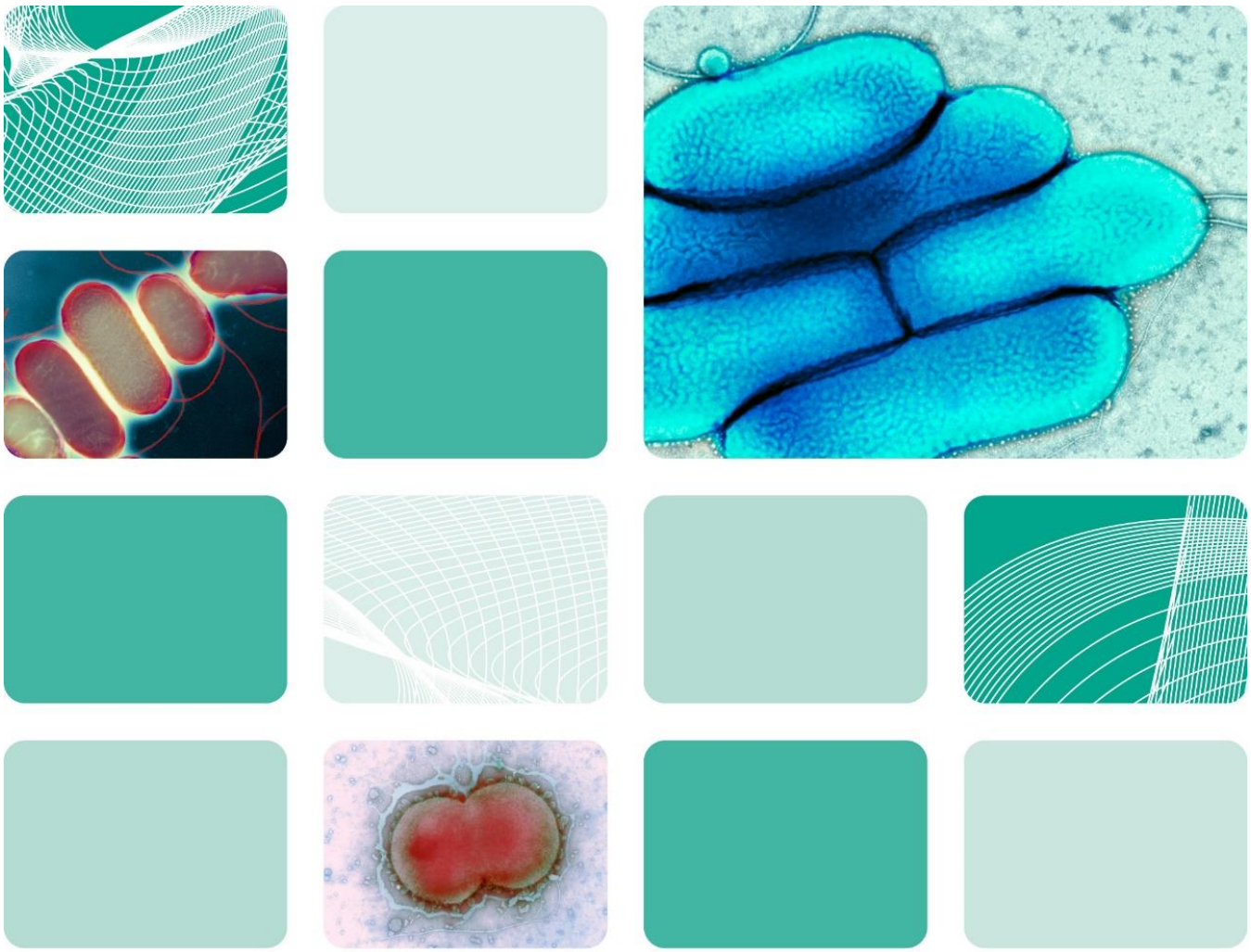
UK Health Security Agency

UK Standards for Microbiology Investigations

Investigation of fluids from normally sterile sites



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Acknowledgments

UK Standards for Microbiology Investigations (UK SMIs) are developed under the auspices of UKHSA working in partnership with the partner organisations whose logos are displayed below and listed on the UK SMI website. UK SMIs are developed, reviewed and revised by various working groups which are overseen by a steering committee.

