute infection. Serology requests will not be processed without prior approval; please contact one of the Medical Microbiology consultants to discuss this request. Samples will be stored in the laboratory for one week from receipt before discarding if no approval is received.

7.3.9. Surveillance and screening for resistant organisms

The patient groups from whom surveillance and screening cultures should be sent to the laboratory can be found in the Trust policy C20 “MRSA & Surveillance Screening Policy”, available on the Intranet.

7.3.9.1. Screening for MRSA

Using Transwabs (orange top for NNU nose swabs, blue top for all other areas) moisten each swab by inserting the swab into the agar in the bottom of the transport tube prior to sampling the required area. It is important to moisten swabs before use – this improves the isolation rate of MRSA.

<table>
<thead>
<tr>
<th>Groin</th>
<th>Rotate the moistened swab gently but firmly over each area. One swab can be used for both groins.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal</td>
<td>Rotate the moistened swab gently but firmly around the anterior nares of each nostril. One swab can be used for both nostrils</td>
</tr>
</tbody>
</table>
7.3.9.2. Surveillance for multi-resistant Gram-negative bacteria

Screening samples are received from patients in critical care and high dependency areas. Samples include stool specimens, colostomy / ileostomy outputs and rectal swabs that show visible faecal matter. Throat swabs are processed from ventilated patients.

These cultures are to detect the carriage of multi-resistant bacteria in the gastrointestinal tract, in line with national guidance. To this end, the preferred specimen type is faeces itself (or the equivalent, e.g. colostomy output). Where patients are unable to provide a faeces sample directly, it is acceptable to take a swab from e.g. a nappy, making sure that the swab collects some faecal material. Samples should be collected as soon as possible after admission, but it is preferable to wait in order to collect a good specimen if faeces is not immediately available from the patient.

When collecting a rectal swab rather than faeces, the swab should be passed beyond the anus. Rectal swabs that show no faecal staining will be discarded.

7.4. Order sets

Order sets are groups of tests requested by clinical teams for specific indications in order to ensure that all the relevant investigations are performed, and may include tests outside microbiology. For example, the order set “Oncology BAL” includes requests for: routine culture, cytology, TB culture, atypical respiratory, Pneumocystis jirovecii, Aspergillus, Candida and CMV PCRs, and galactomannan (Aspergillus antigen) testing. Please check with your clinical team which order sets are in routine use for your speciality.
8. Specimen Containers

The following containers are available from the Pathology department; containers for respiratory aspirates / BALs for PCR or bacterial culture are available from hospital stores directly to the ward.

A. Paediatric BacT/Alert Blood Culture Bottle (Yellow Top)
B. Adult BacT/Alert Blood Culture Bottle – Aerobic culture (Green Top)
C. Adult BacT/Alert Blood Culture Bottle – Anaerobic culture (Orange Top)
D. Amies Transport Media for routine bacterial investigations
E. Wire pernasal swab with charcoal media for pertussis isolation or PCR – this may also be used for ear swabs.
F. Amies Transport swab for Neonatal MRSA Nose swab screens
G. Amies Liquid Media swab for Rapid Gp A Strep Detection
H. Sterile universal – For urines, CSFs, pus, hair and tissue samples
I. Fecon pot – for stool samples
J. Plain sterile tubes for clotted blood samples.
K. Cellotape slide for examination for Enterobius vermicularis (threadworms).
L. Dermapak collection kit for skin scrapings
M. EDTA tube for PCR samples
N. Viral Transport Media for Respiratory virus PCR testing from combined Nose/Throat swabs
O. Virocult swab - For viral PCR tests
P. & Q. Traps for Respiratory secretions – Please replace the vented lid with the solid lid provided.

- All specimen containers that contain transport media must be stored according to the manufacturer's instructions. The acceptable temperature range and expiry date are displayed on each swab or sample tube.
- Specimen containers must not be used if the seal is broken or after the given expiry date.
- Using an incorrectly stored or expired sample container may affect the quality of the results obtained.
- Once collected the samples must be sent to the laboratory as soon as possible to maximise the recovery of any pathogens present and prevent the overgrowth of any commensal (normal) organisms present.
- If there is a delay in transporting samples it is preferable (with the exception of blood cultures) that the samples are refrigerated, delays of >24 hours are not acceptable.
9. The Microbiology Report Explained

9.1. EMR Microbiology Display

Microbiology results are accessed using the “Microbiology” tab on the right hand side of the Meditech Physician Care Manager screen:

<table>
<thead>
<tr>
<th>Collected</th>
<th>Source</th>
<th>Procedure/Result</th>
<th>Report</th>
<th>Grid</th>
</tr>
</thead>
<tbody>
<tr>
<td>18/06/17 13:06</td>
<td>Urine Culture</td>
<td>Direct Microscopic Examination - Final</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete</td>
<td>Clean Catch</td>
<td>Urine Culture - Final</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Escherichia coli</td>
<td>Urine Screen - Final</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Microbiology Comment - Final</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If a sample is not listed, please check the orders section on Meditech to confirm an order has been placed and the sample collected. Samples are formally received on Meditech by the laboratory when they start to be processed; in many cases samples will therefore not be displayed on the EMR until the afternoon.

