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Additional copies of this SOP must not be made without prior approval and documentation. Refer to SOP G94.

Issue No.	Revision Details	Effective Date
1.01	Added Quantiferon TB's and stools for parasitology. Updated issue numbering system. Was 5. New issue number is 1.01. Biomnis Ireland update.	18/09/2012
1.02	Added reference to consultant.	25/10/2012
2.01	Complete restructure of the PSM (Sample type instead of organism).	11/04/2014
2.02	Added reasons for rejection of samples/non reporting of tests and note on TAT's.	25/04/14
2.03	Update to blood culture (samples ideally received within 4 hours) and H.pylori (watery stools not suitable) sections. Added document review history.	23/05/14
2.04	Addition of: Dynex DS2, urine dipstick, MDR Screen, urine OCP sample information, H. pylori sample stability. Removal of Norovirus and FOB testing. Updating of the accreditation status of faecal c+s and C. difficile testing.	08/03/16
2.05	Updated the accreditation status for blood cultures and ESBL/VRE/CRE screening. Removal of Norovirus and FOB from index.	15/11/16
3.01	Eurofins Biomnis rebranding. Updated Blood Culture SOP Number. Added details for mouth swab sampling recommendations. Changed H.pylori to state samples MUST be stored at fridge temperature following sampling for up to 72 hours.	24/05/17
3.02	Addition of blood culture transport and storage temperature. Sample stability for C. Difficile Toxin testing updated. Urine dipstick performed Saturday. CRE renamed to CPE change of SOP number. Additional information supplied for rejection of samples. Updated turnaround time for sterile fluids and tissues/biopsies. ESBL/VRE/CPE Screen is performed on rectal swab and faeces. Updated web address.	09/08/18

CONTENTS

REJECTION OF SAMPLES/NON-REPORTING OF TESTS

1. Samples received beyond the stability limits and/or not at the correct temperature indicated for each test *.

2. Incorrect sample type received.

3. Samples received without the necessary patient identifiers. For more details, see here.

*In certain circumstances and in discussion with the Consultant Microbiologist samples may be processed beyond their stability limits, this remains at the discretion of Eurofins Biomnis.

While every effort is made to ensure that the TAT's stated in this PSM are adhered to, they do remain a guideline, as certain samples may take longer to process depending on bacterial growth.

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INVESTIGATION OF BLOOD CULTURES

Blood culture is considered to be the ‘‘gold standard’’ investigation for the detection of micro-organisms in blood. The culture of micro-organisms from blood is essential for microbiological diagnosis of bacteraemia, fungaemia, infective endocarditis, and many infective conditions associated with a clinical presentation of pyrexia of unknown origin (PUO). It is also an important component of the diagnosis of prosthetic material infections (eg joints and vascular grafts) and intravascular line-associated sepsis. Blood cultures may also detect bloodstream infection in association with other infectious diseases such as pneumonia, septic arthritis and osteomyelitis.

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions: Blood culture bottles (1 aerobic and 1 anaerobic bottle) should be received in the laboratory within four hours of sampling. Blood cultures received outside this time, but still received on the same day as sampling will still be processed, however such samples will have a laboratory comment added to the final report to alert you to the risk of false negative results with samples that have had a delay in processing. Blood cultures not received on the same day as sampling are not suitable for analysis. Blood cultures should remain at ambient temperature until delivered for testing.

For the majority of patients, two blood culture sets are recommended. A second or third set taken from a different site not only increases yield but also allows recognition of contamination. In most conditions other than endocarditis, bacteraemia is intermittent, being related to the fevers and rigors which occur 30-60 minutes after the entry of organisms to the bloodstream. Samples should be taken as soon as possible after a spike of fever. However, some work has shown little difference in isolation rates between blood drawn at intervals and simultaneously with fever spikes. Certainly, the timing is less important for continuous bacteraemia, as seen in infective endocarditis.

The patient’s skin should be disinfected prior to sample collection in order to minimise the risk of contamination.

When filling the bottles, the aerobic bottle may be filled first.

Accredited	No
Method	Microbiology-Culture SOP: CM75
Sample Requirements	Samples should be collected using sterile techniques to reduce the chance of contamination. The recommended volume of blood to be collected is 8-10 mL.
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓ Sun ✓
Stability	Samples should be transported to the laboratory within 4 hours of sampling and remain at ambient temperature until delivered for testing.
Turn around time	Negative Result: 5 days Positive Results: Clinicians will be informed once a blood culture has alerted as positive, with preliminary and final results communicated as soon as possible.

INVESTIGATION OF ABSCESSES AND DEEP-SEATED WOUND INFECTIONS

Abscesses are accumulations of pus in the tissues and any organism isolated from them may be of significance. They occur in many parts of the body as superficial infections or as deep-seated infections associated with any internal organ. Many abscesses are caused by Staphylococcus aureus alone, but others are caused by mixed infections. Anaerobes are predominant isolates in intra-abdominal abscesses and abscesses in the oral and anal areas. Members of the "Streptococcus anginosus" group and Enterobacteriaceae are also frequently present in lesions at these sites.

Post-operative wound infections arise when microorganisms contaminate surgical wounds during an operation or immediately afterwards. Colonised body sites are frequent sources of pathogens, although they may be transmitted via medical and nursing staff or via inanimate objects from other patients or elsewhere in the hospital environment.
Organisms most commonly isolated include:

- *S. aureus* including MRSA.
- Bacteroides species.
- Clostridium species.
- Enterobacteriaceae.
- Pseudomonads.
- β-haemolytic streptococci.
- Enterococci.
- Peptostreptococcus species.

