

BSG Guidelines For Decontamination of Equipment for Gastrointestinal Endoscopy

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[BSG Working Party Report 2003](#)

The Report of a Working Party of the British Society of Gastroenterology Endoscopy Committee

Summary

1. Decontamination of endoscopes should be undertaken at the beginning and the end of each list, and between patients, by trained staff in dedicated rooms. Thorough manual cleaning with an enzymatic detergent, including the brushing of all accessible endoscope channels, must be undertaken before automatic endoscope disinfection.
2. All disinfectants should be used at the correct temperature in accordance with the manufacturers' instructions. Some manufacturers provide test strips and/or kits, the use of which they recommend in ensuring optimal activity of their product.
3. It is important to ensure that the endoscope manufacturer has approved the chosen disinfectant for use in decontaminating their product, and that the disinfectant is also compatible with the automatic endoscope reprocessor in which it is being used.
4. Two percent glutaraldehyde has historically been the most commonly used disinfectant in endoscopy units within the UK. Unfortunately this agent is irritant and sensitising, and adverse effects among endoscopy staff are common. The manufacturers of a widely-used glutaraldehyde-based product have now withdrawn this disinfectant largely due to health and safety concerns.
5. The use of isopropyl alcohol for flushing endoscope channels is recommended as part of the drying process at the end of the working day prior to storage.
6. Automated endoscope reprocessing machines should be used for all endoscope decontamination following manual precleaning. These machines are recommended both because they reliably expose all external and internal components of the endoscope to thorough disinfection and rinsing, and because they help prevent atmospheric pollution by the disinfectant. Automatic reproducers must be reliable, effective and easy to use. Manual disinfection is no longer acceptable.
8. Water used in automatic endoscope reproducers should be free of particulate contamination and of micro-organisms. This can be achieved either by using bacteria-retaining filters or by other methods, for example the addition of biocides. In-line water softeners may be needed if the local supply delivers hard water. The final rinse water should be sampled from the automatic reprocessor and tested for its microbiological quality at least weekly.
9. A record should be kept of the serial number of each endoscope used in each patient. This log should include any loan endoscopes. This is important for any future contact tracing when possible endoscopic transmission of disease is being investigated.
10. Endoscopy should be avoided whenever possible in patients with suspected or confirmed vCJD. When deemed essential either a dedicated endoscope should be used, or one nearing the end of its useful life can be employed and subsequently quarantined and reserved for similar patients in future. When percutaneous feeding gastrostomy or jejunostomy is required in such patients a dedicated endoscope should be used or the feeding tube deployed by radiological or surgical means.

11. The agent of variant Creutzfeldt-Jakob disease (vCJD) is resistant to all forms of conventional sterilisation. The risk of transmission of this agent is probably extremely low provided that scrupulous attention to detail is routinely employed in the decontamination process after every patient. In particular all accessible endoscope channels should be brushed through with a single use purpose-made brush tipped wire assembly that has an appropriate length and diameter for each channel.

12. 'Single use' or autoclavable accessories are preferred. Single use biopsy forceps, guidewires and cytology brushes should always be used in order to minimise any possible risk of transmitting prion disease. Rubber valves covering the working channel must be changed after all procedures involving the passage of biopsy forceps, guidewires and/or other accessories through the endoscope.

13. Health surveillance of staff is mandatory and should include a pre-employment enquiry regarding asthma, skin and mucosal sensitivity

problems and lung function by spirometry. Occupational health records should be retained for 40 years.

14. Those involved in endoscopic practice should be immunised in accordance with local occupational health and infection control policies. All staff should wear single use gloves that are changed after each procedure. Staff involved in endoscope decontamination should also wear appropriate protective clothing.

15. A summary of recommendations is given at the end of the document. Most are based on advice from expert opinion, which includes advice from the Medicine and Healthcare Products Regulatory Agency (MHRA) (formerly the Medical Devices Agency) and from other Working Parties. Some of the recommendations are derived from microbiological studies. Controlled trials in the field of endoscope decontamination are lacking because of a reluctance to expose "placebo control" patients to an infection risk.

1. Introduction

Flexible endoscopes are complex reusable instruments that require unique consideration with respect to decontamination. In addition to the external surface of endoscopes, their internal channels for air, water, aspiration and accessories are exposed to body fluids and other contaminants. In contrast to rigid endoscopes and most reusable accessories, flexible endoscopes are heat labile and cannot be autoclaved.

In 1988 a BSG Working Party published recommendations for cleaning and disinfection of equipment for endoscopy. Three further working parties met during the 1990s, and the most recent BSG guidelines were published in 1997. That report addressed a number of disinfectants used for the decontamination of flexible endoscopes and accessories, and provided updated recommendations on automatic disinfection devices and contact times.

In 2002 a fifth working party was set up to reconsider the recommendations for decontamination of endoscopes and their devices, prompted by the following developments:

- A) Withdrawal of a widely used glutaraldehyde-based disinfectant from the U.K. market.
- B) Emergence of variant Creutzfeld-Jakob Disease (vCJD) as an important pathogen in man.
- C) Publication of an updated Medical Devices Agency (MDA) Device Bulletin DB2002 (05) on decontamination of endoscopes. (2)

2. Transmission of Infection at Endoscopy

A guiding principle for disinfection is that of universal precautions: any patient must be considered a potential infection risk, and each endoscope and device must be decontaminated with the same

rigour following every endoscopic procedure. Few data exist as to the absolute risk of transmission of infection from patient to patient at endoscopy. In 1993 one report suggested that the reported frequency was 1 in 1.8 million procedures (3). Estimating the infection risk is difficult for several reasons: complications such as septicaemia following ERCP may be due to the induction of endogenous infection as opposed to the endoscope being a vehicle of infection. Additionally the onset of infections complicating endoscopy may be delayed until after the patient has been discharged home following their procedure. There is also the potential for transmission of infective particles with very long incubation periods (vCJD, for example).

