**SUPPLEMENTAL TABLES AND FIGURES**

*Endoscopic retrograde cholangiopancreatography and endoscopic ultrasound endoscope reprocessing: Variables impacting contamination risk. Ayres A., et al.*

**Table S1: Bacterial and fungal organisms identified on duodenoscope surveillance cultures**

|  |  |  |  |
| --- | --- | --- | --- |
| Bacterial Pathogen | Frequency | Fungal Pathogen | Frequency |
| Acinetobacter baumannii | 2 | Aspergillus fumigatus | 6 |
| Acinetobacter radioresistens | 2 | Aspergillus niger | 3 |
| Actinobacteria | 1 | Candida albicans | 8 |
| Alternaria sp. | 1 | Candida parapsilosis | 12 |
| Aureobasidium pullulans | 1 | Candida tropicalis | 12 |
| Bacillus beringensis | 1 | Fusarium Species | 1 |
| Bacillus cereus | 1 | Rhizopus oryzae | 1 |
| Bacillus circulans | 1 |  |  |
| Bacillus firmus | 1 |  |  |
| Bacillus firmus/oceanisediminis | 1 |  |  |
| Bacillus idriensis | 1 |  |  |
| Bacillus infantis | 1 |  |  |
| Bacillus licheniformis | 2 |  |  |
| Bacillus oleronius | 1 |  |  |
| Bacillus pumilus | 1 |  |  |
| Bacillus simplex | 1 |  |  |
| Bacillus sp. | 22 |  |  |
| Bacillus sp. (Bacillus vireti) | 1 |  |  |
| Brevibacterium casei | 2 |  |  |
| Brevibacterium ravenspurgense | 1 |  |  |
| Brevibacterium sp. | 1 |  |  |
| Brevundimonas sp. | 3 |  |  |
| Corynebacterium afermentans | 1 |  |  |
| Corynebacterium coyleae | 1 |  |  |
| Corynebacterium aurimucosum | 1 |  |  |
| Corynebacterium sp. | 1 |  |  |
| Coryneform bacillus | 2 |  |  |
| Cryptococcus albidus | 2 |  |  |
| Cryptococcus albidus var. diffluens | 2 |  |  |
| Curtobacterium sp. | 1 |  |  |
| Dermacoccus nishinomiyaensis | 6 |  |  |
| Dermacoccus nishinomiyanensis | 1 |  |  |
| Dermacoccus profundi | 1 |  |  |
| Dermacoccus Species | 2 |  |  |
| Dietzia Species | 1 |  |  |
| Enhydrobacter/Moraxella | 1 |  |  |
| Georgenia muralis | 1 |  |  |
| Gram Positive Rods | 1 |  |  |
| Gram Positive Bacteria | 3 |  |  |
| Klebsiella pneumoniae | 6 |  |  |
| Kocuria marina | 1 |  |  |
| Kocuria palustris | 1 |  |  |
| Kocuria rhizophila | 2 |  |  |
| Kocuria rosea | 2 |  |  |
| Kocuria salsicia | 1 |  |  |
| Kocuria sp. | 1 |  |  |
| Kroppenstedtia eburnea | 1 |  |  |
| Lysinibacillus chungkukjangi | 1 |  |  |
| Lysinibacillus massiliensis | 1 |  |  |
| Microbacterium oxydans | 1 |  |  |
| Micrococcus luteus | 9 |  |  |
| Micrococcus sp. | 9 |  |  |
| Micromonospora sp. | 1 |  |  |
| Moraxella Osloensis | 2 |  |  |
| Moraxella sp. | 1 |  |  |
| Orthinibacillus sp. | 1 |  |  |
| Paenbacillus thailandensis | 2 |  |  |
| Paenibacillus konsidensis | 1 |  |  |
| Paenibacillus provencensis | 2 |  |  |
| Paenibacillus sp. | 4 |  |  |
| Pantoea (Enterobacter) Agglomerans | 2 |  |  |
| Pantoea septica | 4 |  |  |
| Penicillium citrinum | 1 |  |  |
| Pseudarthrobacter/Arthrobacter | 1 |  |  |
| Rathayibacter sp. | 1 |  |  |
| Rhodotorula Mucilaginosa | 13 |  |  |
| Rhodotorula sp. | 1 |  |  |
| Rhodoturla mucilaginosa | 1 |  |  |
| Roseomonas mucosa | 1 |  |  |
| Rothia dentocariosa | 1 |  |  |
| Saccharomyces cerevisiae | 1 |  |  |
| Sphingomonas sp. | 1 |  |  |
| Staphylococcus aureus | 5 |  |  |
| Staphylococcus cohnii | 4 |  |  |
| Staphylococcus epidermidis | 6 |  |  |
| Staphylococcus haemolyticus | 2 |  |  |
| Staphylococcus hominis | 38 |  |  |
| Staphylococcus sp | 7 |  |  |