The contributions of many individuals in clinical, specialist and reference laboratories who have provided information and comments during the development of this document are acknowledged. We are grateful to the medical editors for editing the medical content.

UK SMIs are produced in association with:

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Contents

Amendment table

Each UK SMI document has an individual record of amendments. The amendments are listed on this page. The amendment history is available from standards@ukhsa.gov.uk.

Any alterations to this document should be controlled in accordance with the local document control process.

Amendment number/date	12/17.10.25
Issue number discarded	6.2
Insert issue number	6.3
Section(s) involved	**Amendment**
Whole document.	**This is an administrative point change.** **The content of this UK SMI document has not changed.** **The last scientific and clinical review was conducted on 03/10/2018.** Hyperlinks throughout document updated to Royal College of Pathologists website. Public Health England replaced with UK Health Security Agency throughout the document, including the updated Royal Coat of Arms Partner organisation logos updated. Broken links to devolved administrations replaced. References to NICE accreditation removed. Scope and Purpose replaced with General and Scientific information to align with current UK SMI template. **‘**Public health responsibilities of diagnostic laboratories’ section added.

Amendment No/Date.	11/03.10.18
Issue no. discarded.	6.1
Insert Issue no.	6.2
Section(s) involved	**Amendment**

4.5.1 Culture media, conditions and organisms.	Asterisks has been added to the incubation time for “blood agar” and “chocolate agar” to denote what is in the footnote. Spelling of *Nocardia* corrected where it appeared as Norcardia.

Amendment No/Date.	10/08.03.17
Issue no. discarded.	6
Insert Issue no.	6.1
Section(s) involved	**Amendment**
4.5.1 Culture media, conditions and organisms.	Enrichment broth has been added to the table.

Amendment No/Date.	9/15.06.15
Issue no. discarded.	5.2
Insert Issue no.	6
Section(s) involved	**Amendment**
Whole document.	Hyperlinks changed to gov.uk.
Page 2.	Updated logos added.
Title.	Title amended.
Introduction.	Reviewed and streamlined.
3.1 Optimal transport and storage conditions.	Parameters set for each stage.
4.4 Microscopy.	Total white cell count section amended to now include the use of blood cell analysers.
4.5 Culture and investigation.	Use of blood culture bottles now a recognised method.
References.	References reviewed and updated.

1 General information

View general information related to UK SMIs.

2 Scientific information

View scientific information related to UK SMIs.

3 Scope of document

Type of specimen

Amniotic fluid, pericardial fluid, peritoneal fluid (ascites), pleural fluid, synovial (joint) fluid, bursa fluid

Blood, cerebrospinal fluid, continuous ambulatory peritoneal dialysis (CAPD) fluid, Pouch of Douglas fluid, bile and urine are dealt with in the following respectively:

- UK SMI B 27 – Investigation of cerebrospinal fluid
- UK SMI B 25 – Investigation of continuous ambulatory peritoneal dialysis fluid
- UK SMI B 15 – Investigation of bile
- UK SMI B 41 – Investigation of urine

3.1 Scope

This UK SMI describes the examination of fluids for the detection and recovery of the causative organisms of infections of normally sterile sites (other than those listed above).

This UK SMI should be used in conjunction with other UK SMIs.

4 Introduction

The detection of organisms in fluids that are normally sterile indicates significant infection, which can be life-threatening.

Blood cultures may also be positive with the same infecting organism, and occasionally may be positive when culture of the fluid fails to reveal the organism. It is also possible to use blood culture bottles for the culture of sterile fluids[1].

4.1 Amnionitis[2]

Amnionitis means inflammation of the amnion, the innermost of the two membranes that form the fetal sac, enclosing the fetus and the amniotic fluid. In cases of prolonged rupture of the membranes, the amniotic fluid may become contaminated with vaginal flora. If amnionitis is confirmed during labour, infants are delivered immediately depending on fetus age due to the risk of infection to the mother and the foetus. Amnionitis may also result from instrumentation during antenatal medical procedures.

Cultures of fluid taken perinatally are often mixed and include streptococci, anaerobes, Enterobacteriaceae, *"Streptococcus anginosus"* group, *Listeria monocytogenes* and *Mycoplasma hominis.* Other organisms that have been implicated in amniotic infections include enterococci, *Haemophilus* species, *Candida* species, aerobic Gram positive bacilli, pseudomonads and staphylococci. Proteomics may offer the best diagnostic option for this condition in the future[3].