Endoscopy-induced infection is usually due to procedural errors in decontamination (4) Other potential risk factors for transmission of infection at endoscopy include the use of older endoscopes with associated surface and working channel irregularities, and the use of contaminated water bottles or irrigating solutions. Further potential vehicles of infection are inadequately designed or improperly maintained automatic endoscope reprocessors, the use of substandard disinfectant, or inadequate drying and/or storage of endoscopes.

Recently there have been concerns regarding the transmission of hepatitis C virus (HCV) following an instance reported in 1997 (5). Transmission of viral infection occurred because of (a) failure to brush the biopsy channel, (b) failure to clean ultrasonically and steam sterilise reusable biopsy forceps, (c) inadequate exposure to the liquid chemical germicide. Adherence to current reprocessing guidelines effectively eliminates the risk of HCV transmission from endoscopy (6). In fact the hepatitis viruses are among the micro-organisms most sensitive to disinfectants in current use.

During the last 20 years glutaraldehyde-based products have been the most commonly used disinfectants in endoscopy units worldwide. Most reports of transmission of bacteria such as pathogenic *E. coli* *Salmonella*, *Pseudomonas*, *Enterobacter* and *Serratia* spp. predate not only the introduction of glutaraldehyde for disinfection but also the practice of using fully immersible endoscopes and exposing all working channels to the decontamination process (4).

Three types of micro-organisms have merited particular attention in recent years.

- A) **Mycobacteria:** the emergence of multi-drug resistant strains of *Mycobacterium tuberculosis* and the high incidence of infections with *M. avium intracellulare* among HIV infected patients has led to a greater awareness of the risk of transmission of Mycobacteria during bronchoscopy. Mycobacteria in general, and especially waterborne mycobacteria (such as *M. chelonae*) are extremely resistant to glutaraldehyde.
- B) **Bacterial spores (*Bacillus* and *Clostridium*)** – spores from these organisms can be isolated from endoscopes but there are no reported cases of transmission of these infections by endoscopy. Studies have shown that *Clos. Difficile* spores can be completely inactivated by a standard decontamination procedure (7).
- C) **Pathological Prions** including Creutzfeldt Jakob Disease and vCJD. These infectious particles are extremely resistant to standard decontamination procedures. Recommendations for minimising the risk of transmission of prion proteins are discussed in detail later in this report.

Although the greatest potential risk is transmission of infection from one patient to another using the same contaminated endoscope, there is also the potential for transmission of infection from patients to healthcare workers. Studies have suggested that endoscopes are potential vectors for the transmission of *Helicobacter pylori* (8). Another example is the acquisition of Herpes simplex ophthalmitis following oesophageal biopsy (9). Healthcare workers are also at potential risk of infection with blood-borne viruses transmitted via sharps, such as spiked biopsy forceps.

Traditionally patients harbouring potentially infectious micro-organisms are scheduled for the end of

endoscopy lists in order to minimise cross-infection. Given the universal endoscope decontamination regime, which presumes that all patients are potentially infectious, there is not normally a need to examine patients with known infection last on the list. Nonetheless prevailing infection control policies should be adhered to, and these often include scheduling patients with methicillin-resistant *Staphylococcus aureus* (MRSA) at the end of lists.

3. Decontamination of endoscopes – general considerations.

Sterilisation is defined as the complete destruction of all micro-organisms including bacterial spores. Sterilisation is required for devices that are normally used in sterile areas of the body (e.g. laparoscopes, microsurgical instruments). Flexible endoscopes (which make contact with mucous membranes but do not ordinarily penetrate normally sterile areas of the body) are generally reprocessed by high level disinfection rather than sterilisation in order to kill bacteria, viruses, mycobacteria and some spores. Most flexible gastrointestinal endoscopes would not withstand the conditions normally used in a steam sterilisation process.

Endoscopes are routinely exposed to mucus and other gastrointestinal secretions, blood, saliva, faeces, bile, and sometimes pus. The process of decontamination comprises two basic components:

- a) manual cleaning, which includes brushing with single-use wire brushes, and exposure of all external and accessible internal components to a low-foaming enzymatic detergent known to be compatible with the endoscope;
- b) automatic disinfection, rinsing and drying of all exposed surfaces of the endoscope.

Failure to follow these recommendations may not only lead to transmission of infection, but also to misdiagnosis (e.g. if pathological material from one patient is included in specimens from the next patient) and to instrument malfunction and shortened lifespan.

Decontamination should begin as soon as the endoscope has been removed from the patient. Before the endoscope is detached from the light source/videoprocessor a preliminary cleaning routine should be undertaken. Water or detergent should be sucked through the working channel in order to clear gross debris and ensure that the working channel is not blocked. Similarly the air and water channels should be irrigated with sterile water, not only to check for blockages but also to expel any blood, mucus and other debris. The insertion shaft is wiped down externally and checked for any bite marks or other surface irregularities. The endoscope is then detached from the light source/videoprocessor, removed to the reprocessing room and attached to a leakage tester to check the integrity of all channels before reprocessing.

