Fact sheet for health care professionals

Microbiological testing of endoscopes

Background

Microbiological testing of endoscopes and other medical instruments, such as duodenoscopes, colonoscopes, bronchoscopes, and automated flexible endoscope reprocessors (AFERs), is performed as a quality control measure to verify cleaning and sterilisation processes. Bacteria of interest include enteric, respiratory and environmental organisms (such as rapidly growing mycobacteria), as isolation of these organisms may indicate a breakdown of the cleaning and sterilisation processes of the instruments or inadequate filtering of water used to clean the devices. Additionally, isolation of organisms such as staphylococci and streptococci may indicate contamination during the sample collection process.

Frequency of testing

Because of differential risks of infection transmission, recommendations on the frequency of testing vary with both the proposed use of the endoscopes and with the method of disinfection. Appendix 1 summarises recommendations from the Gastroenterological Society of Australia (GESA) guidelines. Further microbiological screening should be undertaken in consultation with a clinical microbiologist/infection control practitioner in the following circumstances:

- There is a clinical suspicion of cross-infection related to endoscopy
- In response to positive surveillance cultures
- Where new staff are performing endoscope reprocessing
- Where alterations are made to the plumbing of the endoscopy reprocessing area
- With the introduction of new models of equipment (endoscope or AFER).

Sampling of instruments

Instruments should be sampled after usual processing and following storage for at least 12 hours, except in the case of endoscopes that have undergone sterilisation and are already stored in a wrapped state. These should be removed from the packaging and tested at the interval indicated in table 1 or as per agreed endoscopy unit protocol. Detailed recommended methods for instrument or AFER sample collection are available in the GESA guidelines. All samples should be pooled in a single container which is labelled and sent with a request form detailing the following:

- Type of scope sampled and serial number
- Name of person to whom the report should be sent
- Test requested (e.g. routine infection control surveillance; TB - after positive bronchoscopy clinical sample; repeat testing after previous positive surveillance culture).

In the event of a positive surveillance culture, each individual channel will need to be sampled and the rinse fluid placed into separate collection containers.
Microbiological evaluation

Bacterial cultures are reported semi-quantitatively and should be interpreted and acted upon according to guidelines established in individual endoscopy units in consultation with local infection control staff. The type of organism isolated e.g. environmental or skin organisms (e.g. *Bacillus* spp., coagulase-negative staphylococci) vs gastrointestinal organisms (e.g. *E. coli*, *Salmonella*, *Proteus* spp.) are factors used in assessing whether any action is necessary. Growth is evaluated to quantify the level of bacterial contamination and reported according to the scheme below:

<table>
<thead>
<tr>
<th>Growth quantitation</th>
<th>Colony counts per agar plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>&lt; 10</td>
</tr>
<tr>
<td>++</td>
<td>10 – 100</td>
</tr>
<tr>
<td>+++</td>
<td>&gt; 100</td>
</tr>
</tbody>
</table>

Each unit must determine its own interpretative scheme; that described in the GESA guidelines is the most frequently used.

Summary of microbiology interpretation of microbiology results according to GESA guidelines:

> single colonies on agar media are not considered significant
> < 10 colonies per plate: low numbers of environmental-type organisms e.g. coagulase negative staphylococci (CNS), *Bacillus* spp., etc., are most likely derived from the collection process and are not considered significant.

Pathogens and other isolates

Pathogens in any numbers, such as *S. aureus*, *Salmonella* spp., *E. coli*, *P. aeruginosa*, indicate that there is a problem with cleaning/sterilisation, with potential for cross-infection. Immediate further investigation is needed and endoscopes should be removed from patient use until investigations are complete. Microbiological testing of the AER (e.g. Steris and Soluscope) and disinfecting equipment, in addition to retesting of endoscopes, is indicated in order to identify the problem.

Suggested interpretation of cultures and actions are presented in the GESA guidelines and summarised in appendices 1 and 2.

