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# UK Standards for Microbiology Investigations

## Investigation of gastric biopsies for *Helicobacter pylori*



NICE has accredited the process used by Public Health England to produce Standards for Microbiology Investigations. Accreditation is valid for 5 years from July 2011. More information on accreditation can be viewed at [www.nice.org.uk/accreditation](http://www.nice.org.uk/accreditation).

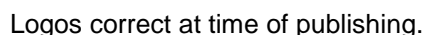
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## Amendment table

Each SMI method has an individual record of amendments. The current amendments are listed on this page. The amendment history is available from [standards@phe.gov.uk](mailto:standards@phe.gov.uk).

New or revised documents should be controlled within the laboratory in accordance with the local quality management system.

Amendment no/date.	9/21.12.15
Issue no. discarded.	5.2
Insert issue no.	6
<b>Section(s) involved</b>	<b>Amendment</b>
Whole document.	Hyperlinks updated to gov. uk.
Page 2.	Updated logos added.
Scope.	Addition of link to ID 20 – Identification of <i>Helicobacter</i> species.
Introduction.	Background text updated. Information on testing methods reorganised into order of use. Information regarding first line treatment updated to reflect NICE clinical guideline 184. Inclusion of information regarding rapid identification.
Technical information/limitation.	Optimal growth requirements updated. Inclusion of information regarding susceptibility testing and contamination.
Specimen transport and storage.	Removal of Aimes transport medium.
Specimen processing/procedure.	NCTC strains changed. Blood agar (10% horse blood) included. Biopsy urease replaced with Christenson's urea broth. Susceptibility testing information updated.
Reporting procedure.	Culture reporting turnaround times changed to: 'up to 12 days (15 days for microscopy, if antimicrobial susceptibility testing is required), but are usually available within 10 days.'

References.	Some references updated.
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UNDER REVIEW



## UK SMI<sup>#</sup>: scope and purpose

### Users of SMIs

Primarily, SMIs are intended as a general resource for practising professionals operating in the field of laboratory medicine and infection specialties in the UK. SMIs also provide clinicians with information about the available test repertoire and the standard of laboratory services they should expect for the investigation of infection in their patients, as well as providing information that aids the electronic ordering of appropriate tests. The documents also provide commissioners of healthcare services with the appropriateness and standard of microbiology investigations they should be seeking as part of the clinical and public health care package for their population.

### Background to SMIs

SMIs comprise a collection of recommended algorithms and procedures covering all stages of the investigative process in microbiology from the pre-analytical (clinical syndrome) stage to the analytical (laboratory testing) and post-analytical (result interpretation and reporting) stages. Syndromic algorithms are supported by more detailed documents containing advice on the investigation of specific diseases and infections. Guidance notes cover the clinical background, differential diagnosis, and appropriate investigation of particular clinical conditions. Quality guidance notes describe laboratory processes which underpin quality, for example assay validation.

Standardisation of the diagnostic process through the application of SMIs helps to assure the equivalence of investigation strategies in different laboratories across the UK and is essential for public health surveillance, research and development activities.

### Equal partnership working

SMIs are developed in equal partnership with PHE, NHS, Royal College of Pathologists and professional societies. The list of participating societies may be found at <https://www.gov.uk/government/publications/uk-standards-for-microbiology-investigations-smi-quality-and-consistency-in-clinical-laboratories>. Inclusion of a logo in an SMI indicates participation of the society in equal partnership and support for the objectives and process of preparing SMIs. Nominees of professional societies are members of the Steering Committee and working groups which develop SMIs. The views of nominees cannot be rigorously representative of the members of their nominating organisations nor the corporate views of their organisations. Nominees act as a conduit for two way reporting and dialogue. Representative views are sought through the consultation process. SMIs are developed, reviewed and updated through a wide consultation process.