The second stage is the dismantling of detachable parts of the endoscope, which includes the removal of valves and water bottle inlets. Some endoscopes have detachable tips which should also be disengaged from the insertion tube at this stage. Rubber biopsy valve caps should be discarded whenever breached by biopsy forceps or any other accessory during the last endoscopy procedure. Water bottles and suction/air-water valves provided with the latest generation of endoscopes are autoclavable, but it should be noted that autoclaving is not fully effective in eliminating prion proteins.

The third stage is manual cleaning and rinsing of all exposed internal and external surfaces. A low-foaming enzymatic detergent that has been specifically designated for medical instrument cleaning should be used at the appropriate dilution according to the manufacturer's instructions. Whilst enzymatic detergents have not been conclusively shown to be superior to other detergents in endoscope decontamination, they have the ability to digest mucus and other biological material. These properties are potentially very important in the manual cleaning of narrow endoscope channel lumens. All accessible channels should be brushed with a purpose-built single-use brush-tipped wire.

The fourth stage is high level disinfection with a liquid chemical germicide. The use of automatic endoscope reprocessors allows the flushing of disinfectant throughout the endoscope at the correct temperature for the correct duration. It is important to note that the use of modern and sophisticated automatic endoscope reprocessors does not replace the need for prior thorough manual cleaning including brushing of all working channels. The process of decontamination should be concluded with further rinsing with sterile or filtered water, followed by proper drying of each endoscope.

The decontamination of endoscopy equipment is a specialised procedure and should only be carried out by personnel who have been trained for the purpose and who have an understanding of the principles involved. It should be done using an automatic endoscope reprocessor in a dedicated area with atmospheric extraction facilities. Manual disinfection is no longer acceptable and should not be done. Atmospheric extraction equipment should be maintained according to manufacturers' instructions. The safe working practices in the decontamination area of each unit should be clearly documented and understood by all staff. Comprehensive records of all decontamination processes and all staff training must be maintained. If an emergency endoscopic procedure is done out of hours, someone with knowledge of the process of endoscope decontamination should be available to prepare and clean the equipment.

Service contracts and guarantees may not be honoured if incompatible disinfectants and detergents have been employed. The MDA Device Bulletin (2) lists the information to be supplied by manufacturers of endoscopes, accessories and disinfectants.

The Health and Safety at Work Act 1974 requires employers to ensure, as far as is reasonably practicable, the health, safety and welfare of all employees. The Act also requires employees to comply with the precautions established to ensure safe working. The Control of Substances Hazardous to Health Regulations 1994 (COSHH) requires employers to assess the risk to the health of staff by exposure to hazardous chemicals such as glutaraldehyde and its derivatives, to minimise and to avoid such exposure where this is reasonably practicable, and otherwise to ensure adequate control. Engineering methods of control must be used in preference to personal protective equipment.

4. Special considerations: CJD and other prions

Creutzfeldt-Jakob disease (CJD) is a member of a group of neurological disorders known as the transmissible spongiform encephalopathies (TSEs) or prion diseases, which affect both animals (scrapie in sheep, BSE in cows) and man. The precise nature of the transmissible agents responsible for these disorders is unknown, but there is increasing evidence to support the prion hypothesis, which states that the agent is composed of an abnormally folded form of a host-encoded protein, prion protein. The normal prion protein (PrP^c) is expressed in many tissues, but occurs at highest levels in neurones in the central nervous system (CNS). The abnormal form of the protein (PrP^{Sc}) accumulates in the CNS in prion diseases and, as the infectious agent, it is remarkably resistant to most forms of degradation.

The sporadic form of CJD affects approximately 1 person per million per annum worldwide. Variant CJD (vCJD) is a new acquired form of CJD, which was first reported in 1996 affecting mainly young adults and with a unique neuropathological phenotype (10). It is now widely accepted that bovine prions passed into the human population through the consumption of BSE-infected bovine tissues and that the transmissible agent responsible for vCJD is identical to the BSE agent (but different from the agent in sporadic CJD). The incubation period for vCJD is likely to be lengthy, between 10 and 30 years. During this time the affected person has the potential to transmit the disease to others during the course of endoscopy.

The distribution of the PrP^{Sc} in the body is different in sporadic and variant CJD, reflecting their different pathogenesis. In the case of sporadic CJD, prion infectivity is largely limited to the CNS

and retina. Gastrointestinal endoscopy is unlikely to be a vector for the transmission of sporadic CJD because infected tissue is not encountered during the procedure. No special precautions are necessary during or after the procedure and the endoscope should be cleaned and disinfected in the normal thorough way. In contrast, in vCJD the lymphoreticular system throughout the body contains PrPSc at the time of death, and may contain significant levels of infectivity during the incubation period (11). Since lymphoid follicles and germinal centres are widely distributed in the gastrointestinal tract (and are often biopsied), it is possible that endoscopy on patients who are incubating vCJD may result in exposure of the instrument (and particularly the biopsy forceps) to PrPSc.

In general the risks of transmitting vCJD from one person to another are dependent on the infectivity of tissues involved, the amount of tissue contaminating the instrument, the effectiveness of decontamination processes and the susceptibility of subsequently exposed patients. Experimental studies suggest that levels of infectivity in prion diseases are highest in the CNS and retina, which are around 100-fold higher than in the tonsils and other lymphoreticular tissue. Two studies have detected the abnormal form of the prion protein in rectal tissue (12,13). The risk of transmitting vCJD through an endoscopy is likely to be small, but contamination of the endoscope and forceps as a result of biopsying lymphoid tissues may represent a larger (but currently unquantifiable) risk. The greatest potential risk ensues from biopsying the terminal ileum because the abundant Peyer's patches in this region may contain significant levels of prion protein in those incubating vCJD (12). The biopsy forceps and the colonoscope become potential vectors for disease transmission under these circumstances.