**Table S2: Frequency of contamination with ≥1 pathogenic bacteria on elevator mechanism or instrument channel of sampled duodenoscopes, by duodenoscope type and reprocessing method, excluding culturing events performed to confirm resolution of contamination with a pathogenic bacterium**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Duodenoscope type** | **Reprocessing method** | **Frequency of pathogenic bacteria (positive/total cultured)** | | **Risk ratio (95% CI), p-value)** |
| Duodenoscope or Linear echoendoscope | dHLD or HLD/ETO | 5.0% | (6/120) | — |
| Duodenoscope or Linear echoendoscope | dHLD | 9.5% | (4/42) | Ref |
| Duodenoscope or Linear echoendoscope | HLD/ETO | 2.6% | (2/78) | 0.27 (0.05-1.41), 0.10 |
| Duodenoscope | dHLD or HLD/ETO | 2.5% | (2/80) | Ref |
| Linear echoendoscope | dHLD or HLD/ETO | 10.0% | (4/40) | 4.00 (0.76, 20.9), 0.08 |
| Duodenoscope | dHLD | 7.4% | (2/27) | — |
| Duodenoscope | HLD/ETO | 0% | (0/53) | — |
| Linear echoendoscope | dHLD | 13.3% | (2/15) | — |
| Linear echoendoscope | HLD/ETO | 9.1% | (2/22) | — |

Note: CI, confidence interval; dHLD, double (repeat) high-level disinfection; HLD, high-level disinfection; ETO, ethylene oxide

**Table S3: Gross contamination rate, by duodenoscope type and reprocessing method**

|  |  |  |  |
| --- | --- | --- | --- |
| **Duodenoscope type** | **Reprocessing method** | **Frequency of duodenoscope contamination (positive/total cultured)** | |
| Duodenoscope or Linear echoendoscope | dHLD or HLD/ETO | 71.7% | (91/127) |
| Duodenoscope or Linear echoendoscope | dHLD | 74.5% | (35/47) |
| Duodenoscope or Linear echoendoscope | HLD/ETO | 70.0% | (56/80) |
| Duodenoscope | dHLD or HLD/ETO | 72.0% | (59/82) |
| Linear echoendoscope | dHLD or HLD/ETO | 71.1% | (32/45) |
| Duodenoscope | dHLD | 72.4% | (21/29) |
| Duodenoscope | HLD/ETO | 71.7% | (38/53) |
| Linear echoendoscope | dHLD | 77.8% | (14/18) |
| Linear echoendoscope | HLD/ETO | 66.7% | (18/27) |

Note: dHLD, double (repeat) high-level disinfection; HLD, high-level disinfection; ETO, ethylene oxide