### Quality assurance

NICE has accredited the process used by the SMI working groups to produce SMIs. The accreditation is applicable to all guidance produced since October 2009. The process for the development of SMIs is certified to ISO 9001:2008. SMIs represent a good standard of practice to which all clinical and public health microbiology

<sup>#</sup> Microbiology is used as a generic term to include the two GMC-recognised specialties of Medical Microbiology (which includes Bacteriology, Mycology and Parasitology) and Medical Virology.

laboratories in the UK are expected to work. SMIs are NICE accredited and represent neither minimum standards of practice nor the highest level of complex laboratory investigation possible. In using SMIs, laboratories should take account of local requirements and undertake additional investigations where appropriate. SMIs help laboratories to meet accreditation requirements by promoting high quality practices which are auditable. SMIs also provide a reference point for method development. The performance of SMIs depends on competent staff and appropriate quality reagents and equipment. Laboratories should ensure that all commercial and in-house tests have been validated and shown to be fit for purpose. Laboratories should participate in external quality assessment schemes and undertake relevant internal quality control procedures.

## Patient and public involvement

The SMI working groups are committed to patient and public involvement in the development of SMIs. By involving the public, health professionals, scientists and voluntary organisations the resulting SMI will be robust and meet the needs of the user. An opportunity is given to members of the public to contribute to consultations through our open access website.

## Information governance and equality

PHE is a Caldicott compliant organisation. It seeks to take every possible precaution to prevent unauthorised disclosure of patient details and to ensure that patient-related records are kept under secure conditions. The development of SMIs is subject to PHE Equality objectives <https://www.gov.uk/government/organisations/public-health-england/about/equality-and-diversity>.

The SMI working groups are committed to achieving the equality objectives by effective consultation with members of the public, partners, stakeholders and specialist interest groups.

## Legal statement

While every care has been taken in the preparation of SMIs, PHE and any supporting organisation, shall, to the greatest extent possible under any applicable law, exclude liability for all losses, costs, claims, damages or expenses arising out of or connected with the use of an SMI or any information contained therein. If alterations are made to an SMI, it must be made clear where and by whom such changes have been made.

The evidence base and microbial taxonomy for the SMI is as complete as possible at the time of issue. Any omissions and new material will be considered at the next review. These standards can only be superseded by revisions of the standard, legislative action, or by NICE accredited guidance.

SMIs are Crown copyright which should be acknowledged where appropriate.

## Suggested citation for this document

Public Health England. (2015). Investigation of gastric biopsies for *Helicobacter pylori*. UK Standards for Microbiology Investigations. B 55 Issue 6. <https://www.gov.uk/uk-standards-for-microbiology-investigations-smi-quality-and-consistency-in-clinical-laboratories>

## Scope of document

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### Type of specimen

Gastric biopsy

This SMI describes the processing and bacteriological investigation of gastric biopsies for *Helicobacter pylori*.

This SMI should be used in conjunction with other SMIs including [ID 26 – Identification of \*Helicobacter\* species](#).

## Introduction

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In 1984 Warren and Marshall first proposed the association of *H. pylori* with peptic ulcer disease, and since then it has become established as the most clinically important species of *Helicobacter*<sup>1</sup>. It is recognized as the main cause of peptic ulcer disease and a major risk factor for gastric cancer<sup>2</sup>. *H. pylori* infection is also an independent risk factor for the development of atrophic gastritis, gastric ulcer disease, gastric adenocarcinomas, and gastric mucosa-associated lymphoid tissue (MALT) lymphomas<sup>2</sup>. The species establishes a chronic infection in the majority of infected people, represented by chronic gastritis. Prominent mucosal inflammation is often evident in the antrum (antrum-predominant gastritis), predisposing to hyperacidity and duodenal ulcer disease. Many patients infected with *H. pylori* have recurrent abdominal symptoms (non-ulcer dyspepsia) without ulcer disease, and there appears to be a clinical benefit in eradicating *H. pylori* in these patients<sup>3</sup>. Acute symptoms of gastritis and epigastric pain, nausea and vomiting may occur and usually subside, but hyperchlorhydria may persist for much longer.

