

# Medical & Scientific Affairs

## Are 'patient-ready' endoscopes free of microbial contamination?

- Gastrointestinal endoscopies are high volume procedures performed worldwide.<sup>1-5</sup>
- Researchers have linked inadequate reprocessing to outbreaks involving multidrug-resistant bacteria.<sup>6</sup>
- Bacterial contamination continues to persist despite reprocessing endoscopes according to guidelines and endoscope instructions for use.<sup>1,6,7</sup>
- High-level disinfection may be unable to completely remove biofilm originating from residual bacterial contamination.<sup>8-12</sup>





**Figure 1.**  
Location of studies reporting endoscope-associated infections from inception to 2020.

Adapted from Deb et al.<sup>1</sup>

● Duodenoscopy and ERCP   ■ Upper GI Endoscopy   ▲ Colonoscopy and Sigmoidoscopy

## Every year, endoscopies are regularly performed around the world<sup>1,3-5</sup>

Annually, health care professionals perform millions of gastrointestinal (GI) endoscopy procedures around the world.<sup>1,3-5</sup> An estimated 17.7 million GI endoscopies occur each year in the United States.<sup>1,2</sup> In Europe, the annual number of procedures is in the tens of millions.<sup>3</sup> In Japan and China, more than 14 million procedures are performed every year.<sup>4,5</sup>

After each procedure, reprocessing staff are responsible for cleaning and disinfection of endoscopes.<sup>6</sup> Reprocessing lapses result in contaminated endoscopes which put patients at risk of infections.<sup>9</sup>

## Contaminated GI endoscopes implicated in more outbreaks than other medical devices<sup>6,9</sup>

Based on a review of 15 journal articles, the proportion of duodenoscope-associated infected or colonized patients ranged from 6% to  $\geq 20\%$ .<sup>7</sup> From infection rates reported in 16 studies, the calculated composite infection rate, which included duodenoscopes and gastroscopes, was 123 per 1,000 procedures.<sup>1</sup> An emerging cause of endoscope-associated infections is multidrug-resistant organisms.<sup>1,6,7</sup>

Reports of more than 500 episodes of microbial transmission span 45 years in a review of 63 articles. In five outbreaks with no reprocessing breaches, bacterial transmission resulted in 93 infected patients.<sup>10</sup> Post-procedure infections arise from contaminated endoscopes or exposure to the patient's own gut flora!

## Complications from contaminated endoscopes<sup>1,7</sup>



Intestinal colonization



Delayed remote site infections



Secondary transmission to patients at other hospitals



Bloodstream infections, sepsis



Deaths

## Contamination persists despite endoscopes reprocessed according to guidelines<sup>1,6,7</sup>

Almost three-quarters of endoscopes sampled (8/11; 73%) were still contaminated after a successful high-level disinfection (HLD) cycle was completed. Additionally, surface ATP was detected on two endoscopes, while surface protein was present on six endoscopes.<sup>13</sup>

Nearly half of reprocessed GI endoscopes (47/102; 46.1%) were found contaminated in an Italian teaching hospital. These endoscopes were positive for *E.coli* (of which one was multidrug resistant), *K. pneumoniae* and multidrug-resistant *P. aeruginosa*.<sup>14</sup> Other researchers detected biofilm contamination in endoscopes reprocessed per guidelines.<sup>15</sup>

## Suggestions of biofilm found in endoscope deemed source of outbreak<sup>16</sup>

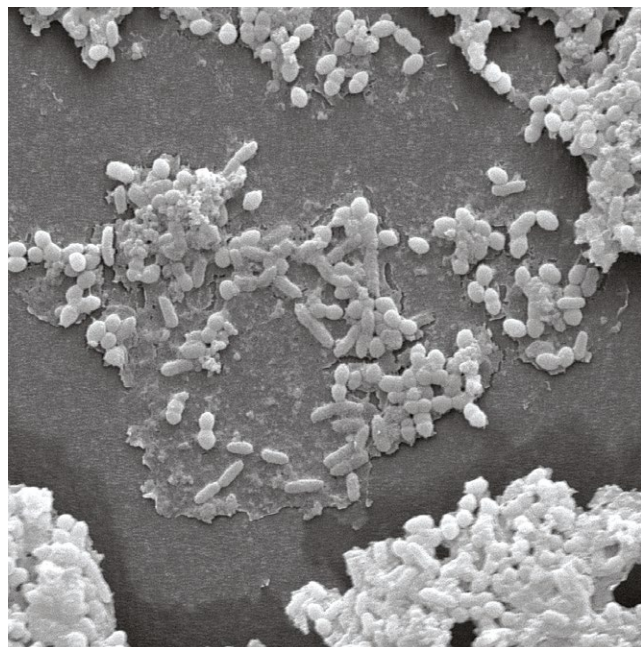
An outbreak involved three patients infected with multidrug-resistant *P. aeruginosa* sepsis. All patients underwent endoscopic retrograde cholangiopancreatography (ERCP) with the same endoscope. After intensive HLD, negative cultures suggested the endoscope was patient-ready.<sup>16</sup>

Patients and endoscope channels yielded linked *P. aeruginosa* isolates over several months. Four months after ethylene oxide sterilization, *P. aeruginosa* contamination reoccurred. Manufacturer repair of the endoscope found suggestions of biofilm inside the endoscope channels. Persistent contamination after HLD and sterilization highlight the difficulty of removing biofilm.<sup>16</sup>

## The challenges of biofilm removal<sup>8-12,17,18</sup>

The biofilm in endoscopes forms under multiple cycles of wetting and drying. This cyclic buildup of biofilm results in compacted biofilm which is difficult to remove.<sup>19</sup> Researchers in one study observed damage, residue or debris on or inside all reprocessed endoscopes. These defects may harbor bioburden and could facilitate biofilm formation.<sup>17</sup>

Rapid biofilm formation may occur in a new endoscope after only 30 days of clinical practice.<sup>18</sup> Limited access for brushes, water or air contributes to ineffective reprocessing.<sup>10-12</sup> Evidence shows HLD is sometimes unable to completely remove biofilm.<sup>8,9</sup>







[Click here to learn more about endoscope reprocessing](#)



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ATP: adenosine triphosphate; ERCP: endoscopic retrograde cholangiopancreatography; GI: gastrointestinal; HLD: high-level disinfection.

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