At present conventional sterilisation methods cannot reliably destroy PrPsc, the infecting agent in vCJD, but the likelihood of equipment becoming contaminated with infective tissue is small. Rigorous cleaning techniques will reduce the risk even further.

It should be emphasised that aldehydes, such as ortho-phthalaldehyde and glutaraldehyde, fix protein, a property which may not only stabilise prion infectivity, but also render it more difficult to remove by other means. Aldehydes should never be used for disinfection until the equipment has been thoroughly cleaned, with all accessory channels manually brushed, washed with enzymatic detergent and rinsed with water. Existing detergents are ineffective against prion proteins, but specialised enzymatic detergents are at an advanced stage of development. If the cleaning process is performed assiduously the risk of prion contamination is minimal but it is important for endoscopy staff to recognise the potential for transmission through poor decontamination practice.

All those involved in endoscopy must ensure that procedures are in place to minimise contamination and maximise cleaning. Best practice defined in these terms (14,15) will reduce a very small, potential risk to one too small to be measured. Meticulous manual cleaning of the endoscope is probably the best defence against person-to-person transmission. The same is true for cleaning accessories that are not single-use and cannot be autoclaved. Clearly every effort should be made to employ single-use equipment, and in some circumstances this may be a cheaper as well as safer option. For example reusable forceps are at least twenty times as expensive as single-use biopsy forceps. If they are used fewer than twenty times then single-use forceps will be cheaper even if the costs of repeated disinfection of reusable forceps are discounted. There is now a strong argument for moving towards single-use biopsy forceps, cytology brushes and guidewires. Endoscopy Units should work towards a policy of employing single-use accessories whenever possible as the only practical way of minimising the risk from accessories. In addition 'random' biopsies, particularly of the terminal ileum, should be kept to a minimum as lymphoid tissue is distributed widely throughout the gastrointestinal tract.

Although thorough cleaning of flexible endoscopes ensures patient safety for 'normal' pathogens, the same process may not be adequate for the PrPSc. The main benefit of the decontamination process under these circumstances is undoubtedly effective manual cleaning, as aldehydes may stabilise PrPSc on the metal surfaces of endoscopes and accessories, with potentially adverse consequences.

It follows that brushes used to clean the channels of the endoscope should also be single-use to ensure maximum efficiency of cleaning. Rubber valves protecting the biopsy channel should be replaced after any endoscopic procedure involving use of any accessory passed through the valve.

It is possible to obtain special endoscopes for patients known to have vCJD who require an endoscopy. Such dedicated endoscopes are available from the National CJD Surveillance Unit in Edinburgh (Tel: 0131 537 1868) and some other regional centres. Clearly patients incubating vCJD may undergo endoscopy and be a potential infective source for others. Neurological patients requiring gastrostomy feeding may be a particularly high-risk group. If there is even slight uncertainty about the underlying neurological diagnosis, and no dedicated gastroscope is readily available, it is probably wise to place a feeding gastrostomy tube using a surgical or radiological rather than endoscopic technique.

Even though the risk of transmitting infection by endoscopy is very small, all units should have a process for tracing equipment used during each procedure in the event that a patient is subsequently found to have the disease. Serial numbers of all endoscopes and accessories must be recorded for each patient examined. If inadvertently a patient with suspected vCJD is endoscoped, or a patient with suspected vCJD is retrospectively discovered to have been endoscoped, the instrument used should be quarantined while advice is obtained from the CJD Incidents Panel (the contact at the time of writing is Dr Nicky Connor, Consultant Epidemiologist/Medical Scientist; tel. 0208 200 6868, Ext. 3411; address and contacts on Department of Health website). If vCJD is diagnosed the endoscope should remain quarantined or sent to the National CJD Surveillance Unit for research purposes, or for dedicated use for patients known to have vCJD. If an endoscopy unit keeps a quarantined endoscope their staff should inform nearby units of its existence for use with any future patients with vCJD requiring endoscopy.

Rigid metal sigmoidoscopes and proctoscopes should be thoroughly cleaned and then autoclaved (12). The same recommendations apply for all other surgical instruments with the capacity to withstand this method. This should not be interpreted as being a procedure that eliminates risk altogether given the resistant nature of prion protein. There is no substitute for thorough manual cleaning.

As research in the UK progresses, it is likely that other procedures will be developed to inactivate prion infectivity and to remove proteins from instrument surfaces. The development of such techniques (along with more sensitive tests for prion detection) may well have an impact on future advice concerning endoscopy and CJD.

Recently updated healthcare guidelines appear in the transmissible spongiform encephalopathy section of the Department of Health website (www.doh.gov.uk/cjd/tseguidance/tseguidancepart4.pdf).

5. Disinfectants

The ideal disinfectant would be:

- Effective against a wide range of organisms including blood-borne viruses and prion proteins.
- Compatible with endoscopes, accessories and endoscope reprocessors.
- Non-irritant and safe for users.
- Environmentally friendly for disposal.

Other factors that will influence the choice of disinfectant include the process of dilution, stability of the solution, number of reuses possible, and the cost of using the particular disinfectant (e.g. costs of the appropriate automatic endoscope reprocessors, storage space, and conditions required for use, including staff protection measures).