9.1.1. Collected

This column shows the date and time when the sample was collected, together with the status of the sample in the laboratory. This status may be:

- **Received**: The sample has been received in the laboratory. No further results will be available at this point.
- **Resulted**: The sample is currently in process and partial results are available. For example, once a sterile site sample has a Gram stain result available, the status will change from “Received” to “Resulted”.
- **Complete**: All appropriate sample processing has been completed and the final report is ready.
- **Cancelled**: The sample has received but not processed.

9.1.2. Source

This column shows the specimen type as selected when the order was placed on Meditech.
9.1.3. **Procedure/Result**

Microbiology tests are built up from a number of separate procedures which can be completed and reported separately. Isolates are highlighted in pink as shown. Each procedure is followed by an indication of the current status:

- **Pending:** No results available at this time.
- **Preliminary:** Partial or interim results are available for this procedure.
- **Complete:** Final results are available for this procedure.
- **Cancelled:** This procedure has been stopped by the laboratory.

9.1.4. **Report**

Select the clipboard icon to view the final report (discussed below).

9.1.5. **Grid**

Please do not use this option.

**9.2. Microbiology Reports**

A standard microbiology report is shown on the next page. Key features are:

A. The patient details.

B. The sample details. This section includes the clinical details entered when the sample was ordered on Meditech.

C. The results for the Microbiology procedures performed in the laboratory.

D. Abnormal results are printed in bold text on the report.

E. Where available, normal ranges are displayed alongside the test results.

F. Bacterial and viral isolates are reported by name together with the concentration if applicable.

G. Where antibiotic susceptibility results are reported, a short form of the organism name is displayed.
H. Antibiotic susceptibility results are reported as:

- **S** Sensitive to the agent
- **I** Intermediate susceptibility to the agent
- **R** Resistant to the agent

Where additional interpretation for the susceptibilities is indicated (e.g. to highlight specific resistance mechanisms of concern) these comments are reported below the susceptibilities.

I. The date the procedure was validated is displayed for each procedure

J. Positive results are clinically validated by one of the consultants; any additional interpretation is recorded here.
9.3. Validity of Results

- The department undertakes duplicate testing of samples as a means of internal quality control and also participates in a number of external quality control schemes organised by Public Health England.

- All positive Blood Culture and CSF results are validated by a Consultant Microbiologist, results may be released as preliminary verified at weekends by a Senior Biomedical Scientist, but these will be reviewed by the Consultant Microbiologist the next working day.

- Senior Scientists are competency assessed by the consultant microbiologist before they can validate any positive result.

- Whilst internal and external quality assurance programmes are in operation to ensure accuracy and precision of results, occasionally random errors may occur and escape detection.

- The clinician is often best placed to detect such errors, if you doubt the validity of any result, it is vital that you contact the department at once so that we can investigate and re-test samples whenever possible.

- Certain factors may affect and possibly invalidate some test results, causing potential biological and analytical interference. For example, haemolysed blood samples, antibiotics and type of specimen tube used.

- Please give relevant clinical details at all times including details of recent travel abroad, current treatment etc. as this will ensure that samples are processed appropriately and reduce the need for additional test requests.
10. **In-House Tests**

10.1. **Meditech Codes and Test Information**

On Meditech 6 most tests can be identified on the “New Orders” screen by typing in the first few letters of the test name from the tables below. Additional tests may be available for specific infections; if the clinical condition under investigation is not listed in the tables then additional testing can be discussed with the microbiologists.

<table>
<thead>
<tr>
<th>Name of Test</th>
<th>Specimen Container</th>
<th>Turnaround time</th>
<th>Meditech Mnemonic</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood cultures</td>
<td>Paediatric blood culture bottle</td>
<td></td>
<td></td>
<td>For the best chance of bacterial or fungal isolation, as close to the recommended maximum blood volume as possible should be inoculated.</td>
</tr>
<tr>
<td></td>
<td>(PF Plus)</td>
<td></td>
<td></td>
<td>BC.PAIRED</td>
</tr>
<tr>
<td></td>
<td>(Up to 4 ml of blood)</td>
<td></td>
<td></td>
<td>*If a fungal infection, brucellosis or endocarditis is suspected please inform the laboratory as the culture will be extended to 21 days.</td>
</tr>
<tr>
<td></td>
<td>Paired blood culture bottles</td>
<td>1-7 days*</td>
<td></td>
<td>BC.PAIRED</td>
</tr>
<tr>
<td></td>
<td>(FA Plus and FN Plus)</td>
<td></td>
<td></td>
<td>*If a fungal infection, brucellosis or endocarditis is suspected please inform the laboratory as the culture will be extended to 21 days.</td>
</tr>
<tr>
<td></td>
<td>(Up to 10 ml of blood per bottle)</td>
<td></td>
<td></td>
<td>BC.PAIRED</td>
</tr>
<tr>
<td>CSF culture and microscopy</td>
<td>Sterile universal (Min 0.5ml)</td>
<td>72 hrs</td>
<td></td>
<td>The laboratory should be informed of all urgent CSFs and they should be hand delivered to the laboratory</td>
</tr>
</tbody>
</table>