Coagulase-negative staphylococci and coryneforms isolated from post-operative sites overlying implants or prostheses may indicate infection. This is particularly true in the presence of a sinus tract in direct communication with the joint. However, with the exception of S. aureus, superficial flora do not necessarily represent the flora deep inside a wound and cultures should be interpreted with care.

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions:

Samples of pus are preferred to swabs. However, pus swabs are often received (when using swabs, the deepest part of the wound should be sampled, avoiding the superficial microflora).

If processing is delayed, refrigeration is preferable to storage at ambient temperature. Delays of over 48hr are undesirable.

Accredited	Yes
Method	Microbiology – Culture SOP: CM 56

INVESTIGATION OF ABSCESSES AND DEEP-SEATED WOUND INFECTIONS	
Sample Requirements	Unless otherwise stated, swabs for bacterial and fungal culture should be placed in Amies transport medium with charcoal. Temperature: 2-8°C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8 ºC
Turn around time	48h for a negative result. 72h for a positive result.

INVESTIGATION OF SKIN, SUPERFICIAL AND NON-SURGICAL WOUNDS

Infections of the skin and subcutaneous tissues are caused by a wide range of organisms. Organisms isolated from a clinically infected wound may be clinically significant but this decision needs to be made in conjunction with clinical details. Examination of biopsies might be more effective for diagnosis than swabs. Commonly isolated organisms include:

- *Staphylococcus aureus*
- Lancefield groups A, B, C and G streptococci
- Bacteroides species
- *Clostridium* species
- Anaerobic cocci
- Coagulase-negative *staphylococci*
- *Corynebacterium* species
- *Enterobacteriaceae*
- *Pseudomonads*

Organisms isolated from a clinically infected wound may be clinically significant although they must be carefully assessed for their true clinical significance.

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions:
Samples of pus/exudate, if present, are preferred to swabs.

Sample a representative part of the lesion. Swabbing dry crusted areas is unlikely to yield the causative pathogen.

If specimens are taken from ulcers, the debris on the ulcer should be removed and the ulcer should be cleaned with saline. A biopsy or, preferably, a needle aspiration of the edge of the wound should then be taken.

If processing is delayed, refrigeration is preferable to storage at ambient temperature. Delays of over 48hr are undesirable.

Accredited	Yes
Method	Microbiology – Culture SOP: CM44
Sample Requirements	Unless otherwise stated, swabs for bacterial and fungal culture should be placed in Amies transport medium with charcoal.
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8 °C
Turn around time	48h for a negative result. 72h for a positive result.

INVESTIGATION OF EAR SWABS

Infections of the ear can be divided into otitis externa and otitis media.

Otitis externa: In general, infection of the external auditory canal resembles infection of skin and soft tissue elsewhere. However, there are some notable differences. The canal is narrow and, as a result, foreign materials and fluid that enter can become trapped, causing irritation and maceration of the superficial tissues. Otitis externa can be subdivided into categories: acute localised; acute diffuse; chronic; and invasive ('malignant'). However, except for invasive, they are rarely differentiated as such in clinical practice.

Otitis media: Acute otitis media is defined by the co-existence of fluid in the middle ear and signs and symptoms of acute illness. It can occur when oropharyngeal flora ascends the Eustachian tube and are not eliminated by the defence mechanisms of the middle ear. Otitis media is a common disease in children with frequent recurrence of infections. It is important to treat otitis media because possible complications include the loss of hearing. This could have adverse effects on the development of speech and behaviour in children. Symptomatic relief is suggested as the initial form of treatment with antibiotic therapy prescribed only upon reoccurrence of infection. The role of antibiotic treatment at the first presentation of infection is a contentious issue as most infections are of viral origin. However, common bacteria causing otitis media, such as *Streptococcus pneumoniae* and *Haemophilus influenzae* can be isolated from ear swabs if the tympanic membrane has perforated. Other less common causes include *S. aureus, S. pyogenes* and *Moraxella catarrhalis*.

Although uncommon in adults, the causative organisms and treatment of otitis media are the same as in children. An external ear swab is not useful in the investigation of otitis media unless there is perforation of the eardrum. Tympanocentesis, to sample middle ear effusion, is rarely justified.

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions:
For investigation of fungal infection, scrapings of material from the ear canal are preferred although swabs can also be used.

If processing is delayed, refrigeration is preferable to storage at ambient temperature. Delays of over 48hr are undesirable.

Accredited	Yes
Method	Microbiology – Culture SOP: CM 47
Sample Requirements	Unless otherwise stated, swabs for bacterial and fungal culture should be placed in Amies transport medium with charcoal. Temperature: 2-8°C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8ºC
Turn around time	48h for a negative result. 72h for a positive result.

INVESTIGATION OF EYE SWABS

Infections of the eye can be caused by a variety of microorganisms. Swabs from eyes may be contaminated with skin microflora, but any organism may be considered for further investigation if clinically indicated.
Exogenous organisms may be introduced to the eye via hands, fomites (eg contact lenses), traumatic injury involving a foreign body, following surgery, or simply by spread from adjacent sites.

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions:
Separate swabs in appropriate transport media are needed for the diagnosis of viral, *acanthamoeba* and chlamydial infections.

If processing is delayed, refrigeration is preferable to storage at ambient temperature. Delays of over 48hr are undesirable.

Accredited	Yes
Method	Microbiology – Culture SOP: CM 46
Sample Requirements	Unless otherwise stated, swabs for bacterial and fungal culture should be placed in Amies transport medium with charcoal. Temperature: 2-8°C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8ºC
Turn around time	48h for a negative result. 72h for a positive result.