Although less irritant than glutaraldehyde, orthophthalaldehyde, peracetic acid and chlorine dioxide are

all potential skin and respiratory sensitisers. Therefore the same precautions should be taken when using these disinfectants, including fume extraction/containment and personal protective equipment (Section 7).

The disinfectants discussed below are reusable within automatic endoscope reprocessors. Their properties are shown in Table 1.

a) Aldehyde-based disinfectants

A formerly widely-used glutaraldehyde-based disinfectant (Cidex ®) has recently been withdrawn from the United Kingdom market by its manufacturer. This is not only because there have been advances in the development of disinfectants with superior bactericidal activity, but also because glutaraldehyde is chemically related to formaldehyde, and has similar toxic effects on skin and mucous membranes. Resulting adverse effects include severe dermatitis, conjunctivitis, sinusitis and asthma. Glutaraldehyde has also been implicated as a cause of chemical colitis (16). A further problem with glutaraldehyde-based disinfectants is their potential to cross-link residual protein material. The resulting amalgam is very difficult to remove from working channels of endoscopes that have been repeatedly flushed with aldehydes. This again underscores the importance of manual pre-cleaning and brushing of all accessible internal channels and valve chambers before disinfection.

Glutaraldehyde and its derivatives kill most bacteria and viruses (including human immunodeficiency virus and hepatitis B) in less than five minutes. Mycobacteria are more resistant to 2% glutaraldehyde, and earlier guidelines recommend that endoscopes are immersed for 20 minutes in 2% glutaraldehyde at room temperature (1).

Ortho-phthalaldehyde (0.55% solution marketed as Cidex OPA ®) is more stable and has a lower vapour pressure than glutaraldehyde. It is therefore practically odourless and does not emit noxious fumes. OPA is a potential skin and respiratory sensitiser and thus can aggravate pre-existing asthma, bronchitis or dermatitis. It is non-flammable and is stable at a wide pH range. It has better mycobactericidal activity than 2% glutaraldehyde (18,19). In use testing of OPA on endoscopes has shown cidal activity achieving a reduction of greater than five logs. and stability over a two-week period (20). The manufacturers of Cidex OPA ® recommend the daily use of OPA test strips to monitor the activity of reused batches of disinfectant solution. Each batch should be replaced after two weeks of use. OPA does not require pre-activation and can be discarded down hospital drains. It does not appear to damage instrument components, but like other aldehydes it can stain and cross-link protein material.

Other aldehyde-based disinfectants available in the UK include a combination product including 10% succine dialdehyde and formaldehyde (Gigasept â), which has been evaluated in comparative studies with glutaraldehyde and other disinfectants (17). Atypical mycobacteria are relatively resistant to this agent. Gigasept Rapid â is a glutaraldehyde/formaldehyde solution; Gigasept FF â contains no glutaraldehyde or formaldehyde, the active ingredient being succine dialdehyde. Septo DN â is a glyoxal/glutaraldehyde combination which has reportedly been used without incident at approximately 50°C in other European countries for several years. NewGennâ is a combination of 6% Sactimed-I-Sinald, a quaternary ammonium compound (QAC) and 0.5% orthophthalaldehyde.

b) Peracetic Acid

This is marketed as NuCidex ® (0.35 % peracetic acid), Perasafe ® (0.26% peracetic acid), Perascope ® and Gigasept PA â, which is marketed in some countries as Anioxyde 1000 and Aperlan â. Peracetic acid is also available as part of a dedicated disinfectant called the Steris ® system (which uses 0.2% peracetic acid at 53° C) (21). Peracetic acid is a powerful oxidising agent that rapidly kills a wide range of micro-organisms. It has a broad spectrum of activity against viruses, vegetative bacteria,

mycobacteria, fungi and spores. Its mycobactericidal activity is superior to that of glutaraldehyde (22), being effective against mycobacteria (including *Mycobacterium avium*) within 10 minutes (23). Peracetic acid is more effective than glutaraldehyde at removing organic matter such as biofilms. Its rate of activity varies according to its use concentration and temperature. Bactericidal activity diminishes after 24 hours and therefore each batch should be changed each day. Peracetic acid can cause discolouration and peeling of electroplated components and rubber. The Steris® system has been shown to be effective at eliminating vegetative organisms, fungi and spores (21,24) and was effective in experimental models of antimicrobial efficacy (25,26). The main drawbacks with the Steris® system are that exposure to detergent is not included in its wash cycle, the instruments must be allowed to cool before use, and the instrument tray shape is unsuitable for the disinfection of Olympus® endoscopic ultrasound scopes.

Peracetic acid is a colourless liquid with a strong vinegary odour which is irritant, but it decomposes to carbon dioxide, oxygen and water and therefore does not pose an environmental hazard. The WATCH committee of the Health and Safety Committee have concluded that peracetic acid can cause skin reactions, and that there is a potential for provoking upper respiratory irritation. Peracetic acid should therefore be used with an exhaust ventilated system.

Some endoscope manufacturers advise users to undertake specified inspection routines as a precondition of honouring their service contracts and warranties.

c) Hypochlorous acid (superoxidised water)

This is marketed as Sterilox® and Suprox â; it is a mixture of active elements derived from salt by electrolysis through a proprietary electrochemical cell. It is important that the parameters for electrolysis are strictly adhered to, as it is only under these conditions that a biocide is produced. Saline (0.05%) electrolysed at 950 mV produces a rapidly active biocide that is effective against vegetative bacteria, mycobacteria, spores, yeasts and viruses (27-29). The more recently introduced hypochlorous acid product (Suprox â) is electrolysed at 750mV. The effectiveness of these products is reduced in the presence of organic matter.