*If a fungal infection, brucellosis or endocarditis is suspected please inform the laboratory as the culture will be extended to 21 days.
<table>
<thead>
<tr>
<th>Name of Test</th>
<th>Specimen Container</th>
<th>Turnaround time</th>
<th>Meditech Mnemonic</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint aspirates</td>
<td>Pus in sterile container and blood culture bottle</td>
<td>5 days</td>
<td>WNDFLUID</td>
<td>The ideal sample to send is a sterile container with pus. Swabs of the joint space are not ideal samples as they cannot be sent for PCR or molecular detection. Inoculation of a blood culture bottle will increase yield, particularly of fastidious organism.</td>
</tr>
<tr>
<td>Wound swabs / Pus / Fluids etc.</td>
<td>Sterile universal or swab</td>
<td>72-96 hrs</td>
<td>WND</td>
<td>Pus in a universal is always the preferred sample to a wound swab. The best routine sample is a clean catch specimen. Bag samples may be contaminated with skin flora.</td>
</tr>
<tr>
<td>Urines – C&amp;S</td>
<td>Sterile universal (2-3mls)</td>
<td>48 hrs</td>
<td>URINE</td>
<td></td>
</tr>
<tr>
<td>Respiratory samples for routine C&amp;S</td>
<td>Sterile universal conical tube or swab</td>
<td>72-96 hrs</td>
<td>RESPCS (non CF Patient)</td>
<td>NPA samples are not suitable for routine culture and will be discarded.</td>
</tr>
<tr>
<td>Nose and Throat swabs</td>
<td>Amies Transport Swab</td>
<td>48 - 72 hrs</td>
<td>ENTR</td>
<td></td>
</tr>
<tr>
<td>Eye and Ear swabs</td>
<td>Amies Transport Swab or Wire Charcoal Swab</td>
<td>48 - 72 hrs</td>
<td>ENTR</td>
<td>Only eye swabs from In-Patients, Rainbow and Ophthalmology clinics are cultured routinely</td>
</tr>
<tr>
<td>Pertussis Culture</td>
<td>Wire Charcoal Swab / NPA</td>
<td>Up to 10 days</td>
<td>ENTP</td>
<td>If sending a pernasal swab and the child is &lt;12mths of age and is admitted,</td>
</tr>
<tr>
<td>Name of Test</td>
<td>Specimen Container</td>
<td>Turnaround time</td>
<td>Meditech Mnemonic</td>
<td>Comments</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>--------------------</td>
<td>-----------------</td>
<td>-------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Throat and Rectal Surveillance swabs</td>
<td>Amies Transport Swabs</td>
<td>72 - 96 hrs</td>
<td>SURV*</td>
<td>Please send a second sample for PCR Faeces samples are preferred to Rectal swabs. Throat swabs are accepted from critical care / cardiac patients only</td>
</tr>
<tr>
<td>Corneal scraping</td>
<td>Sterile Universal</td>
<td>1-7 days - organism dependant</td>
<td>ENTR – CORNEA for C&amp;S ACANTHA for Acanthamoeba</td>
<td></td>
</tr>
<tr>
<td>S. aureus screening</td>
<td>Amies Transport swab</td>
<td>48 hrs</td>
<td>SCRSA</td>
<td>This is the request for culture for PCR see below</td>
</tr>
<tr>
<td>Eye swabs for gonorrhoea</td>
<td>Charcoal swab</td>
<td>48 - 72 hrs</td>
<td>SCRGC</td>
<td></td>
</tr>
<tr>
<td>CAPD fluid</td>
<td>Sterile Universal</td>
<td>48 - 72 hrs</td>
<td>WNDFLUID</td>
<td></td>
</tr>
<tr>
<td>MRSA Screen</td>
<td>Amies Transport swab</td>
<td>48 hrs</td>
<td>SCRMRSA*</td>
<td>Please note there are different options for specific patient groups – Use F9 look up for details.</td>
</tr>
<tr>
<td>Rapid Group A Strep Test</td>
<td>Liquid Amies transport swab</td>
<td>3 hours <strong>A&amp;E Only</strong> Same day for other wards</td>
<td>STREPA</td>
<td></td>
</tr>
</tbody>
</table>