4.2 Pericarditis[4]

Inflammation of the pericardium, the membrane enveloping the heart, is known as pericarditis. This results in an increase in the volume of fluid in this sac. However, most pericardial effusions are small in volume and are sterile.

Infectious pericarditis can be separated into three groups:

1. purulent, which are caused by bacteria and is fatal if untreated. It has a 40% mortality in patients who are treated. A wide range of bacteria have been isolated from cases of purulent pericarditis
2. benign, either due to viruses or post pericardiotomy syndrome
3. hypersensitivity or post-infectious

In AIDS pericarditis, the incidence of bacterial infection is much higher than in the general population, with a higher rate of *Mycobacterium* species infections[5].

4.3 Peritonitis

Peritonitis is inflammation of the peritoneum, the serous membrane lining the abdominal cavity and covering the abdominal viscera. Primary bacterial peritonitis accounts for <1% of bacterial peritonitis and occurs spontaneously without evidence of intra-abdominal organ perforation. It is most frequently seen in children and particularly those with nephrotic syndrome.

Spontaneous bacterial peritonitis (SBP) is the infection of pre-existing ascites in the absence of known intra-abdominal infection, and is a frequent, serious complication of cirrhosis and other liver disease. Infection is almost always mono-microbial, usually resulting from haematogenous spread. Lactoferrin levels can prove a useful way to identify this infection[6-8].

Secondary bacterial peritonitis usually arises following gastrointestinal leakage within the peritoneal cavity. This leakage may follow perforation of diseased viscera or abdominal trauma. The commonest cause in western countries is acute appendicitis. Other causes include perforated peptic ulcer, diverticular disease of the colon, pancreatitis and cholecystitis and as a complication of CAPD (see UK SMI B 25 – Investigation of continuous ambulatory peritoneal dialysis fluid).

Localised peritonitis develops over any inflamed area of the gastrointestinal tract. It is a milder condition that may resolve but may leave residual adhesions.

Acute generalised peritonitis is an extremely serious and often fatal condition. It usually arises as a consequence of leakage of gastrointestinal tract contents from a perforated ulcer or from a ruptured gangrenous appendix. The large quantity of bacterial toxins absorbed often leads to the development of paralytic ileus, toxaemia and septic shock.

Chronic peritonitis may develop as a result of abscess formation and persist for weeks or months unless drained. Persistent abscesses can cause general ill health and may become surrounded by dense fibrous tissue which interferes with the function of the intestinal loops. Chronic infection may also be caused by *M. tuberculosis*.

4.4 Pleurisy

Pleurisy is inflammation of the pleura, the serous membranes that cover the lungs and the inner aspect of the thoracic cavity.

Pleural effusion

Pleural effusion is the accumulation of fluid between the inner and outer (visceral and parietal) layers of the pleura. It may arise as the result of pneumonia, chronic heart failure or uraemia (when cultures will be negative in the latter two), or by direct spread of infection, such as a primary tuberculous focus rupturing into the pleural cavity. Carcinomatous involvement of the visceral pleura is one of the more common causes of sterile pleural effusions.

Effusion occurs early in the course of pneumonia representing the pleural response to an inflammatory reaction in the adjacent lung[9]. Bacteria reach the pleural space by various routes: spreading from an adjacent area of pneumonia, thoracic surgery or drainage, bacteraemia, chest trauma or by trans-diaphragmatic spread from intra-abdominal infection.

Tuberculous pleural effusion usually arises as an extension of infection from a subpleural focus. Only small numbers of bacilli are found in the effusion, and as a result microscopy is rarely positive. Therefore other confirmatory tests are preferred eg sputum examination, skin tests or chest radiography[10].

Empyema

Empyema thoracis is collection of pus in the pleural cavity. It most often occurs as a complication of bacterial infection of the pulmonary parenchyma, either pneumonia or lung abscess.

Whereas the most common cause is *S. pneumoniae,* any organism can be isolated from pleural fluid, in particular organisms associated with lower respiratory tract infection and organisms acquired by aspiration of the oropharyngeal flora, including oral streptococci and anaerobes.