INVESTIGATION OF MOUTH SWABS

Candidosis is the most frequent type of oral infection. Infection of the buccal mucosa, tongue or oropharynx is usually due to Candida albicans. Species of yeast other than C. albicans, such as Candida krusei and Candida glabrata, can also occasionally colonise the mouth but are rarely associated with infection. However, they are becoming increasingly important, particularly in patients who are immunocompromised.

Preparation of patient: Collect specimens before antimicrobial therapy where possible. To assure that the preconditions of the sampling for oral infections are comparable it is advised that patients should not:
1. eat or drink within 2 hours
2. brush their teeth within 2 hours
3. use any mouth rinse of disinfectant within 2 hours prior to sampling
If possible samples should be taken in the morning under fasting conditions.

Precautions:
Sample pus if present otherwise sample any lesions or inflamed areas. A tongue depressor or spatula may be helpful to aid vision and avoid contamination from other parts of the mouth.
Other infective causes of oral ulceration include syphilis, herpes simplex virus and Mycobacterium species. Fungi may attack the sinuses and encroach on the palate, e.g. Aspergillus species.

If processing is delayed, refrigeration is preferable to storage at ambient temperature. Delays of over 48hr are undesirable

Accredited	Yes
Method	Microbiology – Culture SOP: CM 67
Sample Requirements	Unless otherwise stated, swabs for bacterial and fungal culture should then be placed in Amies transport medium with charcoal. Temperature: 2-8°C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8ºC
Turn around time	48h for a negative result. 72h for a positive result.

INVESTIGATION OF NOSE SWABS

Nasal colonisation with *Staphylococcus aureus* increases the risk of staphylococcal infections at other sites of the body such as postoperative wounds and dialysis access sites. It is also associated with recurrent skin infections and nosocomial infections in nurseries and hospital wards. *S. aureus* is a major cause of morbidity and mortality in haemodialysis patients as most patients carry the organism in their anterior nares.

Eradication of nasal carriage of *S. aureus* may be beneficial in certain clinical conditions such as recurrent furunculosis. Systemic, in addition to topical, treatment is appropriate for nasally colonised patients who have infection elsewhere. Topical antibacterial agents such as mupirocin and chlorhexidine/neomycin are preferred to systemic formulations when a patient is identified as a carrier.

Nose swabs may be used to investigate carriage of Lancefield group A *streptococcus* and Methicillin Resistant *Staphylococcus aureus* (MRSA) (Please see Investigation of specimens for screening for MRSA).

There is no clear evidence regarding the significance of isolating *Haemophilus influenzae* and *Streptococcus pneumoniae* from nose swabs as a predictor of involvement in infections such as sinusitis.

Although nose swabs are not the ideal specimen for the examination of nasal discharge, they are sometimes received. Nasal discharge may be a presentation of diphtheria. However, nose swabs are not routinely cultured for *Corynebacterium diphtheriae*. Nasal swabs should not be taken to investigate the presence of *Bordetella pertussis*.

Rhinoscleroma, due to infection with *Klebsiella rhinoscleromatis*, is a rare form of chronic granulomatous nasal infection affecting the nasal passages and sinuses which can also include the pharynx and larynx. The disease is progressive and manifests itself by tumour-like growths with local extension. Although common in Eastern Europe, Central Africa, Latin America and South East Asia, rhinoscleroma appears to be poorly communicable.

Ozaenia (ozena) is a chronic atrophic rhinitis. The condition can destroy the mucosa and is characterised by a chronic, purulent and often foul-smelling nasal discharge. *Klebsiella ozaenae* may have an etiological role.

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions:
Sample the anterior nares by gently rotating the swab over the mucosal surface.

If processing is delayed, refrigeration is preferable to storage at ambient temperature. Delays of over 48hr are undesirable.

Accredited	Yes
Method	Microbiology – Culture SOP: CM 43
Sample Requirements	Unless otherwise stated, swabs for bacterial and fungal culture should be placed in Amies transport medium with charcoal. Temperature: 2-8°C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8ºC
Turn around time	48 h

INVESTIGATION OF THROAT SWABS

The commonest cause of bacterial pharyngitis is the Lancefield group A, *Streptococcus pyogenes* while Lancefield group C streptococci have also been reported as a cause of pharyngitis.
Diphtheria is an acute infectious disease of the upper respiratory tract and occasionally the skin. It is caused by toxigenic strains of *Corynebacterium diphtheria*. Please contact the laboratory if Diphtheria is suspected.
Other causes of infection include;
-*H. Influenza* type B (Children <5)
-Fungal/Yeast (Immunocompromised patients/patients undergoing antimicrobial therapy)
-*Arcanobacterium haemolyticum* (recurrent tonsillitis)
-*Fusobacterium necrophorum* (recurrent/persistent sore throat, peritonsillar abscess)
-*Neisseria gonorrhoeae*
If any such infections are suspected please contact the laboratory.

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions: Throat swab taken from the tonsillar area and/or posterior pharynx, should be taken avoiding the tongue and uvula.

If processing is delayed, refrigeration is preferable to storage at ambient temperature. Delays of over 48hr are undesirable.

Accredited	Yes
Method	Microbiology – Culture SOP: CM 42
Sample Requirements	Sample type: charcoal swab Temperature: 2-8°C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8°C
Turn around time	24h for a negative result. 48h for a positive result.