** Stool samples **
<table>
<thead>
<tr>
<th>Name of Test</th>
<th>Specimen Container</th>
<th>Turnaround time</th>
<th>Meditech Mnemonic</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faeces for microscopy</td>
<td>Fecon™ container (1-2ml)</td>
<td>24 hours</td>
<td>FMICRO</td>
<td>Please notify the laboratory if there is a history of foreign travel as additional cultures may be required. Virology tests are performed less frequently out of season – samples are not tested for clearance purposes.</td>
</tr>
<tr>
<td>Faeces for C&amp;S and virology</td>
<td>Fecon™ container (1-2ml)</td>
<td>72hrs</td>
<td>FCV</td>
<td>Samples will only be accepted for Clostridium difficile toxin (CDT) detection from Children over two years of age and if the sample takes the shape of the container. Samples from CDT positive patients will not be re-tested within 28 days unless approved by the consultant microbiologist.</td>
</tr>
<tr>
<td><em>Clostridium difficile</em> Toxin Detection</td>
<td>Fecon™ container (1-2ml)</td>
<td>24hr</td>
<td>FCLDIFF</td>
<td>N.B. Stool samples are NOT suitable for examination for threadworms and will be discarded.</td>
</tr>
<tr>
<td>Cellotape slide for Threadworm detection</td>
<td>Cellotape kit available from Microbiology</td>
<td>24hr</td>
<td>CELLO</td>
<td>N.B. Stool samples are NOT suitable for examination for threadworms and will be discarded.</td>
</tr>
<tr>
<td><em>Helicobacter pylori</em> antigen</td>
<td>Fecon™ container (1-2ml)</td>
<td>4 days</td>
<td>FHPAG</td>
<td>N.B. Stool samples are NOT suitable for examination for threadworms and will be discarded.</td>
</tr>
</tbody>
</table>

Other
<table>
<thead>
<tr>
<th>Name of Test</th>
<th>Specimen Container</th>
<th>Turnaround time</th>
<th>Meditech Mnemonic</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fungal culture and Microscopy</td>
<td>Dermapak™ type 3 envelopes (5-10 skin flakes or hairs, 4-5 nail clippings)</td>
<td>1 - 4 weeks</td>
<td>FUNGDMC</td>
<td>Larger samples may be sent in sterile universals, some isolates may be sent to a reference laboratory, delaying the final report.</td>
</tr>
<tr>
<td>TB Culture*</td>
<td>Sterile universal or swab</td>
<td>4 weeks</td>
<td>TB</td>
<td>*Contact the laboratory if TB Blood cultures are required as they require special culture bottles.</td>
</tr>
<tr>
<td>Virology tests performed on-site</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory Virus PCR</td>
<td>Conical tube, Universal, nose / throat in virus transport media or aspirates in sterile container</td>
<td>Urgent samples within 3 hours*</td>
<td>RESPVIRALPCR</td>
<td>Samples are processed one at a time and must be prioritised – Test is available routinely (Oct – Mar**)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Test is only available to high risk patients (PICU, HDU and Oncology) out of season (Apr – Sep**).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>** Dates are approximate and will be assessed on an annual basis.</td>
</tr>
<tr>
<td>Meningitis / Encephalitis PCR</td>
<td>Sterile universal -200μl sample</td>
<td>Within 3 hours</td>
<td>CSFFILMARRAY</td>
<td>Please not this procedure is not available to ward order.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>This test is available to PICU and general paediatric patients only and is added to a routine CSF C&amp;S procedure</td>
</tr>
<tr>
<td>Name of Test</td>
<td>Specimen Container</td>
<td>Turnaround time</td>
<td>Meditech Mnemonic</td>
<td>Comments</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------------------------</td>
<td>-----------------</td>
<td>-------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Rapid RSV*</td>
<td>Conical tube – NPA -1ml</td>
<td>Within 24 hours</td>
<td>RSV</td>
<td>*RSV tests are available for clearance testing from ICU patients only.</td>
</tr>
<tr>
<td>Rotavirus/Adenovirus</td>
<td>Fecon™ container – 1-2ml Faeces</td>
<td>Usually within 24 hours</td>
<td>FCV</td>
<td>Tests are performed less frequently out of season – samples are not tested for clearance purposes</td>
</tr>
</tbody>
</table>

**Serology tests performed on site**

<table>
<thead>
<tr>
<th>Anti DNase b &amp; ASOT</th>
<th>1-2ml Clotted blood in a plain white tube</th>
<th>1 week</th>
<th>ANTIDNAB</th>
<th>For interpretation purposes an ASOT is always performed with this test</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASOT</td>
<td>1-2ml Clotted blood in a plain white tube</td>
<td>Same day for screen, titres will be performed within 7 days</td>
<td>ASOT</td>
<td>A screening test will be performed initially; positive results will be further investigated.</td>
</tr>
</tbody>
</table>
11. Referred Tests

<table>
<thead>
<tr>
<th>Tests sent to referral laboratories</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General serology tests</strong></td>
</tr>
<tr>
<td><strong>HIV serology</strong></td>
</tr>
<tr>
<td><strong>Needle stick serology</strong></td>
</tr>
</tbody>
</table>

Please contact the laboratory on ext.2268 if you require any further information or if any result is required urgently, we will notify the referral laboratory in advance of any urgent request.

11.1. Meditech Codes and Test Information

On Meditech 6 most tests can be identified on the “New Orders” screen by typing in the first few letters of the test name from the tables below.