Some oxidising disinfectants have demonstrated an incompatibility with polymer coatings on some models of endoscopes. The manufacturers of Sterilox® therefore offer customers the Scope Protection System®, which should be applied to the insertion and light guide tubes of certain endoscopes each session in order to minimise potential damage. Some endoscope manufacturers stipulate that users should perform inspections for damage at the start of each day, and that failure to adhere to this recommendation may invalidate service contracts and warranties.

The active agents of superoxidised water decompose slowly to harmless chemicals. To minimise the risk of dilution and inactivation the solution should be used once only and discarded.

d) Chlorine Dioxide (Tristel Multi-Shot®, Tristel One-Day® and Tristel One-Shot®).

Chlorine dioxide is a broad spectrum agent with rapid activity against vegetative bacteria including mycobacteria, viruses and spores (30,31). Chlorine is a well-recognised respiratory irritant, and chlorine releasing systems must be kept enclosed and/or used in parallel with an exhaust ventilation system. Chlorine dioxide is potentially corrosive, and some solutions are marketed with a corrosion inhibitor. Users of some manufacturers' endoscopes are advised to perform daily pre-use inspections as a condition for service contracts and warranties to remain in effect.

e) Alcohols

These are at least as effective as 2% glutaraldehyde in their activity against vegetative bacteria

including mycobacteria (30) and against viruses, although activity against enteroviruses is slow (32). Alcohol-based disinfectants are effective against resistant *Pseudomonas* (33). Alcohol fails to destroy bacterial spores. Unfortunately prolonged exposure to 70% alcohol disrupts adhesives, denatures plastics and damages seals in endoscopes. The use of alcohol-based disinfectants is therefore restricted to the flushing and drying of endoscope channels. Alcohol is flammable and its use in the large volumes required for automatic endoscope reprocessors cannot be recommended.

The use of isopropyl alcohol is recommended in the process of drying endoscope channels at the end of the day (34).

f) Sterilisation processes

Ethylene oxide, low temperature steam and formaldehyde and hydrogen peroxide gas plasma may be used for the sterilization of invasive flexible endoscopes (e.g. some choledochoscopes). Ethylene oxide is classified as a human carcinogen. These agents are suitable for the sterilization of some reusable heat-labile accessories.

Long cycle times render these methods impractical during routine gastrointestinal endoscopy lists. Furthermore sterilization is not considered necessary for decontaminating standard flexible GI endoscopes; high level disinfection using the agents discussed earlier in this section is sufficient.

The process of changing from glutaraldehyde

The Working Party endorses the advice given by Babb and Bradley in 2001:

- Inform Infection Control and Occupational Health teams
- Obtain an endorsement of compatibility from the instrument and processing equipment manufacturers/supplies. Unauthorised use may invalidate guarantees and/or service contracts.
- Carefully cost the change bearing in mind the use, concentration, stability and additional equipment required for processing.
- Ensure the processed items are thoroughly cleaned, and that the disinfectant manufacturers' recommended contact times are achieved, unless alternative advice from professional organisations is available.
- Establish what is required in terms of COSHH regulations (e.g. ventilation, personal protective equipment) and ensure that these are included in the costing.
- Keep the British Society of Gastroenterology, and the Microbiology Advisory Committee to the Department of Health, reference centres and disinfectant and instrument manufacturers informed of your experience, be it favourable or not.

6. Automatic Endoscope Reprocessors (AER)

These have now become the standard of care for an endoscopy unit. They protect the user from hazardous reprocessing chemicals such as disinfectants. All AERs should have been validated and tested in accordance with the guidance provided in the NHS estates publication HTM2030 and relevant standards where available. AER should include flow monitoring for each individual channel to detect blockages.

It is essential that the machine is properly cleaned and disinfected at the start of each working day employing, where possible, the AER's self disinfection cycle. It is recommended that an agent other than that used for endoscope disinfection is used to disinfect the machine. Care should be taken

to ensure that all disinfectants used are compatible with the AER, and are employed at the correct temperature and concentration. The microbiological quality of the rinse water and other fluids must be acceptable; it is recommended that the final rinse water is tested for its microbiological quality on a weekly basis. The user should make daily checks of the filters and pipe work supplying rinse water. Water filters should be changed in accordance with the manufacturer's instructions, or more often if the water quality is poor (as suggested by frequent clogging of filters). Hard water can cause a deposit of limescale on internal pipe work. Advice may need to be taken from a company specialising in water treatment, and from a local consultant microbiologist.

The rinse cycle should employ bacteria-free water. This may be achieved either by using bacteria-retaining filters or by other methods (e.g. addition of biocides). If mains water is used a water-softening and/or treatment system may be needed to prevent contamination with limescale, biofilm and micro-organisms. Some machine isolates (e.g. *Mycobacterium chelonae*) are extremely resistant to disinfection and an alternative disinfectant such as a chlorine releasing agent or peracetic acid should be used for machine disinfection.

Some older machines have facilities for conservation of rinse water. A build-up of disinfectant will, however, occur if the rinse water is reused. This may transfer toxic residues to the endoscope and cause irritation of the patient's mucosa or, if using fibrescopes, to the endoscopist's eyes. It is recommended that rinse water is not reused.