The detection and diagnosis of *H. pylori* infections has been of great interest. Initially invasive techniques (for example tissue biopsies) were used for diagnosis. However, with progress in the diagnostic field (especially molecular biology) non-invasive techniques are now routinely used within the clinical laboratory for initial diagnosis of infection.

The National Institute of Clinical Excellence (NICE) and PHE guidelines on dyspepsia states that a 'test and treat' strategy should be employed for cases of dyspepsia and suspected gastric and duodenal ulcer that have not previously been investigated<sup>3-6</sup>. Recommended tests include the urea breath test (UBT) and stool antigen test (SAT)<sup>3-6</sup>. Blood serology is less accurate than the UBT or SAT, results are variable and these tests should not be used in the elderly, children or post treatment<sup>5,6</sup>. Near - patients serology tests are not recommended<sup>5</sup>.

Following a positive result for *H. pylori* eradication therapy consisting of a seven day course of a proton pump inhibitor (PPI) with amoxicillin and either clarithromycin or metronidazole is given. An alternative first line treatment regimen is required if the patient is allergic to penicillin; detailed information regarding first and second line treatment options can be found in NICE clinical guidance 184: Dyspepsia and gastro-oesophageal reflux disease<sup>4</sup>. *H. pylori* culture and sensitivities on gastric biopsies should be considered after the first treatment failure if an endoscopy is carried out. Following a second treatment failure, culture and sensitivity should be performed on all cases<sup>7</sup>. The Maastricht IV consensus report also recommends that culture and



sensitivities are carried out in areas where resistance to clarithromycin is above 20%<sup>7,8</sup>.

In the UK *H. pylori* is frequently resistant to metronidazole (20% to 80%). Clarithromycin resistance is less common in the general population (4% to 11%). Levofloxacin resistance is uncommon (~15%), but occurs due to the widespread use of fluoroquinolones. *H. pylori* are rarely resistant to amoxicillin, rifampicin and tetracycline (~3%). *H. pylori* can also be treated with rifabutin a similar drug to rifampicin, but with different susceptibilities (resistance is extremely rare <1%)<sup>9</sup>.

## Non-invasive techniques

Non-invasive techniques avoid having the need for expensive and invasive endoscopy<sup>10</sup>. For the investigation of cases of dyspepsia and suspected gastric and duodenal ulcer that have not previously been investigated the following tests are recommended<sup>3,5,6</sup>:

- urea breath tests (UBTs)
- stool antigen tests

The urea breath test and stool antigen test have been shown to have equivalent diagnostic accuracy; serological tests are less accurate and may only be used in certain situations<sup>7</sup>.

### Urea breath tests (UBT)

UBTs are considered to be the diagnostic gold standard<sup>11</sup>. Urea Breath Test utilise either a carbon radioactive isotope (<sup>14</sup>C) or a non-radioactive natural isotope (<sup>13</sup>C), which are ingested by the patient. The labeled CO<sub>2</sub> is absorbed by the blood and exhaled in expired air. The testing methodology and factors influencing the result, standardization, and application in different clinical settings have been comprehensively reviewed<sup>12</sup>. The use of the UBT has high diagnostic accuracy (>95%) and, where available, is consistently recommended for the diagnosis of *H. pylori*<sup>13</sup>.

### Stool antigen tests (SAT) (HPStAg)

Stool antigen tests using an ELISA provide another valuable aid in the diagnosis of an active *H. pylori* infection<sup>14</sup>. The test is easy to perform and has the advantage of being non-invasive. Two types of stool antigen test are available; a laboratory based enzyme-linked immunosorbent assay (ELISA) method and rapid near patient (immunochromatographic) kits. Over recent years SAT ELISAs using monoclonal antibodies instead of polyclonal antibodies have been developed. These have high accuracy for both primary diagnosis and post treatment diagnosis<sup>7,15-17</sup>. Near-patient testing serology (pregnancy test-style) kits are less reliable<sup>7,18</sup>. Evidence-based studies suggest that ELISA HPStAg is the most cost-effective means of diagnosing *H. pylori* infection<sup>19,20</sup>.