INVESTIGATION OF FEMALE GENITAL SPECIMENS

Normal vaginal flora consists of a wide range of organisms including Lactobacillus species, streptococci, enterococci and coagulase-negative staphylococci. Anaerobes, such as Bacteroides species and anaerobic cocci, Gardnerella vaginalis, yeasts, coliforms, Ureaplasma urealyticum and Mycoplasma species may also be present as part of the normal flora, but they have also been incriminated in vaginal infections.
Common Genital Infections;
-Vaginal candidosis occurs when alterations in the vaginal environment allow yeasts (which are often present as commensal organisms in the vagina), to proliferate.
-Bacterial vaginosis (BV) is characterised by an increase in anaerobes and a decrease in Lactobacillus species.
-Lancefield group B streptococcus normally colonises the vagina in many women. In pregnancy this organism can infect the amniotic fluid which can lead to neonatal sepsis, pneumonia and meningitis.
Trichomoniasis is caused by the flagellate protozoan, T. vaginalis, is almost always acquired through sexual contact. Presenting symptoms include an increased vaginal discharge, pruritus and dysuria. Swabs for Trichomonis investigation should be received into the lab as soon as possible after sampling.
For the investigation of Neisseria gonorrhoeae infection, endocervical or urethral swabs are the preferred specimens.

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions:
Cervical and high vaginal swabs should be taken with the aid of a speculum. It is important to avoid vulval contamination of the swab.

High vaginal swabs;
After the introduction of the speculum, the swab should be rolled firmly over the surface of the vaginal vault. The swab should then be placed in Amies transport medium with charcoal.

Cervical swabs;
After introduction of the speculum to the vagina, the swab should be rotated inside the endocervix. The swab should then be placed in Amies transport medium with charcoal.

Urethral swabs; Contamination with micro-organisms from the vulva should be avoided. The patient should not have passed urine for at least 1 hour.

Intrauterine contraceptive devices (IUCDs); The entire device should be sent.

If processing is delayed, refrigeration is preferable to storage at ambient temperature. Delays of over 48hr are undesirable.

Accredited	Yes
Method	Microbiology – Gram stain & Culture SOP: CM48

INVESTIGATION OF FEMALE GENITAL SPECIMENS	
Sample Requirements	Sample type: Unless otherwise stated, swabs for bacterial and fungal culture should be placed in Amies transport medium with charcoal. Temperature: 2-8 °C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8 °C
Turn around time	48h for a negative result. 72h for a positive result.

INVESTIGATION OF MALE GENITAL SPECIMENS

Urethral swabs, prostatic secretions can aid in the diagnosis of various male gential tract infections, including prostatitis, epididymitis, balanoposthitis and penile thrush. Causative agents can include;

-Enterobacteriaceae
-Streptococcus
-Anaerobes
-Candida species
-Pseumonads
-Staphylococci
-Anaerobes

For the investigation of *Chlamydia trachomatis* and *Neisseria gonorrhoeae*, a first catch morning urine sample is required.

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions:
If processing is delayed, refrigeration is preferable to storage at ambient temperature. Delays of over 48hr are undesirable.

Accredited	Yes
Method	Microbiology – Culture SOP: CM 48
Sample Requirements	Unless otherwise stated, swabs for bacterial and fungal culture should be placed in Amies transport medium with charcoal. Temperature: 2-8°C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8 ºC
Turn around time	48h for a negative result. 72h for a positive result.

INVESTIGATION OF FLUIDS FROM NORMALLY STERILE SITES

The detection of organisms in fluids that are normally sterile indicates significant infection, which can be life-threatening. Specimens may be taken primarily for culture or this may be incidental to the prime reason for obtaining the specimen.
Blood cultures may be positive with the same infecting organism, and occasionally may be positive when culture of the fluid fails to reveal the organism.
Fluids will be sterile in the absence of infection, as will "sympathetic effusions", and those of immunological or traumatic origin and those due to metabolic disease or heart failure.
Signs of infection may be difficult to detect clinically in patients whose joints are already inflamed due to rheumatological conditions. This is important because these patients are at increased risk of joint sepsis.

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions:
Ideally, a minimum volume of 1 mL is required.
Large volume - specimens such as peritoneal fluid and ascitic fluid may contain very low numbers of organisms which are usually received in adequate quantities and require concentration to increase the likelihood of successful culture.
Small volume - fluids such as synovial fluids may be received in inadequate volumes, which may impede the recovery of organisms.

If processing is delayed, refrigeration is preferable to storage at ambient temperature. Delays of over 48hr are undesirable.

Accredited	Yes
Method	Microbiology – Culture SOP: CM 41
Sample Requirements	A minimum volume of 1mL should be sent in a sterile leak proof container. Temperature: 2-8°C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8ºC
Turn around time	5d for a negative result. 6d for a positive result. Preliminary results available on request.

INVESTIGATION OF BRONCHOALVEOLAR LAVAGE, SPUTUM AND ASSOCIATED SPECIMENS

Recovery and recognition of organisms responsible for pneumonia depends on:
- The adequacy of the lower respiratory tract specimen.
- Avoidance of contamination by upper respiratory tract flora.
- The use of microscopic techniques and culture methods.
- Current and recent antimicrobial treatment.

Distinction between tracheobronchial colonisation and true pulmonary infection can prove difficult.
The expression lower respiratory tract infection (LRTI) includes pneumonia, where there is inflammation of the lung parenchyma, and infections such as bronchiolitis that affect the small airways. Lung abscess, where the lung parenchyma is replaced by pus filled cavities, and empyema, where pus occupies the pleural space, are less common manifestations of LRTI.