Organisms particularly associated with empyema in patients with acquired immune deficiency syndrome (AIDS) include: *Cryptococcus neoformans, Mycobacterium avium-intracellulare, M. tuberculosis* and *Nocardia asteroides*[11,12]*.*

Other organisms which may cause infection in this group of patients include *Pneumocystis jirovecii* and *Rhodococcus equi*[13]*.*

Septic arthritis[14,15]

Septic arthritis is a pyogenic infection of a joint. Infection occurs via haematogenous spread or directly from contiguous lesions. Signs of infection may be difficult to detect clinically in patients whose joints are already inflamed due to rheumatological conditions. Patients with longstanding rheumatoid arthritis and osteoarthritis are predisposed to septic arthritis. Other predisposing factors include a history of trauma

or intra-articular injection, immunosuppression, diabetes mellitus and malignancy. The aetiology of sepsis in prosthetic joints differs from that of non-prosthetic joints.

Infected synovial fluid is usually turbid or purulent with >75% of cells being polymorphonuclear leucocytes, although this is not specific for septic arthritis.

Any organism may be isolated from joint fluid, the most frequent isolates being: *Staphylococcus aureus,* streptococci, Enterobacteriaceae, *M. tuberculosis, Neisseria gonorrhoeae. S. pneumoniae* and *Kingella kingae* are common isolates from children[16]. As a result of immunisation, infection with *Haemophilus influenzae* type b is now less common.

Purulent arthritis and synovitis may also be caused by sodium urate crystals (gout) and calcium pyrophosphate crystals (pseudo-gout). If required, microscopic examination of synovial fluid can be performed under polarised light.

Bursitis[17]

Bursitis is the inflammation of a bursa; a small, fluid-filled sac of fibrous tissue lined with synovial membrane formed around joints and places where ligaments and tendons pass over bones. It is often accompanied with prominent overlying cellulitis. The olecranon and prepatellar bursae are the most commonly affected sites. They are often subjected to repeated trauma. Skin wounds are the most likely portals of entry of infection and *S. aureus* is the most common isolate.

5 Technical information/limitations

Limitations of UK SMIs

The recommendations made in UK SMIs are based on evidence (eg sensitivity and specificity) where available, expert opinion and pragmatism, with consideration also being given to available resources. Laboratories should take account of local requirements and undertake additional investigations where appropriate. Prior to use, laboratories should ensure that all commercial and in-house tests have been validated and are fit for purpose.

Selective media in screening procedures

Selective media which does not support the growth of all circulating strains of organisms may be recommended based on the evidence available. A balance therefore must be sought between available evidence, and available resources required if more than one media plate is used.

Specimen containers[18,19]

UK SMIs use the term “CE marked leak proof container” to describe containers bearing the CE marking used for the collection and transport of clinical specimens. The requirements for specimen containers are given in the EU in vitro Diagnostic Medical Devices Directive (98/79/EC Annex 1 B 2.1) which states: “The design must allow easy handling and, where necessary, reduce as far as possible contamination of, and leakage from, the device during use and, in the case of specimen receptacles, the risk of contamination of the specimen. The manufacturing processes must be appropriate for these purposes”.

6 Safety considerations[18-34]

6.1 Specimen collection, transport and storage[18-23]

Use aseptic technique.

Collect specimens in appropriate CE marked leak proof containers and transport in sealed plastic bags.

Compliance with postal, transport and storage regulations is essential.

6.2 Specimen processing[18-34]

Containment Level 2.

Laboratory procedures that give rise to infectious aerosols must be conducted in a microbiological safety cabinet[26].

Where Hazard Group 3 organisms eg *Mycobacterium tuberculosis* are suspected, all specimens must be processed in a microbiological safety cabinet under full containment level 3 conditions.

All specimens from the pleural cavity must be centrifuged in sealed buckets and processed in a microbiological safety cabinet under full containment level 3 conditions, whether or not examination for *Mycobacterium* species is requested.

Centrifugation must be carried out in sealed buckets which are subsequently opened in a microbiological safety cabinet.

If blood culture bottles are employed to provide an enrichment broth then any consequential use and subsequent disposal of syringes and needles must comply with local safety protocols.

Specimen containers must also be placed in a suitable holder.

Refer to current guidance on the safe handling of all organisms documented in this UK SMI.