References


For more information

Infection Control Service
Communicable Disease Control Branch
11 Hindmarsh Square
Adelaide SA 5000
Telephone: 1300 232 272
www.sahealth.sa.gov.au/infectionprevention
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Appendix 1: Recommended frequency of endoscope and processor testing and microorganisms of interest

<table>
<thead>
<tr>
<th>Device/scope</th>
<th>Recommended frequency of testing</th>
<th>Microorganisms of interest</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic flexible endoscope reprocessors (AFERs)</td>
<td>Monthly</td>
<td>Non-fermentative Gram-negative bacilli (including <em>Pseudomonas</em> spp.) and rapid-growing mycobacteria</td>
<td></td>
</tr>
<tr>
<td>Duodenoscopes</td>
<td>Monthly</td>
<td>coliforms (including <em>Salmonella</em> spp.), enterococci and viridans streptococci; non-fermentative Gram-negative bacilli (including <em>Pseudomonas</em> spp.).</td>
<td></td>
</tr>
<tr>
<td>Bronchoscopy</td>
<td>Monthly</td>
<td>As for duodenoscopes plus rapid-growing mycobacteria</td>
<td>Culture to identify <em>M. tuberculosis</em> is not included in routine surveillance but should be performed on the next scheduled sampling from a bronchoscope that has been used on a patient who has a positive MTB culture</td>
</tr>
<tr>
<td>Linear endoscopic ultrasound instruments</td>
<td>Monthly</td>
<td>As for duodenoscopes</td>
<td></td>
</tr>
<tr>
<td>Other gastrointestinal scopes</td>
<td>3-monthly</td>
<td>As for duodenoscopes</td>
<td></td>
</tr>
<tr>
<td>Processed endoscopes stored in wrapped state</td>
<td>3-monthly</td>
<td>As for duodenoscopes</td>
<td></td>
</tr>
<tr>
<td>Water supply for manual rinsing</td>
<td>Monthly if no filter 3 monthly if 0.2 micron filter in place</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loan instruments</td>
<td>Within 72 hours of receipt and then on routine schedule</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Non-enteric bacteria: *Pseudomonas* spp. (including *P. aeruginosa*), *Alcaligenes*, *Flavobacterium*, *Stenotrophomonas* and *Acinetobacter* spp.
Appendix 2: Recommendations based on testing results

1. Bronchoscopes

<table>
<thead>
<tr>
<th>Culture classification</th>
<th>Culture result</th>
<th>Interpretation</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light skin contamination</td>
<td>&lt; 10 colonies skin flora (CNS, Bacillus spp, diphtheroids, micrococi)</td>
<td>Insignificant result</td>
<td>No further action required/educate staff on sample collection if repeated problem</td>
</tr>
</tbody>
</table>
| Heavy skin contamination | ≥10 colonies skin flora (CNS, Bacillus species, diphtheroids, micrococci) | Probable contamination during sample collection | > investigate sample collection procedure  
> reprocess endoscope and reculture  
> if culture negative, no further action  
> if positive, retest |
| Upper respiratory tract contamination | Any quantity of *Staphylococcus aureus*, viridans streptococci, non-tuberculous mycobacteria, enteric or non-enteric Gram negatives* (except *P. aeruginosa*, *Burkholderia cepacia* or *Acinetobacter baumanii* or *Candida* species) | Breaches in cleaning or disinfection | > determine whether low level contamination has occurred within past month from any endoscope or within 3 months for same endoscope  
> if no, remove endoscope from patient use  
> reprocess endoscope and reculture  
> if reculture results negative, scope may be reused  
> if culture positive, reculture again  
> if remains positive, treat as per high quantity gastrointestinal contamination |
| Serious pulmonary pathogen | Any growth of *Mycobacterium tuberculosis*, *P. aeruginosa*, *Burkholderia cepacia* or *Acinetobacter baumanii* | Major breach in cleaning or disinfection process | > investigate and improve cleaning and disinfecting procedure  
> remove endoscope from patient use  
> **initiate patient recall**  
> reprocess endoscope and reculture  
> if culture negative, scope may be reused  
> if positive culture, retest |

Non-enteric bacteria: *Pseudomonas* spp. (including *P. aeruginosa*), *Alcaligenes*, *Flavobacterium*, *Stenotrophomonas* and *Acinetobacter* spp.
# 2. Duodenoscopes