### Serology

*H. pylori* infection is regarded as a chronic infection and therefore only IgG is considered when carrying out serological tests for diagnosis<sup>7</sup>. The favoured method is standard ELISA. Commercial tests show variable accuracy and ideally validated IgG serology may only be used in the following situations<sup>7,8</sup>:

- following recent use of antimicrobial and antisecretory drugs

- where there is ulcer bleeding, atrophy or gastric malignancy

Laboratory based serology should only be used where a particular serological assay has been sufficiently validated locally and has been shown to be fit for use.

### Invasive techniques (gastric biopsies)

Gastric biopsy is the specimen of choice for the culture of *H. pylori*. Attempts to culture from other specimens have a low success rate<sup>21</sup>. The collection of a biopsy is an invasive procedure and is not a cost effective means of diagnosing *H. pylori* infections.

Invasive techniques for examination of gastric biopsies taken at endoscopy include<sup>12,22,23</sup>:

- culture
- biopsy (urease test)
- microscopy
- histology

Neither culture nor histology provides a rapid diagnosis.

#### Culture

Culture of the organism is the most specific method and offers opportunity for conventional antimicrobial susceptibility testing. This is important in predicting and evaluating the efficacy of treatment, and in identifying reinfections. With the adoption of the 'test and treat' strategy as recommended by NICE, the main rationale for obtaining a biopsy for culture is to establish the susceptibility of the isolate.

#### Biopsy (urease test)

The urease test also known as the rapid urease test (RUT) or Campylobacter-like organism test (CLO test), is a rapid, sensitive and cost effective test<sup>8,22</sup>. Positive results are often available within minutes but negative reporting may take a great deal longer, according to manufacturers' instructions. It is recommended for use in combination with either culture or histology, depending on local facilities. This test is often carried out in the endoscopy suite. Commercial kits are available which are highly accurate but also expensive.

#### Microscopy

Organisms may be stained using Giemsa or Gram stains according to preference. Sensitivities of up to 90% have been reported if two biopsies are examined, but this method requires technical expertise<sup>21</sup>.

#### Histology

Histology examination is as sensitive as culture when detecting *H. pylori*, and has a high degree of specificity<sup>12</sup>. It is also a useful means of detecting culture-resistant *Helicobacter* species such as *Helicobacter heilmannii* and similar species which are uncommon causes of gastritis and ulcer. Currently Giemsa staining is most widely used, immunostaining may also be used and increases sensitivity and specificity<sup>8</sup>.

## Rapid identification

### Nucleic acid amplification techniques (NAATs)

NAATs have been used for the detection of *H. pylori* in various sample types including gastric biopsies, gastric mucosa and stool samples<sup>8,22</sup>. PCR and real-time PCR are most frequently used, however the role of PCR in routine diagnosis remains to be established<sup>8,22</sup>. NAATs assays can provide added value in investigating culture-negative gastric biopsy specimens, particularly those from cases for which other clinical tests indicate an *H. pylori* infection<sup>24</sup>. A systematic study of primers for *H. pylori* detection found that the four best-performing assays each attained a detection limit of <100 CFU/mL from gastric tissue<sup>25</sup>. However, no assay had 100% specificity or sensitivity, and all produced false positives<sup>25,26</sup>.

### MALDI-TOF mass spectroscopy

This technology is promising for the identification of relatively unreactive bacteria such as *Helicobacter* species. Although it is probably more useful for *H. pylori*, *Helicobacter* species (refer to [ID 26 - Identification of \*Helicobacter\* species](#))<sup>27</sup>.

## Technical information/limitations

### Limitations of UK SMLs

The recommendations made in UK SMLs 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.

### Specimen containers<sup>23,29</sup>

SMLs 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”.