Additional tests may be available for specific infections; if the clinical condition under investigation is not listed in the tables then additional testing can be discussed with the microbiologists.
11.1.1. **Viral Serology**

Commonly requested serological tests orderable from the EMR:

<table>
<thead>
<tr>
<th>Name in Order Entry</th>
<th>Tests Done</th>
<th>Referral Lab</th>
<th>Sample type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute hepatitis diagnosis</td>
<td>HBsAg, HBC, HAV IgG &amp; IgM, HCV Ab</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Adoption screen</td>
<td>HIV Ag &amp; Ab, HBsAg, HCV Ab, Syphilis serology</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>BMT donor screen</td>
<td>HBsAg, anti-HBC, HCV Ab, HIV Ag &amp; Ab, CMV IgG, EBV VCA IgG, HTLV 1&amp;2,</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td></td>
<td>Syphilis, Toxoplasma IgM &amp; IgG, HSV IgG, VZV IgG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiomyopathy screen</td>
<td>Parvovirus IgG &amp; IgM, Toxoplasma IgG &amp; IgM</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Chronic hepatitis diagnosis</td>
<td>HBsAg, HBC, HAV Ab, HCV Ab</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>CMV diagnosis</td>
<td>CMV IgG &amp; IgM</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>CMV immunity</td>
<td>CMV IgG</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Congenital infection screen</td>
<td>Toxoplasma IgM &amp; IgG, CMV IgG &amp; IgM</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Dialysis screen</td>
<td>HBsAg, HCV Ab, HIV Ag &amp; Ab</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>EBV diagnosis (symptomatic)</td>
<td>EBV VCA IgM &amp; IgG</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>EBV immunity</td>
<td>EBV VCA IgG</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Hepatitis A - immunity status</td>
<td>HAV Ab</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Hepatitis B surface antigen</td>
<td>HBsAg</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>HepatitisB post vaccine status</td>
<td>anti-HBs</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Hep B core Ab - Gastro team only</td>
<td>HBc</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Name in Order Entry</td>
<td>Tests Done</td>
<td>Referral Lab</td>
<td>Sample type</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-----------------------------------------------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Hepatitis C antibody</td>
<td>HCV Ab</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>HIV serology</td>
<td>HIV Ab &amp; Ag</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>HIV serology – Rainbow</td>
<td>HIV Ab &amp; Ag</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Hodgkins – hepatitis screen</td>
<td>HCV Ab, HBcAb, HBsAg, HAV Ab</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>LAC serology</td>
<td>HIV Ag &amp; Ab, HBsAg, HCV Ab, Syphilis serology</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Measles diagnosis</td>
<td>Measles IgG &amp; IgM</td>
<td>MRI</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Measles immunity</td>
<td>Measles IgG</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Mumps diagnosis</td>
<td>Mumps IgG &amp; IgM</td>
<td>MRI</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Mumps immunity</td>
<td>Mumps IgG</td>
<td>MRI</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Needlestick – donor</td>
<td>HIV Ag &amp; Ab, HBsAg, HCV Ab</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Needlestick – recipient</td>
<td>anti-HBs, serum to store</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Oncology – pre sperm collection</td>
<td>HIV Ag &amp; Ab, HBsAg, HBcAb, HCV Ab</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Organ donor screen</td>
<td>HBsAg, anti-HBc, HCV Ab, HIV Ag &amp; Ab, CMV IgG, EBV VCA IgG, HTLV 1&amp;2, Syphilis, Toxoplasma IgM &amp; IgG</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Parovirus serology</td>
<td>Parovirus IgM and IgG</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Rainbow viral serology</td>
<td>HIV Ag &amp; Ab, HBsAg, HBcAb, HCV Ab, Syphilis serology</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Renal dialysis bld borne virus</td>
<td>HBsAg, HCV Ab, HIV Ag &amp; Ab</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Renal nephrotic</td>
<td>HBsAg, HCV Ab, CMV IgG, EBV IgG</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Renal pre transplant baseline</td>
<td>HBsAg, anti-HBc, HCV Ab, CMV IgG, EBV IgG, Measles IgG, VZ IgG, HIV</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Name in Order Entry</td>
<td>Tests Done</td>
<td>Referral Lab</td>
<td>Sample type</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>------------------------------------------------</td>
<td>--------------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td>Ag &amp; Ab</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Renal transplant A/R</td>
<td>HBsAg, anti-HBc, HCV Ab, Measles IgG, VZ IgG</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Renal transplant base returned</td>
<td>HBsAg, anti-HBc, HCV Ab, CMV IgG, EBV IgG</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Rubella diagnosis</td>
<td>Rubella IgG &amp; IgM</td>
<td>MRI</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Rubella immunity</td>
<td>Rubella IgG</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Store sample</td>
<td></td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Transplant recipient screen</td>
<td>HBsAg, anti-HBc, HCV Ab, HIV Ag &amp; Ab, CMV IgG,</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td></td>
<td>VZV IgG, EBV VCA IgG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VZ diagnosis</td>
<td>Varicella IgG &amp; IgM</td>
<td>MRI</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>VZ immunity</td>
<td>Varicella IgG</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
</tbody>
</table>