<table>
<thead>
<tr>
<th>Culture classification</th>
<th>Culture result</th>
<th>Interpretation</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light skin contamination</td>
<td>&lt; 10 colonies skin flora (CNS, <em>Bacillus</em> spp, diphtheroids, micrococci)</td>
<td>Insignificant result</td>
<td>No further action required/educate staff on sample collection technique if repeated problem</td>
</tr>
<tr>
<td>Heavy skin contamination</td>
<td>≥10 colonies skin flora (CNS, <em>Bacillus</em> spp, diphtheroids, micrococci)</td>
<td>Probable contamination during sample collection</td>
<td>&gt; investigate sample collection procedure  &gt; reprocess endoscope and reculture  &gt; if culture negative no further action  &gt; if positive on reculture, retest</td>
</tr>
<tr>
<td>Upper gastrointestinal tract contamination</td>
<td>Any quantity of <em>Staphylococcus aureus</em>, viridans streptococci, <em>Enterococcus sp.</em> , enteric or non-enteric Gram-negatives* (except <em>P. aeruginosa</em>), <em>Candida</em> species</td>
<td>Upper gastrointestinal tract contamination</td>
<td>&gt; investigate and improve cleaning and disinfecting procedure  &gt; restrict endoscope from patient use  &gt; patient recall may be indicated  &gt; reprocess endoscope and reculture  &gt; if culture negative, scope may be reused  &gt; if culture positive, reculture; consider structural fault in scope</td>
</tr>
<tr>
<td>Serious biliary pathogen</td>
<td>Any quantity of <em>P. aeruginosa</em>, <em>Yersinia</em>, <em>Shigella</em> or <em>Salmonella</em> spp.</td>
<td>Serious biliary pathogen, indicative of incomplete cleaning or disinfection</td>
<td>&gt; investigate and improve cleaning and disinfecting procedure  &gt; restrict endoscope from patient use  &gt; initiate patient recall  &gt; reprocess endoscope and reculture  &gt; if culture negative scope may be reused  &gt; if positive culture, consider structural fault in scope – send to manufacturer for testing.</td>
</tr>
</tbody>
</table>

Non-enteric bacteria: *Pseudomonas* spp. (including *P. aeruginosa*), *Alcaligenes*, *Flavobacterium*, *Stenotrophomonas* and *Acinetobacter* spp.
### 3. Endoscopes/gastroscopes

<table>
<thead>
<tr>
<th>Culture classification</th>
<th>Culture result</th>
<th>Interpretation</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light skin contamination</td>
<td>&lt; 10 colonies skin flora (CNS, viridans streptococci, <em>Bacillus</em> spp, diphtheroids, micrococci)</td>
<td>Insignificant result</td>
<td>No further action/educate staff on sample collection technique if repeated problem</td>
</tr>
</tbody>
</table>
| Heavy skin contamination                    | ≥ 10 colonies skin flora (CNS, viridans streptococci, *Bacillus* spp, diphtheroids, micrococci)                                                          | Probable contamination during sample collection | > investigate sample collection procedure.  
   > reprocess endoscope and reculture  
   > if culture negative no further action  
   > if positive, reculture                                                                                                                                  |
| Low quantity gastrointestinal contamination | <10 colonies *Staphylococcus aureus, Enterococcus spp.*, viridans streptococci, enteric or non-enteric Gram-negatives* (except *Yersinia, Salmonella or Shigella spp.*), Candida species | Breaches in cleaning or disinfection | Determine whether low level contamination has occurred within past month from any endoscope or within 3 months for same endoscope. If no:  
   > restrict endoscope from patient use  
   > reprocess endoscope and reculture  
   > if repeat culture negative, scope may be reused  
   > if positive culture repeated,  
   > manage as per high quantity gastrointestinal contamination                                                                                          |
| High quantity gastrointestinal contamination | ≥ 10 colonies *Staphylococcus aureus, Enterococcus spp.*, viridans streptococci, enteric or non-enteric Gram-negatives* (except *Yersinia, Salmonella or Shigella spp.*), Candida species | Significant breach in cleaning and or disinfecting process | Investigate and improve cleaning and disinfecting procedure:  
   > restrict endoscope from patient use  
   > **patient recall may be indicated**  
   > reprocess endoscope and reculture  
   > if culture negative scope may be reused  
   > if positive, reculture                                                                                                                                  |
| Serious gastrointestinal pathogen contamination | Any quantity of *Yersinia, Salmonella or Shigella spp.*                                                                                                   | Major breach in cleaning or disinfection process | Investigate and improve cleaning and disinfecting procedure:  
   > restrict endoscope from patient use  
   > **initiate patient recall**  
   > reprocess endoscope and reculture  
   > if culture negative scope may be reused  
   > if positive reculture                                                                                                                                  |

* Enteric bacteria: *E coli, Klebsiella, Enterobacter, Serratia, Citrobacter, Morganella, Proteus spp.*  
  Non-enteric bacteria: *Pseudomonas spp.* (including *P. aeruginosa*), *Alcaligenes, Flavobacterium, Stenotrophomonas and Acinetobacter spp.*