The above guidance should be supplemented with local COSHH and risk assessments.

7 Specimen collection

7.1 Type of specimens

Amniotic fluid, bursa fluid, pericardial fluid, synovial (joint) fluid, peritoneal fluid (ascites), pleural fluid

7.2 Optimal time and method of collection[35]

For safety considerations refer to Section 6.1.

Collect specimens before antimicrobial therapy where possible[35].

Samples of fluid rather than swabs of the fluids are the preferred specimen type to facilitate comprehensive investigation.

Collect specimens other than swabs into appropriate CE marked leak proof containers and place in sealed plastic bags

7.3 Adequate quantity and appropriate number of specimens[35]

Ideally, a minimum volume of 1mL.

Large volume specimens such as peritoneal fluid and ascitic fluid may contain very low numbers of organisms which require concentration in order to increase the likelihood of successful culture.

Small volume fluids such as synovial fluids may be received in insufficient volumes. This may impede the recovery of organisms.

The number and frequency of specimens collected depend on the clinical condition of the patient.

8 Specimen transport and storage[18,19]

8.1 Optimal transport and storage conditions

For safety considerations refer to Section 6.1.

Specimens should be transported and processed as soon as possible[35].

If acute infection is suspected and the result may affect medical management, receive and process the sample within 4 hours. The result for microscopy should be made available within 2hr of the Gram stain.

If processing is delayed, refrigeration is preferable to storage at ambient temperature.

9 Specimen processing/procedure[18,19]

9.1 Test selection

Divide specimen on receipt for appropriate procedures such as microscopy and culture for *Mycobacterium* (UK SMI B 40 – Investigation of specimens for Mycobacterium species), and/or Legionella.

9.2 Appearance

Describe colour, opacity and if a clot is present.

9.3 Sample preparation

For all except clotted or very viscous specimens:

- centrifuge in a sterile, capped, conical-bottomed container at 1200xg for 5-10mins or use a cytospin preparation

  Note: If investigation for *Mycobacterium* species is also requested, the centrifugation time may be increased to 15-20mins and the same deposit used for this as well as routine microscopy and culture

- transfer all but the last 0.5mL of the supernatant using a sterile pipette to another CE Marked leak proof container in a sealed plastic bag, for additional testing if required (eg virology)
- resuspend the deposit in the remaining fluid

9.4 Microscopy

Refer UK SMI TP 39 – Staining procedures.

9.4.1 Standard

Gram stain

For all except clotted or very viscous specimens:

- place one drop of centrifuged deposit using a sterile pipette on to a clean microscope slide
- spread this with a sterile loop to make a thin smear for Gram staining

Clotted specimens

If possible, the clot should be broken up with a sterile pipette and a portion used to make a smear for Gram staining.

Total white cell count

The presence of a clot will invalidate a cell count.

If specifically requested for the differential diagnosis of Spontaneous Bacterial Peritonitis, or according to local protocol, perform a total cell count on the uncentrifuged specimen in a counting chamber. A full blood count, as well as a differential count, can also be performed using automated blood-cell analysers provided that they have been validated for body fluid microscopies, on specimens other than blood, and provided that the specimens which are acceptable are defined along with exclusion criteria and in which circumstances a manual microscope might be preferable[36-39].

9.4.2 Supplementary

Differential leucocyte count

Differentiating between polymorphonuclear leucocytes and mononuclear leucocytes may be performed in two ways:

1. **Counting chamber method: recommended for lower WBC counts.**

a) Non- or lightly-bloodstained specimens

- stain the uncentrifuged fluid with 0.1% stain solution such as toluidine, methylene or nile blue. This stains the leucocyte nuclei thus aiding differentiation of the cells
- the dilution factor must be considered when calculating the final cell count
- count and record the numbers of each leucocyte type
- express the leucocyte count as number of cells per litre

b) Heavily bloodstained specimens

- dilute specimen with WBC diluting fluid and leave for 5 minutes before loading the counting chamber. This will lyse the red blood cells and stain the leucocyte nuclei for differentiation
- count and record the number of each leucocyte type. The dilution factor must be considered when calculating the final cell count
- express the leucocyte count as number of cells per litre

2. **Stained method**

   Recommended for very high WBC counts where differentiation in the counting chamber is difficult