NOTE: Samples for the investigation of mycobacterial disease, parasitic infection and fungal infection should be clearly marked as such, as these samples are not processed in Biomnis Ireland.

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions:
Specimens should be transported and processed as soon as possible.
Sputum may be refrigerated for up to 2-3 h without an appreciable loss of pathogens. Any delay beyond this time may allow overgrowth of Gram-negative bacilli, and Haemophilus species and S. pneumoniae may be rendered non-viable.
Where transport is difficult, specimens may be cultured up to 48 h after collection. If specimens are not processed on the same day as they are collected, interpretation of results should be made with care.

For sputum specimens the material required is from the lower respiratory tract, expectorated by deep coughing. When the cough is dry, physiotherapy, postural drainage or inhalation of an aerosol before expectoration may be helpful. Saliva and pernasal secretions are not suitable.

If processing is delayed, refrigeration is preferable to storage at ambient temperature. Delays of over 48hr are undesirable.

Accredited	No
Method	Microbiology – Culture SOP: CM 49
Sample Requirements	Sputum - Ideally, a minimum volume of 1 mL. BAL - It is difficult to be specific on volume required; in principle, as large a volume as possible is preferred. Temperature: 2-8°C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8ºC
Turn around time	48h for a negative result. 72h for a positive result.

INVESTIGATION OF TISSUES & BIOPSIES

A biopsy may be defined as a portion of tissue removed from the living body for further examination. With the increasing sophistication of clinical imaging and sampling devices there are few organs in the human body that cannot be biopsied. Tissue obtained at operation is particularly precious as the sampling procedure may not be repeatable. Ideally these specimens should be discussed with the laboratory prior to sampling to ensure that transport and processing are timely and appropriate tests are performed.

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions:
The specimen should, ideally, be large enough to carry out all microscopy preparations and cultures. The volume of the specimen influences the transport time that is acceptable. Larger pieces of tissue maintain the viability of anaerobes for longer. Specimens received in formol-saline are not suitable for culture.

If processing is delayed, refrigeration is preferable to storage at ambient temperature. Delays of over 48hr are undesirable.

Accredited	Yes
Method	Microbiology – Culture CM 68
Sample Requirements	Samples should be placed in a sterile leak proof container. Temperature: 2-8°C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8ºC
Turn around time	5d for a negative result. 6d for a positive result. Preliminary results available on request.

INVESTIGATION OF INTRAVASCULAR CANNULAE AND ASSOCIATED SPECIMENS

The use of indwelling cannulae/catheters for reliable intravascular access is an essential feature of modern health care for both monitoring and intervention. Insertion of intravascular cannulae and catheters allows continuous and painless access to the circulation for administration of fluids and electrolytes, medications, blood products and nutritional support. In addition the intravascular access can be used for blood sampling, haemodynamic monitoring, haemodialysis and haemofiltration.

Specific examples of descriptions of cannulae, defining their siting, use or design, include:
• Peripheral e.g. Venflons, Abbocaths.
• Central lines e.g. triple lumen, subclavian lines, jugular lines, femoral lines.
• Monitoring lines e.g. central venous pressure lines, Swan Ganz lines, arterial lines.
• Long term access e.g. Hickman lines, Broviac lines, Portacath.
• Miscellaneous e.g. Vascath for haemofiltration, and umbilical cannulae for exchange transfusions in neonates.
• Antimicrobial coated or impregnated CVCs: recent studies have demonstrated that antimicrobial coated or impregnated CVC can reduce the incidence of catheter colonisation and CR-BSI in appropriate situations.

Cannula tip culture gives valuable information but necessitates the removal of the cannula. This can sometimes result in the loss of venous access that can interfere seriously with the medical management of the patient, although sometimes catheter removal is necessary to gain control of a catheter-related infection, especially with certain organisms, such as Candida species.
Cannula associated swabs (e.g. swabs of catheter insertion sites) may be employed as alternative specimens. However, routine investigation of cannula associated swabs from asymptomatic patients is of dubious value.
Culture of the skin around insertion sites or of cannula connectors (hubs) is becoming increasingly used in confirming cannula site infection. This is reported as having high sensitivity and specificity but is only useful where there is clinical evidence of localised infection, as positive culture results may reflect the presence of commensals and be misleading. Careful interpretation of these culture results should be correlated with blood culture isolates.

Collection of Samples;
-Cannulae
Disinfect the skin around the cannula entry site, remove cannula using aseptic technique, and cut off 4 cm of the tip into an appropriate sterile leak proof container using sterile scissors. Place in sealed plastic bags for transport.
Note 1: Skin disinfection procedures depend on local protocols and may vary.
Note 2: Cannulae should only be sent if there is evidence of infection.
-Swabs
Sample the inflamed area around the catheter insertion site using an appropriate swab.

If processing is delayed, refrigeration is preferable to storage at ambient temperature35.
Delays of over 48hr are undesirable.

INVESTIGATION OF INTRAVASCULAR CANNULAE AND ASSOCIATED SPECIMENS	
Preparation of patient: Collect specimens before antimicrobial therapy where possible. **Precautions:** See above.	
Accredited	Yes
Method	Microbiology – Culture SOP: CM 45
Sample Requirements	Cannulae should be collected in appropriate sterile leak proof containers. Temperature: 2-8 °C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8°C
Turn around time	48h for a negative result. 72h for a positive result.