## Optimal growth requirements

### Media

There is no consensus on which medium is best for the isolation of *H. pylori* although blood based media is preferred. Several have been described<sup>23,30-32</sup>. Blood-free media, containing alternative supplements, may not be as good for primary isolation. This SMI recommends the use of Columbia Blood Agar (CBA) with 10% horse blood and Dent's selective agar (other selective media are available)<sup>33</sup>.

Antimicrobial supplements may be added to media to inhibit overgrowth with contaminating bacteria and fungi<sup>33</sup>. *H. pylori* is sensitive to clindamycin,

cephalosporins and sodium desoxycholate, none of which should be used in the selective medium.

## Atmosphere

Optimal growth requirements for the isolation of *H. pylori* are a moist, micro-aerobic atmosphere (5-7% O<sub>2</sub> and 5-10% CO<sub>2</sub>) at 35-37<sup>23</sup>. It should be noted that *H. pylori* recovery is significantly enhanced by the presence of hydrogen (3-5%), which is absent from the most widely available micro-aerobic atmosphere generating kits<sup>21,34</sup>. Micro-aerobic atmosphere generating kits that include hydrogen are available; alternatively other methods which introduce hydrogen into the system can be used (eg using a tailored gas supply)<sup>21</sup>. All methods should be validated prior to use.

## Incubation

Cultures should be incubated for a minimum of 10 days, although colonies may be visible at 3 to 5 days<sup>23</sup>. It is not good practice to expose the plates to air too regularly, and once examined they should be returned to the incubator or gas jar as soon as possible.

## Sensitivity testing

BSAC state that the disc diffusion method is not suitable for *H. pylori*, as the organism is slow growing, and results may therefore be inaccurate<sup>35</sup>. The recommended method of susceptibility testing is an antibiotic gradient strips which evaluates the minimum inhibitory concentration (MIC)<sup>36</sup>. The range of antibiotic strips available varies and is dependent on the manufacturer. The MIC breakpoints for *Helicobacter pylori* are based on epidemiological “cut-off” values (ECOFFs), which distinguish “wild-type” isolates from those with reduced susceptibility, and can be accessed via the BSAC website<sup>35</sup>. Alternative MIC breakpoints have been recommended by the European *Helicobacter* study group and are included in the Maastricht IV consensus guidelines<sup>7,9</sup>. Alternatively, isolates can be sent to an appropriate specialist or reference laboratory.

## Contamination

Contamination with moulds may be reduced by the incorporation of an antifungal agent to the medium such as cyclohexamide (100mg/L) and thorough cleaning of equipment before and after use. Autoclaving of jars previously contaminated with moulds is recommended (if able to according to manufacturer's instructions). Otherwise thorough decontamination followed by cleaning and thorough rinsing is recommended.

# 1 Safety considerations<sup>28,29,37-51</sup>

## 1.1 Specimen collection, transport and storage<sup>28,29,37-40</sup>

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.

## 1.2 Specimen processing<sup>28,29,37-51</sup>

Containment Level 2.

Laboratory procedures that give rise to infectious aerosols must be conducted in a microbiological safety cabinet<sup>43</sup>.

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

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

# 2 Specimen collection

## 2.1 Type of specimens

Gastric biopsy

## 2.2 Optimal time and method of collection<sup>52</sup>

For safety considerations refer to Section 1.1.

Collect specimens before starting antimicrobial therapy where possible<sup>52</sup>.

Ideally biopsies should be taken before antimicrobial therapy is begun, however a 'test and treat' strategy for the diagnosis of *H. pylori* is recommended by NICE and therefore most samples referred for culture will be due to treatment failure<sup>3-5,20</sup>. A period of at least two weeks should have elapsed since the last dose of antimicrobial therapy before the collection of the specimen<sup>7</sup>.

Gastric biopsy specimens are usually taken from the gastric antrum at endoscopy, and sometimes from the main body of the stomach depending on location of inflammation. Duodenal biopsies will be taken in cases with duodenal ulcers.

## 2.3 Adequate quantity and appropriate number of specimens<sup>52</sup>

Numbers and frequency of specimen collection are dependent on clinical condition of patient at the discretion of the endoscopist as it depends on the individual patient.