- prepare a slide from the centrifuged deposit or cytospin preparations as for the Gram stain but allow to air dry
- fix in alcohol and stain with a stain suitable for WBC morphology

  Note: Heat fixation distorts cellular morphology
- count and record the number of each leucocyte type as a percentage of the total

Microscopy for crystals

Performed only on request or according to local protocols

- examine the centrifuged deposit for the presence of crystals with a polarising microscope (sometimes such examinations are referred to other departments or pathology disciplines such as rheumatology, histopathology or cytology) depending on local protocols
- the needle-shaped, birefringent crystals of sodium urate are diagnostic of gout
- the rod or rhomboid-shaped crystals of calcium pyrophosphate are weakly birefringent and are indicative of pseudo-gout. Note that joints affected by gout can be secondarily infected

Other microscopy

- microscopy for *Mycobacterium* species - see UK SMI B 40 – Investigation of specimens for Mycobacterium species
- direct immunofluorescent antibody for *Legionella* species
- indirect immunofluorescent antibody test for *P. jirovecii* (often performed in other pathology disciplines, eg histology)

Note: Methods for staining procedures and immunofluorescent techniques are contained in separate UK SMIs.

9.5 Culture and investigation

Pre-treatment

Standard

Centrifuge specimen (already performed for microscopy – see Section 4.4).

Note: Every sample should be cultured regardless of cell count.

If blood culture bottles are used, inoculate bottles with the uncentrifuged specimen, ideally at the “bedside”.

Supplementary

Mycobacterium species - see UK SMI B 40 – Investigation of specimens for Mycobacterium species.

Specimen processing

Inoculate each agar plate and the enrichment broth with the centrifuged deposit (see UK SMI Q 5 – Inoculation of culture media for bacteriology) using a sterile pipette.

For the isolation of individual colonies, spread inoculum with a sterile loop.

Clotted specimens

Inoculate the clot fragments to the agar plates and the enrichment broth.

If the specimen contains only a small clot, this should be included either in the enrichment culture or inoculated onto the chocolate agar plate. The unclotted portion of the specimen should be cultured in the normal way as described above.

Supplementary

If culture negative from a patient where infection is strongly implicated, consider other non-culture methods for identification eg 16S rDNA PCR, etc.

9.5.1 Culture media, conditions and organisms[1,40-43]

Clinical details/ conditions	Specimen	Standard media	Incubation			Cultures read	Target organism(s)
			Temp °C	Atmos	Time		
Infection suspected in a normally sterile site	Amniotic fluid, bursa fluid, pericardial fluid, synovial (joint) fluid, peritoneal fluid (ascites), pleural fluid	Blood agar	35-37	5-10% CO_2	40-48hr*	daily	Any organism
		Fastidious anaerobe agar	35-37	anaerobic	40-48hr*	≥40hr	Anaerobes
		Chocolate agar	35-37	5-10% CO_2	40-48hr*	daily	Any organism

		If supplemented blood culture bottles† are used then that may replace the need for the plates outlined above, based on local risk assessment. Or anaerobic broth then subcultured to the plates above.	35-37	air	continuous monitoring	N/A	Any organism
For these situations, add the following:							
Clinical details/ conditions	**Specimen**	**Supplementary media**	**Incubation**			**Cultures read**	**Target organism(s)**
			Temp °C	**Atmos**	**Time**		
Peritonitis	Ascitic fluid Peritoneal fluid	Neomycin fastidious anaerobe agar	35-37	anaerobic	40 – 48hr*	≥48hr	Anaerobes
		CLED or MacConkey agar	35-37	air	16-24hr	≥16hr	Enterobacteriaceae
Clinical details/ conditions	**Specimen**	**Optional media**	**Incubation**			**Cultures read**	**Target organism(s)**
			Temp °C	**Atmos**	**Time**		
If microscopy suggestive of mixed infection	As appropriate	Staph/strep selective agar	35-37	air	16-24hr	≥16hr	*S. aureus* β-haemolytic streptococci
If fungi suspected clinically	As appropriate	Sabouraud or mycosel agar	35-37	air	21 days	10 and 21 days	Moulds and Yeasts
Other organisms for consideration –*Mycobacterium* (UK SMI B 40), *Chlamydia* species, *Pneumocystis jirovecii,* viruses.							
* plates can be incubated up to 5-7 days if required for example if *Nocardia* or *Actinomyces* is suspected. † follow manufacturer's recommendations							

9.6 Identification

Refer to individual UK SMIs for organism identification.