11.1.2. Molecular Tests

<table>
<thead>
<tr>
<th>Name in Order Entry</th>
<th>Referral Lab</th>
<th>Sample type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspergillus PCR</td>
<td>MRI</td>
<td>BAL, EDTA Blood</td>
</tr>
<tr>
<td>Atypical resp pathogens PCR</td>
<td>LCL</td>
<td>BAL</td>
</tr>
<tr>
<td>NB. Includes <em>Chlamydia</em>, <em>Mycoplasma</em> and <em>Legionella</em> – not usually indicated if in-house respiratory PCR has been performed or <em>Legionella</em> infection thought likely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BK virus PCR</td>
<td>LCL</td>
<td>EDTA Blood, Urine</td>
</tr>
<tr>
<td>Name in Order Entry</td>
<td>Referral Lab</td>
<td>Sample type</td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>BK/JC virus PCR</td>
<td>LCL</td>
<td>CSF</td>
</tr>
<tr>
<td>Bordetella PCR</td>
<td>MRI</td>
<td>PNS, NPA</td>
</tr>
<tr>
<td>Candida PCR</td>
<td>MRI</td>
<td>BAL, EDTA Blood</td>
</tr>
<tr>
<td>Chlamydia/GC PCR (GC; <em>Neisseria gonorrhoea</em>)</td>
<td>LCL</td>
<td>Urine, Eye, Genital samples, Rectal swabs</td>
</tr>
<tr>
<td>CMV PCR (NOT BLOOD) (Cytomegalovirus PCR)</td>
<td>LCL</td>
<td>BAL, CSF, Urine</td>
</tr>
<tr>
<td>CSF PCR - HSV, VZ, Enterovirus</td>
<td>LCL</td>
<td>CSF</td>
</tr>
<tr>
<td>EBV PCR (NOT BLOOD) (Epstein-Barr virus PCR)</td>
<td>LCL</td>
<td>CSF, Bone marrow</td>
</tr>
<tr>
<td>Enterovirus PCR</td>
<td>LCL</td>
<td>Faeces, throat swab</td>
</tr>
<tr>
<td>Hepatitis B PCR</td>
<td>LCL</td>
<td>EDTA Blood</td>
</tr>
<tr>
<td>Hepatitis C PCR</td>
<td>LCL</td>
<td>EDTA Blood</td>
</tr>
<tr>
<td>HHV 6 PCR (Human herpesvirus 6 PCR)</td>
<td>MRI</td>
<td>EDTA Blood</td>
</tr>
<tr>
<td>HHV 6/7 PCR (Human herpesvirus 6 &amp; 7 PCR)</td>
<td>MRI</td>
<td>EDTA Blood</td>
</tr>
<tr>
<td>HHV 6 PCR (Human herpesvirus 7 PCR)</td>
<td>MRI</td>
<td>EDTA Blood</td>
</tr>
<tr>
<td>HIV PCR – Proviral DNA</td>
<td>VRD, Colindale</td>
<td>EDTA Blood</td>
</tr>
<tr>
<td>HIV PCR – Viral load</td>
<td>LCL</td>
<td>EDTA Blood</td>
</tr>
<tr>
<td>HIV Resistance testing</td>
<td>LCL</td>
<td>EDTA Blood</td>
</tr>
<tr>
<td>HIV tropism determination</td>
<td>LCL</td>
<td>EDTA Blood</td>
</tr>
</tbody>
</table>
The Medical Microbiology Department

<table>
<thead>
<tr>
<th>Name in Order Entry</th>
<th>Referral Lab</th>
<th>Sample type</th>
</tr>
</thead>
<tbody>
<tr>
<td>JC virus PCR</td>
<td>LCL</td>
<td>CSF</td>
</tr>
<tr>
<td>Measles PCR</td>
<td>MRI</td>
<td>Throat swab, Urine</td>
</tr>
<tr>
<td>Mumps PCR</td>
<td>MRI</td>
<td>CSF, Throat swab, Urine, saliva</td>
</tr>
<tr>
<td>Meningococcal/Pneumococcal PCR</td>
<td>MRI</td>
<td>CSF, EDTA Blood</td>
</tr>
<tr>
<td>Parvovirus PCR</td>
<td>LCL</td>
<td>EDTA Blood</td>
</tr>
<tr>
<td>Pneumocystis jirovecii PCR</td>
<td>LCL</td>
<td>BAL</td>
</tr>
<tr>
<td>Renal PCR – Adeno, EBV, CMV, BK</td>
<td>LCL</td>
<td>EDTA Blood</td>
</tr>
<tr>
<td>Toxoplasma PCR</td>
<td>MRI</td>
<td>EDTA Blood, CSF</td>
</tr>
<tr>
<td>Viral blood PCR- Adeno,EBV,CMV</td>
<td>LCL</td>
<td>EDTA Blood</td>
</tr>
<tr>
<td>Viral eye PCR – HSV, VZ, Adeno</td>
<td>LCL</td>
<td>Viral swab</td>
</tr>
<tr>
<td>Vesicle fluid – HSV,VZ, Entero</td>
<td>LCL</td>
<td>Viral swab</td>
</tr>
</tbody>
</table>