Some special features or performance characteristics are optional but all machines should expose all internal and external endoscope surfaces to disinfectant and rinse water in accordance with the local hospital infection control committee protocols and/or national guidelines. Ideally all channel irrigation should be verified during each cycle. Instructions and training should be given by the machine manufacturers on how to connect the instrument to the washer/disinfector to ensure all channels are irrigated. The machine should be programmable to accommodate the disinfectant contact time recommended by the disinfectant manufacturers, the Department of Health, and the professional societies such as the BSG. They should have also a cycle time compatible with the workload of the unit and run at a temperature that is compatible with the endoscopes. Care must be taken to ensure that AER are used with reprocessing chemicals that are compatible with each machine. The manufacturers of reprocessing chemicals, and the manufacturers of AER, should provide clear instructions on compatibility. Newer machines have automatic leak-testing facilities incorporated within them, but these devices are not foolproof because they do not angle the endoscope tip during leak testing, and may therefore fail to recognise positional leaks.

Older duodenoscopes do not have endoscope tips that can be detached to allow access to the elevator wire channel for cleaning. Some AERs have the capacity to deliver high-level disinfection to this channel. Users of duodenoscopes without detachable tips should pay special attention to the capability of their AERs in this respect. Manual cleaning and disinfection of the elevator wire channel may be necessary.

A Health Technical Memorandum discourages the decontamination of more than one endoscope within a single chamber of an AER (35). The Working Party understands that to implement this recommendation nationwide would significantly reduce the working capacity of many endoscopy units, and believes the risk of cross-infection associated with simultaneous reprocessing is likely to be minimal. Nonetheless purchasers of AER should take this guideline into account, and those planning layouts of new endoscopy units should ensure that decontamination rooms are large enough to allow for sufficient separate chamber AER capacity for their predicted caseload.

It is important to ensure that the AER will irrigate all channels of each endoscope being processed, and will verify that such irrigation has taken place. This facility should include alerting the user to endoscope blockages or disconnections within the AER. Other features to consider when purchasing

an AER include (a) a cycle counter and fault indicator, (b) a control system for use when the disinfectant produces an irritating or sensitising vapour, (c) a water treatment system which prevents recontamination of processed instruments during rinsing, (d) a reliable, effective and simple machine disinfection cycle, (e) an air drying facility to expel fluids and dry the channels of the endoscope at the end of the cycle, (f) a facility to irrigate the channels of the endoscope with alcohol before storage, (g) a leak test facility, and (h) a print-out of cycle parameters which can be retained for quality assurance records.

Users are advised to review independent test reports and consult their local Authorised Persons (AP as defined in NHS estates publications) before purchasing AER.

7. Protecting the Operator (Box 1)

When handling cleaning and disinfecting agents single-use nitrile gloves should be peeled back to cover the sleeves of long-sleeved waterproof gowns. Eye and face protection with goggles and masks is essential. Eye protection with visors or goggles should be employed both during endoscopy procedures and while performing endoscope decontamination. Staff should be trained in effective handwashing in a separate sink from that used for endoscope decontamination. Care should be taken to clean and disinfect work surfaces at the end of each working day.

Staff exposed to disinfectant vapours should receive regular health surveillance. Pre-employment medical checks are still recommended even when disinfectants other than glutaraldehyde are used. Occupational health departments should enquire regarding any history of asthma, conjunctivitis, rhinitis or dermatosis. Departments should conduct a COSHH risk assessment for substances used in their hospitals' endoscopy units and, when regular staff health surveillance monitoring is indicated, lung function testing by spirometry should be carried out at the pre-employment medical visit and annually thereafter. Surveillance of employees for the appearance of symptoms should be carried out annually either by direct assessment in the Occupational Health Department or by questionnaire. Surveillance records should be retained for 40 years. If surveillance demonstrates the occurrence of occupational dermatosis or asthma, further exposure must be avoided. Staff should be encouraged to report any health problems to their line management and occupational health department.

All staff working with endoscopes should be immunised in accordance with local occupational health policy. Care must be taken in the handling of sharps, including spiked biopsy forceps. Staff should avoid the use of hypodermic needles or other sharp instruments for removing specimens from the cups of biopsy forceps. A blunt-ended needle can be used to free the specimen.

8. Health and safety

There should always be sufficient numbers of trained staff and items of equipment to allow enough time for thorough cleaning and disinfection to take place (36). Each endoscopy unit must have a policy for dealing with disinfectant or body-fluid spillage. This policy should be prominently displayed within the unit, and all staff must be trained in its implementation. Training of staff should be documented and reviewed regularly.

Given the policy of "universal precautions", which assumes that any patient may be harbouring infectious agents, there is no logic in placing "high risk" patients at the end of endoscopy lists. An exception would be a patient with Acquired Immune Deficiency Syndrome who may have resistant and/or atypical mycobacterial infection. Local infection control policies, however, may dictate that certain patients are listed at the end of the session and before the standard theatre cleaning routine. Patients with Methicillin-resistant *Staphylococcus aureus* or Vancomycin-resistant enterococci might fall into this category.

9. Practical Recommendations for Decontamination and Storage of Endoscopes (Box 2)

Manufacturers of all reusable medical instruments are required under the UK Medical Devices Regulations to provide validated reprocessing instructions for their equipment. In view of this, the Working Party has decided not to include generic cleaning and disinfection instructions in this document, but to refer users to the detailed instructions supplied by the manufacturers.

Before commencing sessions the endoscopes to be used during the list should be checked for faults. All endoscopes must have been exposed to a full decontamination cycle not more than 3 hours prior to use. The exposure times recommended by the manufacturer for each disinfectant should be adhered to.