# 3 Specimen transport and storage<sup>28,29</sup>

## 3.1 Optimal transport and storage conditions

For safety considerations refer to Section 1.1.

Specimens should be transported and processed as soon as possible (preferably within 6hr)<sup>23,52</sup>.



It is important to maintain a moist atmosphere during transport.

If processing is delayed, refrigeration is preferable to storage at ambient temperature<sup>52,53</sup>.

**Where culture is to be carried out within six hours<sup>23</sup>:**

The biopsy should be placed in a small, CE marked, leak proof container such as a bijou bottle, containing a small amount (approximately 100µL) of sterile isotonic saline to prevent desiccation<sup>54</sup>. Alternatively, Dent's transport medium can be used<sup>33</sup>.

**Note:** Sensitivity of the microscopy may be reduced if the biopsy is submerged in the saline, because mucus globules form and production of a satisfactory smear becomes difficult.

**Where delays of >6hr are expected<sup>23,55</sup>:**

The biopsy should be covered with approximately 1mL brain heart infusion broth in a small sterile container, such as a bijou bottle, and stored at 4°C for up to 48hr. Alternatively Dent's transport medium can be used.

Biopsies may be stored for up to 6 months at -70°C in broth containing 20-25% glycerol although viability will be significantly reduced.

## 4 Specimen processing/procedure<sup>28,29</sup>

### 4.1 Test selection

The urease test is often performed on biopsies in the endoscopy suite; therefore only culture and microscopy may be required in the laboratory.

The order in which any or all of the tests are performed will be in accordance with local protocol.

### 4.2 Appearance

N/A

### 4.3 Sample preparation

For safety considerations refer to Section 1.2.

Finely cut biopsy with a sterile scalpel.

Homogenisation can be performed, but may be counterproductive as it is more time consuming and requires the use of a sterile tissue grinder (Griffiths grinder or an unbreakable alternative).

### 4.4 Microscopy

Refer to [TP 39 – Staining procedures](#).

Microscopy is carried out using carbol fuchsin or Sandiford's stain.

#### 4.4.1 Standard

Pick up the biopsy (or piece of finely cut biopsy) with a sterile swab and smear vigorously on to a clean microscope slide (a sterile slide is required if microscopy is performed before culture).

Staining and examination of the stained preparation need only be performed if the culture result is negative and the biopsy urease test positive. Gram or Giemsa stains are suitable.

## 4.5 Culture and investigation

### 4.5.1 Pre-treatment

N/A

### 4.5.2 Specimen processing

#### Culture

The same swab containing the biopsy that was used for microscopy (if performed) should be used to inoculate each agar plate (see [Q 5 – Inoculation of culture media for bacteriology](#)).

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

**Note:** The simultaneous subculture of known control strains of *H. pylori* is recommended, especially if susceptibility testing is to be performed.

The following control strains may be used<sup>9</sup>:

- type strain – NCTC 11637
- Metronidazole and Clarithromycin sensitive strain – NCTC 12455
- Metronidazole and Clarithromycin resistant strain – NCTC 11637

#### Biopsy (urease test)

Squash the biopsy on the end of a swab into urea broth after culture (and microscopy if performed).

The swab should be broken off in the broth and left *in situ* throughout the test.

Incubate the urea broth at ambient temperature. Positive results are often available within minutes, but negative reporting takes longer (up to 24hr), according to manufacturers' instructions.