INVESTIGATION OF URINE

Urinary tract infection (UTI) results from the presence and multiplication of microorganisms in one or more structures of the urinary tract with associated tissue invasion. This can give rise to a wide variety of clinical syndromes. These include acute and chronic pyelonephritis (kidney and renal pelvis), cystitis (bladder), urethritis (urethra), epididymitis (epididymis) and prostatitis (prostate gland). Infection may spread to surrounding tissues (eg perinephric abscess) or to the bloodstream.

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions: Rapid transport and culture, or measures to preserve the sample aid reliable laboratory diagnosis. Delays and storage at room temperature allow organisms to multiply which generates results that do not reflect the true clinical situation. Where delays in processing are unavoidable, refrigeration is recommended or the use of a boric acid preservative may be beneficial.

Accredited	Yes
Method	Microbiology – Microscopy & Culture SOP: CM 38
Sample Requirements	Sample type: MSU, CSU, Bag urine. Minimum volume: 1mL Temperature: 2-8°C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8°C
Turn around time	24h for a negative result. 48h for a positive result.

INVESTIGATION OF SPECIMENS FOR SCREENING FOR MRSA

MRSA strains are a continuing and increasing problem in many hospitals. Colonised and infected patients represent the most important reservoir of MRSA strains in hospitals. MRSA are mainly transmitted by direct person-to-person contact, usually via the hands of health care workers, and through environmental contamination. Screening for MRSA provides a means of identifying patients and staff who may be involved in transmission of the organism.

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions:
National Guidelines issued by the Department of Health, December 2013, recommend that
Swabs from the anterior nares, perineum or groin, throat, catheter specimen of urine (CSU), sputum if productive cough and any skin lesions (e.g. surgical site, PEG tube site) should be obtained for screening purposes. Additional samples to diagnose infection (e.g. blood, vascular catheter tip) should be taken as clinically indicated.
For previously MRSA positive patients who have undergone decolonisation, three negative follow-up samples at least 48 hours apart are required for the patient to be considered as successfully decolonised.

If processing is delayed, refrigeration is preferable to storage at ambient temperature. Delays of over 48hr are undesirable.

Accredited	Yes
Method	Microbiology – Culture SOP: CM 54
Sample Requirements	Unless otherwise stated, swabs for bacterial culture should be placed in Amies transport medium with charcoal. Temperature: 2-8°C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8ºC
Turn around time	24h for a negative result. 72h for a positive result.

INVESTIGATION OF FAECAL SPECIMENS FOR ENTERIC PATHOGENS

Diarrhoea may be defined as unusual frequency of bowel action (usually at least three times in a 24 hour period), passing loose, watery, unformed faeces. The consistency of the stools is more important than the frequency: frequently passed formed stools are not considered to be diarrhoea. It may be associated with symptoms such as abdominal cramps, nausea and malaise, and with vomiting, fever and consequent dehydration. Patients with visible blood and mucus in the faeces suggesting inflammation of the bowel, accompanied by symptoms such as abdominal cramps and constitutional disturbance, may be said to be suffering from dysentery.
A wide range of bacterial pathogens, viruses and parasites are capable of causing diarrhoea by a number of mechanisms. Routine screening of faecal samples includes screening for *Salmonella* species, *Shigella* species, *E.coli* 0157 and *Campylobacter* species.
Additional Screening;
Vibrio cholera can be requested if there is suspicion that the patient has ingested contaminated water or seafood or travelled to endemic areas.
Yersinia enterocolitica which causes Yersiniosis is a zoonotic infection. *Y. enterocolitica* can be isolated from wild and domestic animals, environmental samples and food samples.

Preparation of patient: Collect specimens soon as possible after onset of symptoms and before antimicrobial therapy where possible.

Precautions: Specimens of faeces should be transported to the laboratory and processed as soon as possible. Important pathogens such as *Shigella* species may not survive the pH changes that occur in faeces specimens which are not promptly delivered to the laboratory, even if refrigerated. If processing is delayed, refrigeration is preferable to storage at ambient temperature. Delays of over 48hrs are undesirable.
Specimen may be passed into a clean, dry, disposable bedpan or similar container and transferred into an appropriate sterile leak proof containers and place in sealed plastic bags. The specimen is unsatisfactory if any residual soap, detergent or disinfectant remains in the pan.
Faecal samples should be liquid or semi formed i.e. take the shape of the container.

Accredited	Yes
Method	Microbiology – Culture SOP: CM39
Sample Requirements	Sample type: Stool. 1-2g is sufficient for routine culture Temperature: 2-8°C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8°C
Turn around time	48h for a negative result. 72h for a positive result.

INVESTIGATION OF STOOL SPECIMENS FOR CLOSTRIDIUM DIFFICILE TOXIN

Clostridium difficile is a leading cause of nosocomial diarrhoea. The production of two toxins A (enterotoxin) and B (cytotoxin) causes the characteristic mucosal damage consisting of plaque-like lesions leading to the formation of a pseudomembrane. Not all strains of *C. difficile* produce toxin and therefore not all can cause illness. The spectrum of disease ranges from a self-limiting mild diarrhoea to the advanced and severe illness characteristic of pseudomembranous colitis. The most accurate diagnosis of pseudomembranous colitis is affected by endoscopic detection of colonic pseudomembranes or microabscesses in antibiotic-treated patients who are suffering from diarrhoea and who have *C. difficile* and its toxins in their stools.

Clostridium difficile testing algorithm:

A GDH screening test is initially performed on a stool sample requesting C. difficile. If this is negative, *C. difficile* infection is highly unlikely and no further testing is required. If the GDH screen is positive, *C. difficile* toxin testing is performed. If this toxin test is positive, *C. difficile* infection is highly probable and the sample is reported as positive. If the *C*. *difficile* toxin testing is negative, we recommend testing samples for confirmatory PCR testing. Clinicians will be contacted before a sample is referred for PCR testing.