11.1.3. Miscellaneous serology

<table>
<thead>
<tr>
<th>Name in Order Entry</th>
<th>Referral Lab</th>
<th>Sample type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspergillus precipitans</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Bordetella pertussis serology</td>
<td>RVPBRU, Colindale</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Name in Order Entry</td>
<td>Referral Lab</td>
<td>Sample type</td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Brucella serology</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Cryptococcal antigen</td>
<td>PHE, Bristol</td>
<td>CSF</td>
</tr>
<tr>
<td>E.coli 0157 serology</td>
<td>GBRU, Colindale</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Func. Ab. (Hib &amp; Pneumo only) (Haemophilus and pneumococcal functional antibody screen)</td>
<td>SNGH</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Functional Abs (ID team only) (Haemophilus, tetanus and pneumococcal functional antibody screen)</td>
<td>SNGH</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Galactomannan test (Aspergillus antigen)</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Interferon Gamma Release Assay</td>
<td>Immunology, LCL</td>
<td>Heparin Blood</td>
</tr>
<tr>
<td>Leptospira serology</td>
<td>LHTD</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Lyme serology</td>
<td>PHE, Porton</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Mycoplasma serology</td>
<td>MRI</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Pneumo specific antibodies</td>
<td>MRI</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Pneumococcal antigen</td>
<td>LCL</td>
<td>Urine</td>
</tr>
<tr>
<td>Q fever serology</td>
<td>PHE, Porton</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Rickettsia serology</td>
<td>PHE, Porton</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Syphilis serology</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Name in Order Entry</td>
<td>Referral Lab</td>
<td>Sample type</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Toxocara screen</td>
<td>LHTD</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Toxoplasma serology</td>
<td>LCL</td>
<td>Clotted blood</td>
</tr>
<tr>
<td>Urine – Legionella antigen</td>
<td>LCL</td>
<td>Urine</td>
</tr>
</tbody>
</table>

11.1.4. **Culture**

<table>
<thead>
<tr>
<th>Name in Order Entry</th>
<th>Referral Lab</th>
<th>Sample type</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB culture &amp; sensitivity</td>
<td>LCL</td>
<td>Various sample types</td>
</tr>
</tbody>
</table>

11.2. **Specimen types**

<table>
<thead>
<tr>
<th>Test</th>
<th>Sample required</th>
<th>Comments and expected turnaround times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viral Serology</td>
<td>Plain tube – Clotted blood</td>
<td>Clinical details are particularly important when requesting viral serology including date of onset of symptoms. Paired samples may be required to assess change in antibody titre. For HIV testing documentation of patient consent is required. Results are usually available within 7-10 days</td>
</tr>
<tr>
<td>Bacterial / parasite serology</td>
<td>Plain tube – Clotted blood</td>
<td>Clinical details are particularly important when requesting serology including date of exposure and onset of symptoms. Paired samples may be required to assess change in antibody titre. Results are usually available within 7-10 days</td>
</tr>
<tr>
<td>Test</td>
<td>Sample required</td>
<td>Comments and expected turnaround times</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>----------------------------------------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>PCR Tests/HIV viral loads</td>
<td>Blood sample – pink EDTA tube</td>
<td>For HIV testing written / electronic documentation of patient consent is required.</td>
</tr>
<tr>
<td></td>
<td>CSF samples – Sterile universal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Respiratory – Sterile container</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tissue / Chlamydia samples – Virus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transport media</td>
<td></td>
</tr>
<tr>
<td>Atypical Respiratory PCR</td>
<td>Sterile container</td>
<td>Samples are transported daily at 12.00 p.m. (Mon-Fri only) and results are usually available within 7 days.</td>
</tr>
<tr>
<td>Functional antibodies</td>
<td>Plain tube – Clotted blood</td>
<td>Used to measure the patient’s response to vaccination against haemophilus, pneumococci (pneumovax) and tetanus.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Please request only the tests required and when available please include any relevant vaccination details. Results are reported within 21 days.</td>
</tr>
<tr>
<td>Pneumococcal specific antibody screen</td>
<td>Plain tube – Clotted blood</td>
<td>For testing post Prevenar vaccination. Results are reported within one month.</td>
</tr>
<tr>
<td>Mycobacterium culture</td>
<td>As required.</td>
<td>Samples are transported daily at 10am (Mon-Fri only). Positive microscopy will be reported on day of receipt by the referral laboratory. Mycobacterial culture can take up to 4 weeks to be reported. Any positive results will be notified as received. Microscopy for Acid Fast Bacilli can be done on site if URGENT. Microscopy will NOT be performed on urine samples.</td>
</tr>
<tr>
<td>Aspergillus precipitins/Galactomannan test for</td>
<td>Plain tube – Clotted blood</td>
<td>Results reported in 7-10 days.</td>
</tr>
<tr>
<td>Test</td>
<td>Sample required</td>
<td>Comments and expected turnaround times</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>--------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Aspergillus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IGRA – Interferon Gamma Release Assay</td>
<td>Heparin Blood Sample</td>
<td>This test must be booked in advance – testing is only available on Tuesdays. The blood sample must be collected and delivered to the department before 11am on the day of testing.</td>
</tr>
<tr>
<td>T-Spot TB test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantiferon Gold Test</td>
<td>Heparin Blood Sample</td>
<td>This test is available Monday – Thursday but the sample must be collected and delivered to the department before 1pm on the day of testing. Samples are not suitable for testing the next day. Samples cannot be accepted on the day before a Bank Holiday or on Bank Holiday Mondays.</td>
</tr>
</tbody>
</table>