### 4.5.3 Culture media, conditions and organisms

Clinical details/ conditions	Specimen	Standard media	Incubation			Cultures read	Target organism(s)
			Temp °C	Atmos	Time		
Gastritis	Gastric biopsy	Dent's selective agar or alternative <i>H. pylori</i> selective agar*	35-37	Microaerobic  Moist chamber, ideally containing hydrogen	10 d	Every 48hr	<i>H. pylori</i>
		Blood agar 10% horse blood <sup>30</sup>	35-37	Microaerobic  Moist chamber, ideally containing hydrogen	10 d	Every 48hr	
For these situations, add the following:							
Clinical details/ conditions	Specimen	Supplementary media	Incubation			Cultures read	Target organism(s)
			Temp °C	Atmos	Time		
Gastritis - Biopsy urease test if not already performed in endoscopy suite	Gastric biopsy	Christenson's Urea broth	ambient	Microaerobic	24hr	hourly up to 6hr and again at 24hr	<i>H. pylori</i>
*GC selective agar may be used in absence of <i>H. pylori</i> media.							

## 4.6 Identification

Refer to individual CMIs for organism identification.

### 4.6.1 Minimum level of identification in the laboratory

<a href="#">H. pylori</a>	species level
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## 4.7 Antimicrobial susceptibility testing

Disc diffusion criteria for antimicrobial susceptibility testing of *H. pylori* have not been defined therefore an MIC method should be used<sup>35</sup>.

If a commercial MIC method is used, manufacturer's instructions should be followed.

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

Alternatively, isolates can be sent to an appropriate specialist or reference laboratory.

## 4.8 Referral for outbreak investigations

N/A

## 4.9 Referral to reference laboratories

For information on the tests offered, turnaround times, transport procedure and the other requirements of the reference laboratory [click here for user manuals and request forms](#).

Organisms with unusual or unexpected resistance, or associated with a laboratory or clinical problem, or anomaly that requires elucidation should be sent to the appropriate reference laboratory.

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

England and Wales

<https://www.gov.uk/specialist-and-reference-microbiology-laboratory-tests-and-services>

Scotland

<http://www.hps.scot.nhs.uk/reflab/index.aspx>

Northern Ireland

<http://www.publichealth.hscni.net/directoriate-public-health/health-protection>

# 5 Reporting procedure

## 5.1 Microscopy

### Gram stain (if performed)

Report presence or absence of *H. pylori*-like organisms.

### 5.1.1 Microscopy reporting time

All results should be issued to the requesting clinician as soon as they become available, unless specific alternative arrangements have been made with the requestors.

Urgent results should be telephoned or transmitted electronically in accordance with local policies.

## 5.2 Culture

The following as appropriate:

### Culture

#### Positive report

*H. pylori* isolated

#### Negative report

*H. pylori* not isolated

**Biopsy (urease test) if performed**

Report urease test result as positive or negative.

**5.2.1 Culture reporting time**

Interim or preliminary results should be issued on detection of potentially clinically significant isolates as soon as growth is detected, unless specific alternative arrangements have been made with the requestors.

Urgent results should be telephoned or transmitted electronically in accordance with local policies.

Final written or computer generated reports should follow preliminary and verbal reports as soon as possible.

Culture results may take up to 12 days (15 days if antimicrobial susceptibility testing is required), but are usually available within 10 days.

**5.3 Antimicrobial susceptibility testing**

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

**6 Notification to PHE<sup>56,57</sup>, or equivalent in the devolved administrations<sup>58-61</sup>**

The Health Protection (Notification) Regulations 2010 require diagnostic laboratories to notify Public Health England (PHE) 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 PHE 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 PHE. The vast majority of NHS laboratories voluntarily report a wide range of laboratory diagnoses of causative agents to PHE and many PHE Health Protection Teams have agreements with local laboratories for urgent reporting of some infections. This should continue.