**Table S4: Pathogenic contamination rate, by duodenoscope type and reprocessing method using alternate definitions of pathogenic organisms**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Duodenoscope type** | **Reprocessing method** | **Frequency of duodenoscope contamination (positive/total cultured)** | | | | | |
| **Bacteria only** | | **Bacteria + *Candida* sp.** | | **Bacteria + Pathogenic Fungi** | |
| Duodenoscope or  Linear echoendoscope | dHLD or HLD/ETO | 4.7% | (6/127) | 10.2% | (13/127) | 14.2% | (18/127) |
| Duodenoscope or  Linear echoendoscope | dHLD | 8.5% | (4/47) | 19.1% | (9/47) | 19.1% | (9/47) |
| Duodenoscope or  Linear echoendoscope | HLD/ETO | 2.5% | (2/80) | 5.0% | (4/80) | 11.3% | (9/80) |
| Duodenoscope | dHLD or HLD/ETO | 2.4% | (2/82) | 6.1% | (5/82) | 12.2% | (10/82) |
| Linear echoendoscope | dHLD or HLD/ETO | 8.9% | (4/45) | 17.8% | (8/45) | 17.8% | (8/45) |
| Duodenoscope | dHLD | 6.9% | (2/29) | 10.3% | (3/29) | 10.3% | (3/29) |
| Duodenoscope | HLD/ETO | 0% | (0/53) | 3.8% | (2/53) | 13.2% | (7/53) |
| Linear echoendoscope | dHLD | 11.1% | (2/18) | 33.3% | (6/18) | 33.3% | (6/18) |
| Linear echoendoscope | HLD/ETO | 7.4% | (2/27) | 7.4% | (2/27) | 7.4% | (2/27) |

Note: dHLD, double (repeat) high-level disinfection; HLD, high-level disinfection; ETO, ethylene oxide

**Table S5: Gross contamination rate among duodenoscopes samples processed at two different laboratories, by duodenoscope type and reprocessing method using alternate definitions of pathogenic organisms**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Duodenoscope type** | **Reprocessing method** | **Frequency of duodenoscope contamination (positive/total cultured)** | | | |
| Clinical Microbiology Laboratory\* | | Commercial Environmental Laboratory\* | |
| Duodenoscope or Linear echoendoscope | dHLD or HLD/ETO | 71.6% | (48/67) | 71.7% | (43/60) |
| Duodenoscope | dHLD or HLD/ETO | 70.7% | (29/41) | 73.2% | (30/41) |
| Linear echoendoscope | dHLD or HLD/ETO | 73.1% | (19/26) | 68.4% | (13/19) |
| Duodenoscope or Linear echoendoscope | dHLD | 74.5% | (35/47) | - | - |
| Duodenoscope or Linear echoendoscope | HLD/ETO | 65.0% | (13/20) | 71.7% | (43/60) |
| Duodenoscope | dHLD | 72.4% | (21/29) | - | - |
| Duodenoscope | HLD/ETO | 66.7% | (8/12) | 73.2% | (30/41) |
| Linear echoendoscope | dHLD | 77.8% | (14/18) | - | - |
| Linear echoendoscope | HLD/ETO | 62.5% | (5/8) | 68.4% | (13/19) |

Note: dHLD, double (repeat) high-level disinfection; HLD, high-level disinfection; ETO, ethylene oxide

\* Dates of specimens collected and submitted to the clinical microbiology laboratory, 06/16/2020 – 10/21/2020; dates of specimens collected and submitted to the commercial environmental laboratory, 11/18/2020 – 2/24/2021. No specimens undergoing dHLD were submitted to the commercial environmental laboratory.