Preparation of patient: N/A

Precautions: Samples should be collected in a sterile universal container. If processing is delayed, refrigeration is preferable to storage at ambient temperature.

Accredited	Yes
Method	Enzyme Immunoassay. SOP: GM 66 & GM 75
Sample Requirements	Sample type: Stool; a liquid specimen of 3 ml is sufficient for GDH and toxin detection.
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat
Stability	4 days @ 2–8 ºC
Turn around time	24 hours

INVESTIGATION OF SCREENING SPECIMENS FOR ESBL/VRE/CPE SCREENING

ESBLs are Gram Negative organisms that possess an acquired class A β-lactamases that hydrolyses and confers resistance to oxyimino- '2nd- and 3rd-generation' cephalosporins, e.g. cefuroxime, cefotaxime, ceftazidime and ceftriaxone.

VREs are Enterococcus species resistant to vancomycin.

CPEs are Gram Negative organisms that possess a β-lactamase that hydrolyses carbapenems i.e. any or all of doripenem, ertapenem, imipenem and meropenem.

These resistant mechanisms can all be screened for by requesting a Mulit-Drug Resistant (MDR) Screen. Alternatively they can also be requested individually.

If processing is delayed, refrigeration is preferable to storage at ambient temperature. Delays of over 48hr are undesirable.

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions: 1 rectal swab is required for an MDR screen.

Accredited	Yes
Method	Culture SOP CM76
Sample Requirements	Rectal swab is preferred but 1-2g of stool is also sufficient in a sterile faeces container Temperature: 2-8°C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2–8 ºC
Turn around time	Negative result: 48 hours Positive results: 72-96 hours

INVESTIGATION OF STOOL SPECIMENS FOR *HELICOBACTER PYLORI* ANTIGEN

The detection of *H. pylori* stool antigen is intended to aid in the diagnosis of *H. pylori* infection. This can also be used to demonstrate loss of *H. pylori* following treatment, however it is recommended that this is done at least four weeks following completion of therapy.
H. pylori has been established as an etiologic agent in chronic gastritis and peptic ulcer disease, and has been associated with mucosa-associated lymphoid tissue lymphoma and gastric adenocarcinoma.

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions:
Specimens should be transported to the laboratory in an airtight sterile container.
Watery stool samples (composed mainly of fluid with little or no solid matter) are not suitable for analysis.
If processing is delayed samples should be refrigerated provided they can reach the laboratory within 72 hours. If this is not possible, samples should be frozen immediately on receipt and sent to the laboratory as soon as possible (preferred method of storage).

Accredited	Yes
Method	Microbiology-Immunoassay SOP: GM82
Sample Requirements	Sterile faeces container. Temperature: 2-8°C up to 3 days or frozen immediately at ≤-20°C where processing or transport is delayed
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	3 days @ 2-8ºC. >3days at ≤-20°C
Turn around time	24 hours. 48 hours if sample received frozen.

URINE DIPSTICK ANALYSIS

Urine dipsticks can test a sample for protein, blood, leucocytes, nitrite, glucose, ketone, pH, specific gravity, bilirubin and urobilinogen.

Preparation of patient: N/A

Precautions: Freshly voided urine should be collected into a clean, dry container and ideally tested within two hours. Contamination of the urine with skin cleansers containing chlorhexidine may affect protein, specific gravity and bilirubin test results. If samples cannot be tested within two hours, then they should refrigerated at 2-8ºC

Accredited	Yes
Method	Siemens Multi-Stix Dipstick
Sample Requirements	MSU/CSU. minimum 5 mL Temperature: 2-8°C
Setup Schedule	Mo ✓ Tu ✓ We ✓ Th ✓ Fr ✓ Sat ✓
Stability	2 days @ 2-8ºC
Turn around time	24 hours

PARASITOLOGY

Investigation of stool and urine samples for ova, cysts and parasites.

Preparation of patient: N/A

Precautions:
Faeces; samples should be taken into a sterile universal container and before antimicrobial or anti-diarrhoeal therapy.
Ideally three stool specimens should be collected over no more than a 10-day period. It is usually recommended that specimens are collected every other day. Unless the patient has severe diarrhoea or dysentery, no more than one specimen should be examined within a single 24 hour period, as shedding of cysts and ova tends to be intermittent.

Sellotape slide; Samples should be taken between 10pm and midnight, or early in the morning, before defecation or bathing.
Method: Apply clear Sellotape to the perianal region, pressing the adhesive side of the tape firmly against the left and right perianal folds several times; the tape can be wrapped around a tongue depressor to aid specimen collection. Carefully smooth the tape back on the slide, adhesive side down.
It is recommended that samples should be taken for at least 4 to 6 consecutive days. If the results of all these are negative the patient can be considered free from infection.

Urine; (for S. haematobium) samples should be taken into a sterile urine container. Optimum specimen collection is a terminal urine sample taken between 10am and 2pm (period of maximum activity).
Minimum volume required is 10ml.