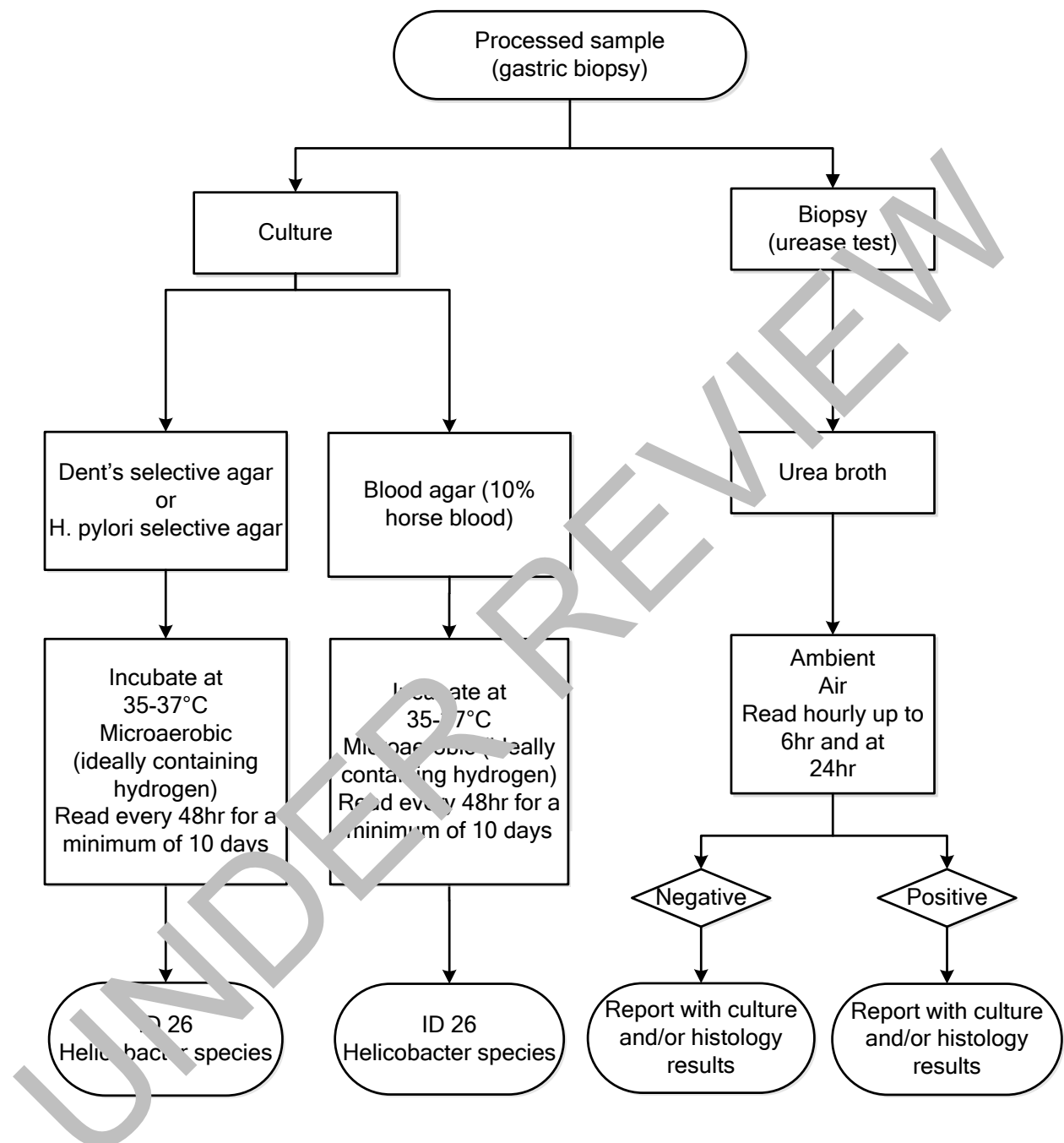
**Note:** The Health Protection Legislation Guidance (2010) includes reporting of Human Immunodeficiency Virus (HIV) & Sexually Transmitted Infections (STIs), Healthcare Associated Infections (HCIs) and Creutzfeldt–Jakob disease (CJD) under ‘Notification Duties of Registered Medical Practitioners’: it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

<https://www.gov.uk/government/organisations/public-health-england/about/our-governance#health-protection-regulations-2010>

Other arrangements exist in [Scotland](#)<sup>58,59</sup>, [Wales](#)<sup>60</sup> and [Northern Ireland](#)<sup>61</sup>.



## Appendix: Gastric biopsies for *Helicobacter pylori*



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