9.6.1 Minimum level of identification in the laboratory

Anaerobes	"anaerobes" level
β-haemolytic streptococci	Lancefield group level
Coagulase negative staphylococci	"coagulase negative" level
All other organisms (including moulds and yeast)	species level

Mycobacterium species	UK SMI B 40 - Investigation of specimens for Mycobacterium species

Organisms may be further identified if this is clinically or epidemiologically indicated.

9.7 Antimicrobial susceptibility testing

Refer to British Society for Antimicrobial Chemotherapy (BSAC) and/or EUCAST guidelines.

9.8 Referral for outbreak investigations

N/A

9.9 Referral to reference laboratories

For information on the tests offered, turnaround times, transport procedure and the other requirements of the reference laboratory see user manuals and request forms

Contact appropriate reference laboratory for information on the tests available, turnaround times, transport procedure and any other requirements for sample submission:

England

Wales

Scotland

Northern Ireland

Note: In case of sending away to laboratories for processing, ensure that specimen is placed in appropriate package and transported accordingly.

10 Reporting procedure

10.1 Microscopy

Gram stain

Report on WBCs and organisms detected.

Cell count (if requested)

Report numbers of WBCs x 10^6 per litre.

Also report PMNs and mononuclear leucocytes as percentage of the total WBCs, if requested.

P. *jirovecii* immunofluorescence

Report *P. jirovecii* cysts detected or not detected by immunofluorescence.

Microscopy for *Legionella* and *Mycobacterium* species UK SMI B 40 – Investigation of specimens for Mycobacterium species.

Microscopy reporting time

Urgent microscopy results to be telephoned or sent electronically within 2 hours of processing.

Written report, 16-72hr.

10.2 Culture

Report the organisms isolated or

Report absence of growth.

Also, report results of supplementary investigations.

10.3 Antimicrobial susceptibility testing

Report susceptibilities as clinically indicated. Prudent use of antimicrobials according to local and national protocols is recommended.

11 Notification to UKHSA[44,45] or equivalent in the devolved administrations[46-49]

The Health Protection (Notification) regulations 2010 require diagnostic laboratories to notify UK Health Security Agency (UKHSA) when they identify the causative agents that are listed in Schedule 2 of the Regulations. Notifications must be provided in writing, on paper or electronically, within seven days. Urgent cases should be notified orally and as soon as possible, recommended within 24 hours. These should be followed up by written notification within seven days.

For the purposes of the Notification Regulations, the recipient of laboratory notifications is the local UKHSA Health Protection Team. If a case has already been notified by a registered medical practitioner, the diagnostic laboratory is still required

to notify the case if they identify any evidence of an infection caused by a notifiable causative agent.

Notification under the Health Protection (Notification) Regulations 2010 does not replace voluntary reporting to UKHSA. The vast majority of NHS laboratories voluntarily report a wide range of laboratory diagnoses of causative agents to UKHSA and many UKHSA Health protection Teams have agreements with local laboratories for urgent reporting of some infections. This should continue.

Note: The Health Protection Legislation Guidance (2010) includes reporting of Human Immunodeficiency Virus (HIV) & Sexually Transmitted Infections (STIs), Healthcare Associated Infections (HCAIs) and Creutzfeldt–Jakob disease (CJD) under 'Notification Duties of Registered Medical Practitioners': it is not noted under 'Notification Duties of Diagnostic Laboratories'.

https://www.gov.uk/government/organisations/uk-health-security-agency

Other arrangements exist in Scotland[46,47], Wales[48] and Northern Ireland[49].

