Risk on bacterial contamination of duodenoscopes and linear echoendoscopes is not age or wear and tear dependent: outcomes of two Dutch prevalence studies

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AIMS

- To assess the contamination prevalence of duodenoscopes and linear echoendoscopes (DLE)
- To assess risk factors for bacterial contamination of DLE

BACKGROUND

- Rising number of duodenoscope-associated outbreaks of MDRO worldwide. ≥41 outbreaks, ≥ 350 patient infections, ≥ 20 deaths, between 2012-2015.[1-3]
- Duodenoscopes (used for ERCP) and linear echoendoscopes (used for EUS) have a similar contamination-prone design. [4,5,6]
- During the studies, microbial surveillance was not mandatory in the Netherlands. Reprocessing is monitored by process control.[7]
- 2015 Dutch prevalence **PROCESS 1** study:[8]
  15% of duodenoscopes are contaminated with gut / oral flora
- Predicted probability decreased during the study. Possibly due to effect of alerts on reprocessing adherence
- **PROCESS 2** nationwide prevalence study was conducted. Data of **both studies** were **merged** to assess the aims.

STUDY FLOWCHART

PROCESS 1
June 2015 – March 2016
66/74 (89%) responding centers

PROCESS 2
October 2016 - May 2017
61/73 (84%) responding centers

150 Duodenoscopes (701 samples)

64 Linear Echoendoscopes (371 samples)

159 Duodenoscopes (797 samples)

PROCESS 1 & 2 combined:
72/74 (97%) responding centers

373 DLE (1869 samples)
64 Linear echoendoscopes
309 Duodenoscopes:
81 sampled once in PROCESS 1
90 sampled once in PROCESS 2
69 sampled twice in both studies

METHODS

- Two cross-sectional prevalence studies :
  PROCESS 1: ≥2 duodenoscopes per center
  PROCESS 2: all **DLE** of each center
- Local sampling according a strict and uniform sampling protocol explained by video instructions
- Central culturing of all samples at the Erasmus MC
  Flushes filtrated over 0.22 µm filter, filtrate on R2A agar
  Swabs vortexed in E-swab medium, 0.75ml on blood agar
  Incubation: 3 days on 35°C
- ESGE and Dutch guideline **contamination definitions** [7,9,10]
  - **AM20**: Any microorganism with ≥20 colony forming units
  - **MGO**: Microorganisms with gastrointestinal or oral origin
- Analysis 1: Age & usage (number of procedures)
- Analysis 2: PROCESS 2 only: Age & usage reset if biopsy channel was replaced.

References: 1. Murray, P. US Senate Report, 2016 2. Hawken, Clin Infect Dis 2018 3. Bourigalt, J Hosp Infect 2018 4. Verfaillie, Endoscopy 2015 5. Chapman GIE 2017 6. Rutala, JAMA 2014 7. SFERD 2016 8. Rauwers, Gut 2018 9. Beilenhoff 2007 10. NVMM 2018.
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CONCLUSIONS

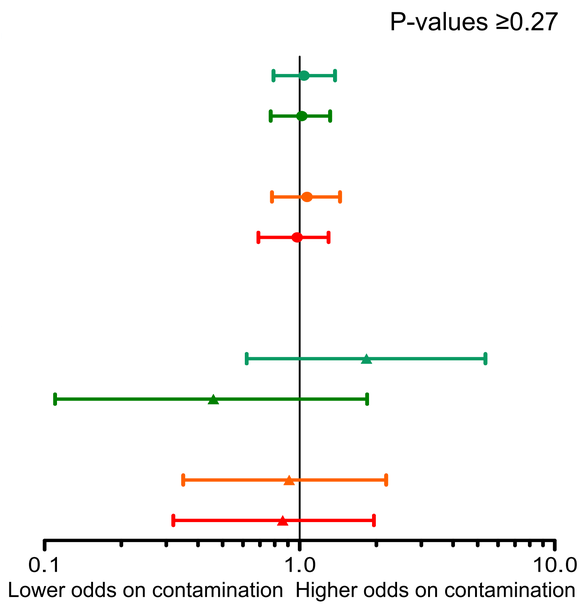
- Similar high contamination prevalence for D & LE of ~15%
- Similar contamination risk for older & heavy used DLE as for new DLE
- Similar high contamination prevalence during PROCESS 1 & 2 studies

