



A Novel Study of Intraluminal Pathogens in Veterinary Feeding Tubes and Veterinary Professionals' Perceptions of Their Associated Risk



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Introduction:

Enteral feeding tubes (FTs) are an essential intervention, providing nutrition to many anorexic patients. But whilst pathogen contamination of FT lumens is a well-documented risk in human medicine, with identical bacteria strains as in the blood being isolated from FTs in some cases of septic hospitalised patients [1,2]; this concern remains unexplored in veterinary patients.

This pilot study aimed to determine if intraluminal pathogen contamination is also present in veterinary FTs, and establish if this risk is currently considered by veterinary professionals in practice.

Methods:

All FTs, once removed from patients, were collected at two veterinary hospitals for 12-weeks. An ultrasonic cleaner was used to disrupt any intraluminal biofilm, then a 0.5ml intraluminal fluid sample was injected onto blood agar and incubated at 37°C for 24-hours. Pathogen culture counts were then performed on the agar plates, and bacteria species were identified using triple-sugar-iron agar and an interpretation protocol.

Additionally, student and qualified veterinary nurses and surgeons completed a 6-question questionnaire regarding their current consideration of infection via FTs. Participants were recruited via stratified sampling, emailing every second RCVS-listed veterinary hospital, and convenience sampling, promoting the survey on veterinary social media groups.

Statistical analysis of data included descriptive statistics and Mann-Whitney U tests.

Results:

Laboratory Results:

- 11 FTs were collected: 7 (63.6%) nasal FTs and 4 (36.4%) oesophageal FTs. Placement duration ranged from <1 to 25 days, with a mean indwelling time of 4.5 days, and median and mode indwelling times of 2 days.
- All intraluminal fluid samples had substantial bacterial contamination, with 90.9% ($n=10$) of agar plates exceeding countable colony limits ($n>250$).
- Each FT lumen had contamination with just one bacteria species, indicating bacterial biofilm presence. These bacteria most frequently included *Escherichia coli* ($n=5$, 50%) and *Pseudomonas* ($n=3$, 30%) (Figure 1).
- Fungal colonies were also present in 18.2% ($n=2$) of samples, including substantial growth of an unidentified mould from one sample (Figure 2).

Survey Results:

- 107 veterinary professionals responded to the survey, including 93 (86.9%) veterinary nurses and 14 (13.1%) veterinary surgeons. Of these, 90 (84.1%) were qualified, and 17 (15.9%) were students.
- Concern for intraluminal infection risk was significantly ($p<0.001$) lower than concern for stoma site infection risk.
- Veterinary professionals who had previously seen gross contamination of a FT lumen, such as with food or visible fungal growth, were significantly ($p=0.01$) more likely to consider and be concerned by intraluminal infection risk (Figure 3).

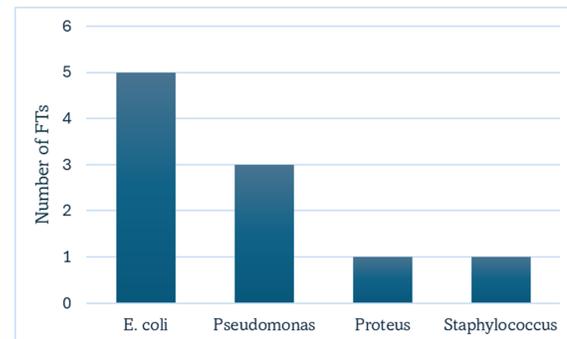


Figure 1: A column graph representing the number of each bacteria species found within sampled FTs ($n=10$).

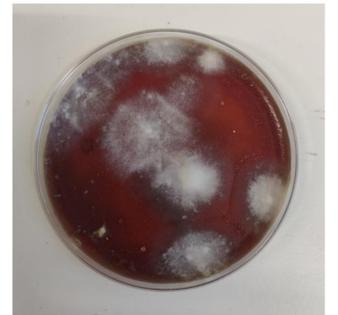


Figure 2: Unidentified fungus, from an oesophageal FT sample.

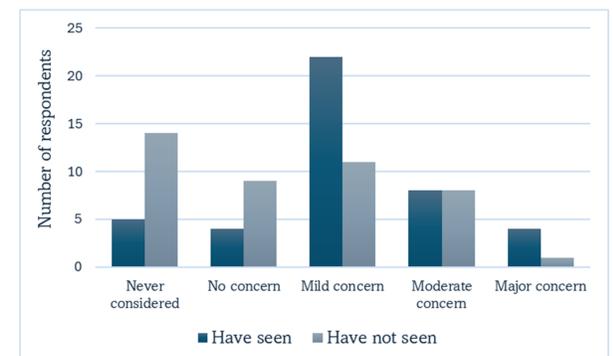


Figure 3: A clustered column graph comparing concern for intraluminal infection risk in those who have and have not previously seen gross FT lumen contamination.

Discussion:

- Bacterial biofilm presence suggests all fluid passing through FT lumens, including 'sterile' water given pre-feed, becomes pathogenically contaminated. This brings potential to cause infection following respiratory aspiration.
- Substantial bacterial contamination suggests gastrointestinal infection, derived from intraluminal pathogens, is a potential risk for all patients with FTs.
- Fungal contamination supports other veterinary literature [3,4] and human medical literature [5], which discuss risk of fungal infection via FTs and suggest fungal colonisation is damaging to FT structural integrity, contributing to failure of long-term indwelling medical devices.
- Intraluminal infection risk is under-considered by veterinary professionals, so greater awareness of risk and potential consequences is required.

Limitations and Further Research:

- Pilot study capability - Almost all samples exceeded countable colony limits, so comparisons with independent variables could not be performed.
- Small survey sample sizes limited reliability and generalisability to entire populations.
- A second pilot study, with serial dilutions of intraluminal fluid samples, is required to compare independent variables. A multi-centre study should then be conducted to further investigate pilot study findings.

Conclusion & Clinical Significance:

Pathogens are present in veterinary FT lumens, with all intraluminal samples containing significant levels of bacteria, and some containing fungal colonies. *Escherichia coli* and *Pseudomonas*, associated with patient infection and sepsis, were most frequently identified, suggesting clinical risk to patients. These findings, paired with the survey results, suggest risk of infection via FT lumens is under-considered by veterinary professionals.

Therefore, risk of infection via FT lumens requires greater awareness in practice, particularly for patients with onset of abnormal gastrointestinal clinical signs after FT placement, or patients that have potentially aspirated intraluminal FT contents into the respiratory tract. Additionally, further research of this risk is required, including serial dilutions of samples, to assess the influence of independent variables.

References:

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