Please note: Some serology samples will be batched before they are sent to a PHE reference laboratory.
### 12. List of Referral Laboratories

The Microbiology Department refers work to the following CPA accredited laboratories:

**PHE = Public Health England**

<table>
<thead>
<tr>
<th>Laboratory</th>
<th>Description</th>
<th>Address</th>
</tr>
</thead>
</table>
| **LCL** | Liverpool Clinical Laboratories  
- Microbiology Department  
- Immunology Department  
- Virology Department | Royal Liverpool and Broadgreen University Hospitals NHS Trust  
Duncan Building  
Prescot Street  
Liverpool  
L7 8XP |
| **PHE, Colindale** | Antibiotic Resistance and Healthcare Associated Infections (AMRHAI)  
Respiratory and Vaccine Preventable Bacteria Reference Unit (RVPBRU)  
Gastrointestinal Bacteria Reference Unit (GBRU)  
Sexual Transmitted Bacteria Reference Unit (STBRU)  
Virus Reference Department (VRD) | Centre for Infection  
Public Health England  
61 Colindale Avenue  
London  
NW9 5EQ |
| **ARL** | Antimicrobial Reference Laboratory | Department of Medical Microbiology  
North Bristol NHS Trust  
Southmead Hospital  
Bristol  
BS10 5NB |
| **LHTD** | Department of Parasitology | The Hospital for Tropical Diseases  
Mortimer Market  
LONDON  
WC15 6AU |
| **SNGH** | Department of Immunology | Sheffield Northern General Hospital  
PO Box 894,  
SHEFFIELD,  
S5 7YT |
| **LSTM** | The Diagnostic Laboratory | Liverpool School of Tropical Medicine  
Pembroke Place  
Liverpool  
L3 5QA |
<table>
<thead>
<tr>
<th>Institution</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI</td>
<td>Manchester Medical Microbiology Partnership</td>
</tr>
<tr>
<td></td>
<td>PO Box 209</td>
</tr>
<tr>
<td></td>
<td>Clinical Sciences Building</td>
</tr>
<tr>
<td></td>
<td>Manchester Royal Infirmary</td>
</tr>
<tr>
<td></td>
<td>Oxford Road</td>
</tr>
<tr>
<td></td>
<td>Manchester</td>
</tr>
<tr>
<td></td>
<td>M13 9WZ</td>
</tr>
<tr>
<td>GOSH</td>
<td>Level 4 Camelia Botnar Laboratories</td>
</tr>
<tr>
<td></td>
<td>Great Ormond Street Hospital NHS Foundation Trust</td>
</tr>
<tr>
<td></td>
<td>Great Ormond Street</td>
</tr>
<tr>
<td></td>
<td>London</td>
</tr>
<tr>
<td></td>
<td>WC1N 3JH</td>
</tr>
<tr>
<td>PHE, Porton</td>
<td>Rare and Imported Pathogens Laboratory</td>
</tr>
<tr>
<td></td>
<td>Porton Down</td>
</tr>
<tr>
<td></td>
<td>Salisbury</td>
</tr>
<tr>
<td></td>
<td>Wiltshire</td>
</tr>
<tr>
<td></td>
<td>SP4 0JG</td>
</tr>
<tr>
<td>UHSM</td>
<td>Regional Mycology Laboratory</td>
</tr>
<tr>
<td></td>
<td>2nd Floor Laboratory, Education and Research Centre</td>
</tr>
<tr>
<td></td>
<td>Wythenshawe Hospital</td>
</tr>
<tr>
<td></td>
<td>Southmoor Road</td>
</tr>
<tr>
<td></td>
<td>Manchester</td>
</tr>
<tr>
<td></td>
<td>M23 9LT</td>
</tr>
<tr>
<td>PHE, Birmingham</td>
<td>Public health laboratory Birmingham</td>
</tr>
<tr>
<td></td>
<td>Heart of England NHS Foundation Trust</td>
</tr>
<tr>
<td></td>
<td>Bordesley Green East</td>
</tr>
<tr>
<td></td>
<td>Birmingham</td>
</tr>
<tr>
<td></td>
<td>B9 5SS</td>
</tr>
</tbody>
</table>
13. Useful links

  
PHE provides information to both the public and healthcare professionals in respect to infectious diseases.

- **The European Committee on Antimicrobial Susceptibility Testing**: [www.eucast.org](http://www.eucast.org)
  
EUCAST is associated with the European Society of Clinical Microbiology and Infectious Diseases and deals with antimicrobial breakpoints and technical aspects of in vitro susceptibility testing.

- **Dr Fungus**: [www.doctorfungus.org](http://www.doctorfungus.org)
  
Contains images and information on fungal infections.

We welcome any suggestions on how this user manual can be improved, please forward these comments to:

Mrs Christine Gerrard  
Microbiology Laboratory Manager  
Alder Hey Children’s NHS Foundation Trust  
Eaton Road  
West Derby  
Liverpool L12 2AP  
chris.gerrard@alderhey.nhs.uk  
Alder Hey Ext. 2267  
Direct line: 0151 252 5267

Last review date: June 2017