**Table S6: Gross and pathogenic contamination rate among duodenoscopes samples processed at two different laboratories, by duodenoscope sampling location**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sample Site** | **Frequency of sample contamination by sample site (positive/total sampled)** | | | |
| Clinical Microbiology Laboratory\* | | Commercial Environmental Laboratory\* | |
| Gross contamination rate | 53.0% | (71/134) | 56.9% | (66/116) |
| Elevator mechanism | 53.7% | (36/67) | 42.4% | (25/59) |
| Instrument channel | 52.2% | (35/67) | 71.9% | (41/57) |
| Pathogenic contamination rate | 5.2% | (7/134) | 1.7% | (2/116) |
| Elevator mechanism | 7.5% | (5/67) | 1.7% | (1/59) |
| Instrument channel | 3.0% | (2/67) | 1.8% | (1/57) |

\* Dates of specimens collected and submitted to the clinical microbiology laboratory, 06/16/2020 – 10/21/2020; dates of specimens collected and submitted to the commercial environmental laboratory, 11/18/2020 – 2/24/2021. No specimens undergoing dHLD were submitted to the commercial environmental laboratory.

***Figure S1: Serial Sampling Results, by Duodenoscope***

|  |  |
| --- | --- |
| Key | |
| No Growth | |
| Gross Contamination | |
| Pathogenic Contamination | |
| Duodenoscope Serial No. | CX 1 | | CX 2 | CX 3 | CX 4 | CX 5 | CX 6 | CX 7 | CX 8 | CX 9 | CX 10 |
| 781 |  | |  |  |  |  |  |  |  |  |  |
| 1988 |  | |  |  |  |  |  |  |  |  |  |
| 2120 |  | |  |  |  |  |  |  |  |  |  |
| 2176 |  | |  |  |  |  |  |  |  |  |  |
| 2185 |  | |  |  |  |  |  |  |  |  |  |
| 2194 |  | |  |  |  |  |  |  |  |  |  |
| 2408 |  | |  |  |  |  |  |  |  |  |  |
| 2510 |  | |  |  |  |  |  |  |  |  |  |
| 2515 |  | |  |  |  |  |  |  |  |  |  |
| 2606 |  | |  |  |  |  |  |  |  |  |  |
| 2644 |  | |  |  |  |  |  |  |  |  |  |
| 2657 |  | |  |  |  |  |  |  |  |  |  |
| 2619287 |  | |  |  |  |  |  |  |  |  |  |
| 2619288 |  | |  |  |  |  |  |  |  |  |  |
| 2619297 |  | |  |  |  |  |  |  |  |  |  |
| 2619300 |  | |  |  |  |  |  |  |  |  |  |
| 2619302 |  | |  |  |  |  |  |  |  |  |  |
| 2619305 |  | |  |  |  |  |  |  |  |  |  |
| 2619893 |  | |  |  |  |  |  |  |  |  |  |
| 2619919 |  | |  |  |  |  |  |  |  |  |  |
| 2619924 |  | |  |  |  |  |  |  |  |  |  |
| 2719926 |  | |  |  |  |  |  |  |  |  |  |
| 2719929 |  | |  |  |  |  |  |  |  |  |  |
| 2719931 |  | |  |  |  |  |  |  |  |  |  |
| 2719941 |  | |  |  |  |  |  |  |  |  |  |

***Figure S2: Serial Sampling Results, by Linear Echoendoscope***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Linear echoendoscope Serial No. | CX 1 | CX 2 | CX 3 | CX 4 | CX 5 |
| 162 |  |  |  |  |  |
| 410 |  |  |  |  |  |
| 411 |  |  |  |  |  |
| 414 |  |  |  |  |  |
| 417 |  |  |  |  |  |
| 419 |  |  |  |  |  |
| 420 |  |  |  |  |  |
| 1221060 |  |  |  |  |  |
| 7530144 |  |  |  |  |  |
| 7530147 |  |  |  |  |  |
| 7530151 |  |  |  |  |  |
| 7530158 |  |  |  |  |  |
| 7640214 |  |  |  |  |  |
| 7640228 |  |  |  |  |  |
| 7722030 |  |  |  |  |  |
| 7040236 |  |  |  |  |  |
| 7740237 |  |  |  |  |  |
| 7740238 |  |  |  |  |  |
| 7740239 |  |  |  |  |  |
| 7740240 |  |  |  |  |  |