Accredited	Yes
Method	Midi Parasep Kit
Sample Requirements	Sample type: Stool /Sellotape test/ urine/perianal swab Temperature: 2-8°C
Setup Schedule	Mo: – Tu: ✓ We: – Th: – Fr: ✓ Sat: –
Stability	5 days @ 2–8 ºC
Turnaround time	3-4 working Days

INVESTIGATION OF DERMATOLOGICAL SPECIMENS FOR SUPERFICIAL MYCOSES

Dermatophytes are the most common cause for superficial mycoses in hair, nail and skin.
Dermatophytes can be divided into three groups: anthropophilic, zoophilic, and geophilic. Anthropophilic dermatophytes are passed from human to human and are the most common in the community. Zoophilic or animal acquired infections are usually sporadic. Infections with geophilic dermatophytes are most often acquired following a close association with soil or from an animal itself infected by soil contact. Infection is diagnosed by observing the presence of fungal hyphae in skin, hair or nail specimens. However, it is important to culture the material to determine the infecting genus and species. This is done to ensure selection of the most appropriate therapy and in order to trace its likely epidemiology.
Dermatophyte (otherwise known as ringworm) infections are usually referred to as tinea followed by the Latin name of the body area involved. The most common dermatophyte infections are tinea pedis in adults (athlete's foot) which may also include tinea unguium (nail infection), and tinea capitis (scalp ringworm) in children.
Infection by dermatophytes is cutaneous and generally restricted to the non-living cornified layers in patients who are immunocompetent. This is because the dermatophyte group of fungi are generally unable to penetrate tissues which are not fully keratinised (i.e. deeper tissues and organs). However, reactions to such infections can range from mild to severe depending upon the host's immune response, the virulence of the infecting species, the site of infection and environmental factors.
The dermatophyte group of fungi are classified in three genera: Epidermophyton species, Microsporum species and Trichophyton species.
Non-dermatophytes:
There are few non-dermatophyte moulds that can infect otherwise healthy skin and these include Scytalidium dimidiatum, Scytalidium hyalinum (a white variant of S. dimidiatum), Phaeoannellomyces werneckii and Piedraia hortae. Non-dermatophyte moulds, including those above, can infect nails damaged by physical trauma, disease or pre-existing infection with a dermatophyte. There are many non-dermatophyte moulds that have been implicated in nail infection, therefore isolation of a mould from a nail specimen should only be reported if certain strict criteria are met because contamination of nail samples with mould spores is common. A non-dermatophyte mould accounts for the diagnosis in less than 5% of infected nails.

INVESTIGATION OF DERMATOLOGICAL SPECIMENS FOR SUPERFICIAL MYCOSES

Preparation of patient: Collect specimens before antimicrobial therapy where possible.

Precautions:
Specimens should be collected into folded paper squares secured and placed in a plastic bag or in commercially available packets designed specifically for the collection and transport of skin, nail and hair samples.

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. If insufficient material can be obtained by scraping, then sticky tape can be pressed on the lesion and transferred to a clean glass slide for transport to the laboratory ('stripping').

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. When there is superficial involvement (as in white superficial onychomycosis) nail scrapings may be taken with a curette. 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.

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.

Specimens should be kept at room temperature and transported and processed as soon as possible although, provided the samples are kept dry, the fungus will remain viable for several months.

Accredited	Yes
Method	Microbiology – Microscopy & Culture SOP: CM 50
Sample Requirements	See above precautions. Temperature: Ambient Room Temperature

INVESTIGATION OF DERMATOLOGICAL SPECIMENS FOR SUPERFICIAL MYCOSES	
Setup Schedule	<table><tr><td>Mo</td><td>Tu</td><td>We</td><td>Th</td><td>Fr</td><td>Sat</td></tr><tr><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr></table>
Stability	Specimens should be kept at ambient room temperature and transported and processed as soon as possible although, provided the samples are kept dry, the fungus will remain viable for several months.
Turnaround time	Microscopy results available after 3 days. Culture results available following 3 weeks incubation.

QUANTIFERON TB GOLD PLUS

Quantiferon-TB Gold In-Tube is an in vitro diagnostic test using a peptide cocktail simulating ESAT-6, CFP-10 and TB7.7 (p4) proteins to stimulate cells in heparinised whole blood. Detection of interferon-γ (IFN-γ) by Enzyme-Linked Immunosorbent Assay (ELISA) is used to identify in vitro responses to these peptide antigens that are associated with *Mycobacterium tuberculosis* infection.

Preparation of patient: N/A

Precautions: Ensure strictly 1 ml of blood is taken into each tube. Immediately after filling tubes, gently invert them 10 times to ensure the entire inner surface of the tube is coated with blood, to solubilise antigens on tube walls. Samples should be transferred to a 37°C incubator as soon as possible, and within 16 hours of collection. Prior to incubation, maintain the tubes at room temperature (22°C ± 5°C). Do not refrigerate or freeze the blood samples.
Incubate the samples upright at 37°C for 16-24 hours. Following incubation, samples should be centrifuged for 15 minutes at 2000 to 3000 RCF (g). The gel plug will separate the cells from the plasma. If this does not occur, the tubes should be centrifuged again at a higher speed.
All samples received in the laboratory should be accompanied by a request form and a Quantiferon TB Information Form (available at www.eurofins-biomnis.ie).

Accredited	Yes
Method	Cellestis Quantiferon TB Gold Plus Kit on Dynex DS2
Sample Requirements	Sample type: Blood Temperature: See above
Setup Schedule	Quantiferon runs are performed in batch runs. Set-up days can vary.
Stability	28 days @ 2–8 ºC (once samples incubated and centrifuged)
Turnaround time	5 working Days
Reference Range	Nil: ≤8.0 IU/ml TB Antigen: <0.35 IU/ml Mitogen: ≥0.5 IU/ml Source: Qiagen Quantiferon TB Gold Kit Insert.