IMPLICATIONS

- No need for standard depreciation of older DLE, if maintained correctly
- Microbiological surveillance & control methods for cleaning
- Redesign of complex flexible endoscopes is needed

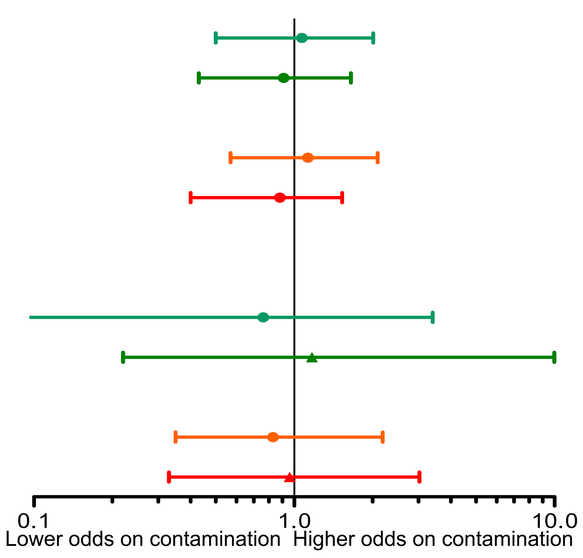
ANALYSIS 1: Contamination is independent of age and usage

Duodenoscopes (n=227)	OR*	95%CI
AM20		
Age (per each year)	1.04	0.79-1.38
Usage (per 100 proc.)	1.02	0.77-1.32
MGO		
Age (per each year)	1.07	0.78-1.44
Usage (per 100 proc.)	0.98	0.69-1.30
LE (n=50)		
AM20		
Age (per each year)	1.83	0.62-5.35
Usage (per 100 proc.)	0.46	0.11-1.84
MGO		
Age (per each year)	0.91	0.35-2.19
Usage (per 100 proc.)	0.86	0.32-1.96



ANALYSIS 2: Channel replacement does not 'reset' endoscope

Duodenoscopes (n=109)	OR*	95%CI
AM20		
Age (per each year)	1.07	0.50-2.01
Usage (per 100 proc.)	0.91	0.43-1.65
MGO		
Age (per each year)	1.13	0.57-2.09
Usage (per 100 proc.)	0.88	0.40-1.53
LE (n=43)		
AM20		
Age (per each year)	0.76	0.05-3.40
Usage (per 100 proc.)	1.17	0.22-9.98
MGO		
Age (per each year)	0.83	0.35-2.19
Usage (per 100 proc.)	0.96	0.33-3.03



** Adjusted for multiple samples of each DLE and for correlated outcomes within centers*

BASELINE: 55/373 (15%) DLE contaminated with MGO

	N	AM20		MGO	
		Contaminated	Not contaminated	Contaminated	Not contaminated
DLE	373	61 (16%)	312 (84%)	55 (15%)	318 (85%)
D	309	53 (17%)	256 (83%)	46 (15%)	263 (85%)
Age	290	5.4 (3.8-7.2)	4.7 (2.2-6.7)	5.6 (3.6-7.1)	4.8 (2.2-6.6)
Usage	227	275 (123-637)	228 (101-441)	264 (139-550)	229 (101-444)
LE	64	8 (13%)	56 (88%)	9 (14%)	55 (86%)
Age	58	5.6 (0.8-6.5)	3.5 (1.3-5.7)	2.9 (1.8-4.9)	3.7 (1.3-6.0)
Usage	50	405 (34-841)	243 (134-424)	305 (147-411)	250 (112-450)

METHODS – Sampling sites

All DLE

1. Swab forceps elevator
2. Flush suction channel
3. Flush biopsy channel
4. Brush biopsy/suction ch.

Type dependent

5. Swab protection cap
6. Flush forceps elevator ch.
7. Flush air/water channel
8. Brush air/water channel
9. Brush balloon channel

Type dependent: 4 to 6 sample sites