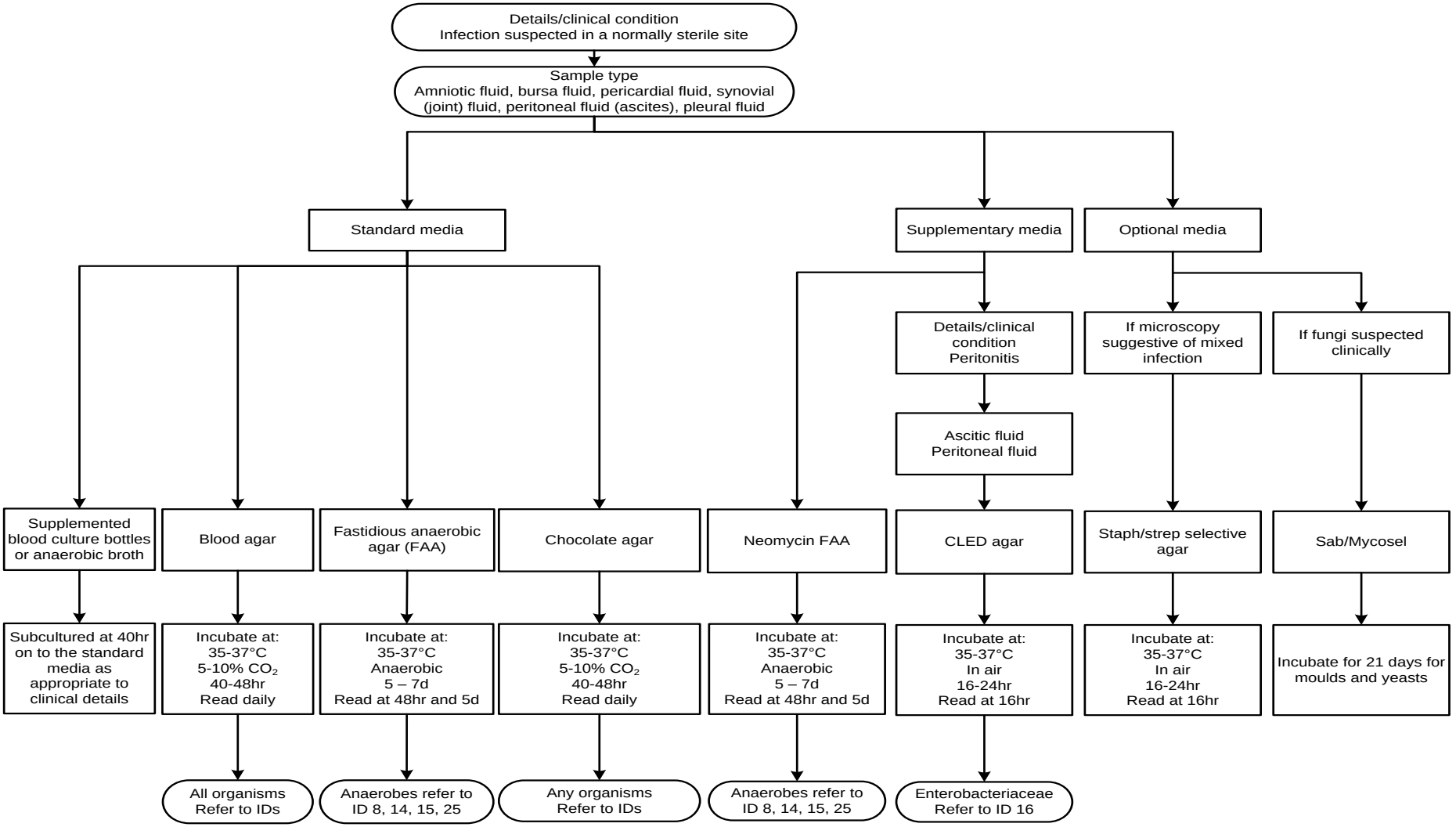
12 Public health responsibilities of diagnostic laboratories

Diagnostic laboratories have public health responsibility as part of their duties. Amongst these are additional local testing, or referral to further characterise the organism as required, primarily for public health purposes e.g. routine cryptosporidium detection; serotyping or microbial subtyping; and a duty to refer appropriate specimens and isolates of public health importance to a reference laboratory.

Diagnostic laboratory outputs inform public health intervention, and surveillance data is required to develop policy and guidance forming an essential component of healthcare. It is recognised that additional testing and referral of samples may entail some costs that has to be borne by the laboratory but in certain jurisdictions these costs are covered centrally.

Diagnostic laboratories should be mindful of the impact of laboratory investigations on public health and consider requests from the reference laboratories for specimen referral or enhanced information.

Algorithm: Investigation of fluids from normally sterile sites



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An explanation of the reference assessment used is available in the scientific information section on the UK SMI website.

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