New disinfecting apparatus for gastrointestinal fibre-endoscopes

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SUMMARY Bacterial contamination of gastrointestinal fibre-endoscopes is a potential source of clinically significant infection. Aqueous 2% alkaline glutaraldehyde adequately disinfects fibre-endoscopes but may cause serious sensitivity reactions among endoscopy staff. A new 'closed-system' disinfecting apparatus is described that disinfects with glutaraldehyde for 30 minutes before an endoscopy session, for two minutes between patient procedures, and for 10 minutes before storage. Bacteriological cultures of the endoscope after disinfection were virtually sterile. Extremely low glutaraldehyde vapour levels were detected by gas chromatography in endoscopy room air during disinfection procedures. This relatively simple apparatus offers rapid, effective, and safe disinfection of fibre-endoscopes.

In recent years there has been an increasing awareness of the potential for infection with gastrointestinal endoscopic procedures and of the need for thorough disinfection of endoscopic equipment.¹⁻¹⁰ The intricate design and delicate materials of endoscopes make them difficult to disinfect and easily damaged. Aqueous 2% alkaline glutaraldehyde, the most widely used disinfectant for endoscopic equipment in Great Britain, causes sensitivity problems, especially contact dermatitis, among endoscopy staff.¹¹ The ideal disinfecting apparatus must rapidly and thoroughly disinfect fibre-endoscopes with a technique which protects endoscopy staff from contact with potentially toxic disinfectants and is safe for the endoscopes themselves. We have designed a new 'closed-system' disinfecting apparatus to meet these requirements.

Methods

APPARATUS

The disinfecting apparatus (Fig. 1) consists of two rectangular Perspex chambers with a connecting tap. The lower chamber is connected to mains water and has a draining outlet. The upper chamber is connected to a conventional suction apparatus and has a vacuum release valve.

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Received for publication 26 November 1981

PROCEDURE

After it has been thoroughly pre-cleaned in soapy water according to the manufacturer's instructions, the endoscope is threaded into the lower chamber, which contains 2% aqueous alkaline glutaraldehyde (Fig. 2). Disinfectant is initially aspirated through the suction/biopsy (S/B) channel and then into the S/B channel 'dead space' in the control head of the instrument through a washing adaptor. Disinfectant is also flushed through the endoscope from a wash bottle filled with glutaraldehyde. The endoscope is disinfected for 30 minutes before the endoscopy list, for two minutes between patient procedures, and for 10 minutes at the end of the list. Glutaraldehyde is then drawn from the lower chamber into a vacuum induced in the upper chamber by the suction apparatus and is held there while the endoscope is rinsed with tap water (Fig. 3). After a clean biopsy valve has been inserted, the endoscope is taken out of the lower chamber, air-dried, and is ready for use on the next patient. The tap water in the lower chamber is drained away to waste; glutaraldehyde is recycled from the upper to the lower chamber, and the apparatus is ready for the next disinfection cycle.

MICROBIOLOGICAL EFFICIENCY

Multiple swabs and washings for bacteriological analysis were obtained from different parts of the endoscope before and after disinfection. The results of cultures from the S/B channel (Fig. 4) are

Fig. 1 The disinfecting apparatus.

representative of those from other parts of the endoscope.

Disinfection for 30 minutes before the endoscopy list and for two minutes between patient procedures effectively eradicated endoscopic contamination with oropharyngeal and enteric organisms occurring after overnight storage and after each patient examination. The endoscope was also thoroughly decontaminated by 10 minutes' disinfection at the end of the list.

GLUTARALDEHYDE VAPOUR LEVELS

Exposure to glutaraldehyde at endoscopy occurs

directly by manual contact and splashing and indirectly by inhalation of disinfectant vapour. A 'closed-system' disinfecting apparatus prevents direct handling of disinfectant and splashing during disinfection procedures. To assess the role of a 'closed-system' apparatus in protecting endoscopy staff from inhalation of vapourised glutaraldehyde, we compared vapour levels, measured by gas chromatography, occurring during disinfection with the Leeds disinfecting apparatus and with an open-trough disinfection system. Glutaraldehyde vapour levels of 0.10–0.20 parts per million (ppm) were detected when the open-trough system was used.

Fig. 2 Disinfection with glutaraldehyde.

Fig. 3 Rinse with tap water.

Fig. 4 Suction/biopsy channel contamination before and after disinfection.

The Threshold Limit Value-Ceiling approved for glutaraldehyde in 0.20 ppm.¹² There was a four to six-fold reduction in glutaraldehyde vapour levels during disinfection procedures with the 'closed-system' apparatus when 0.03-0.05 ppm were detected (Table).

Discussion

The danger of infection with gastrointestinal endoscopy can be eliminated by thorough disinfection of endoscopic equipment.¹¹ The disinfecting apparatus we have devised is simple to operate and the effective short disinfection cycle is easily completed in the limited time available between patient examinations. Endoscopy staff are protected from contact with potentially toxic disinfectants and fibre-endoscopes can be repeatedly disinfected with no evidence of damage. In conclusion, we believe that this disinfecting apparatus could adequately fulfill the current need for a quick, effective, and safe method for disinfection of fibreoptic instruments.¹¹

Table Glutaraldehyde vapour levels

	Parts per million	
	Leeds disinfectant	Open trough disinfectant
Before endoscopy list	0.05	0.20
During endoscopy list	0.05	0.20
After endoscopy list	0.03	0.10

The industrial manufacture and marketing of the apparatus are at present under active consideration by a commercial company.

We are indebted to Dr K Bartle and Mr G Lumby, University of Leeds Departments of Physical Chemistry and Medical Illustration respectively, and to our endoscopy assistants, Sister L Murphy and Nurse S Wilcock. We are also grateful to Mrs C L Baxendale for typing this manuscript.

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