Care should be taken to ensure that endoscopes prepared for use are stored in a separate room from endoscopes that await reprocessing. Endoscopes should be stored hanging vertically in a designated dry and well-ventilated storage cupboard. Special care should be taken to avoid coiling of any part of the endoscope so as to reduce stasis of any droplets within the channels. All valves, seals, soaking caps, angulation locks and detachable tips should have been removed and should not be replaced until the endoscope is next used. Valves should be dried with a cotton wool bud and lubricated with silicone oil or water as instructed by the manufacturer.

10. Cleaning and Disinfection of Accessories

This topic was addressed by an earlier BSG Working Party (37). Increasingly the accessories that are passed via the working channel of endoscopes are single use. These include cytology brushes, polypectomy snares, injection needles and most ERCP accessories. Most biopsy forceps in current use are reusable but the trend towards single use biopsy forceps has been accelerated by the discovery of vCJD within the gut lymphoid system. The Working Party now recommends that endoscopy units in the UK should move towards a policy of replacing reusable biopsy forceps with single use forceps. Indeed it has been suggested that single use biopsy forceps may be more cost-effective than their reusable counterparts (15).

Accessories that are not passed through the working channel of endoscopes, such as water bottles and bougies, are normally marketed as reusable. Autoclavable accessories should be chosen whenever possible.

The Medical Devices Agency Bulletin DB9501 (38) advises on potential hazards, clinical and legal, associated with reprocessing and reusing medical devices intended for single use. Users who disregard this information and prepare single use items for reuse without due precautions may be transferring legal liability for the safe performance of the product from the manufacturer to themselves or their employers.

Footnote: A U.S. multi-society guideline for gastrointestinal endoscope reprocessing appeared while the members of the Working Party approved the final draft of the BSG guidelines (39). There are no major differences between the two sets of guidelines, other than our recommendations for single use accessories to reduce the risk of transmission of vCJD, a pathogen that is more relevant to gastrointestinal practice in the U.K.

REFERENCES

1. The report of a Working Party of the British Society of Gastroenterology Endoscopy Committee. Cleaning and disinfection of equipment for gastrointestinal endoscopy. *Gut* 1998;42:585-93
2. Medical Devices Agency Device Bulletin. Decontamination of endoscopes. (July 2002) MDA DB2002 (05)
3. Spach DH, Silverstein FE, Stamm WE. Transmission of infection by gastrointestinal endoscopy. *Ann Intern Med* 1993;118:117-28.
4. Technology Status Evaluation Report; Transmission of infection by gastrointestinal endoscopy. *Gastrointest Endosc* 2001;54:824-8.
5. Bronowicki JP, Vernard V, Botte C et al. Patient-to-patient transmission of hepatitis C virus during colonoscopy. *New Engl J Med* 1997;337:237-40.
6. Deva AK, Vickery J, Zou J et al. Detection of persistent vegetative bacteria and amplified viral nucleic acid from in-use testing of gastrointestinal endoscopes. *J Hosp Infect* 1998;39:149-57.
7. Rutala WA, Gergen MF, Weber DJ. Inactivation of *Clostridium difficile* spores by disinfectants. *Infection Control Hosp Epidemiol* 1993; 14: 36-9.
8. Nurnberg M, Schulz HJ, Ruden H et al. Do conventional cleaning and disinfection techniques avoid the risk of endoscopic *Helicobacter pylori* transmission? *Endoscopy* 2003; 35: 295-9.
9. Kaye MD. Herpetic conjunctivitis as an unusual occupational hazard (endoscopist's eye). *Gastrointest Endosc* 1974;21:69.
10. Will RG, Ironside JW, Zeidler M et al. A new variant of Creutzfeldt-Jakob disease in the UK. *Lancet* 1996;347:921-925.
11. Hill AF, Butterworth RJ, Joiner S et al. Investigation of variant Creutzfeldt-Jakob disease and other human prion diseases with tonsil biopsy samples. *Lancet* 1999;353:183-189.
12. Wadsworth JD, Joiner S, Hill AF et al. Tissue distribution of protease resistant prion proteins in variant Creutzfeldt Jakob Disease using a highly sensitive immunoblotting assay. *Lancet* 2001; 358: 171-80.
13. Will RG, Zeidler M, Stewart GE et al. Diagnosis of new variant Creutzfeldt-Jakob disease. *Ann Neurol* 2000; 47: 575-82.
14. Axon ATR, Beilenhoff U, Bramble MG et al. E.S.G.E Guidelines: Variant Creutzfeldt-Jakob Disease (vCJD) and gastrointestinal endoscopy. *Endoscopy* 2001; 33: 1070-80.
15. Bramble MG Ironside JW. Creutzfeldt-Jakob disease: implications for gastroenterology. *Gut* 2002; 50: 88-90.
16. West AB, Kuan SF, Bennick M et al. Glutaraldehyde colitis following endoscopy: clinical and pathological features and investigation of an outbreak. *Gastrointest Endosc* 1995;108:1250-5.
17. Griffiths PA, Babb JR, Fraise AP. *Mycobacterium terrae*: a potential surrogate for *Mycobacterium tuberculosis* in a standard disinfectant test. *J Hosp Infect* 1998; 38: 183-92.

18. Walsh SE, Maillard JY, Russell AD. Orthophthalaldehyde: a possible alternative to glutaraldehyde for high level disinfection. *J Appl Microbiol* 1999;86:1039-46.
19. Walsh SE, Maillard JY, Simmons C et al. Studies on the mechanisms of the antibacterial action of orthophthalaldehyde. *J Appl Microbiol* 1999;87:702-10.
20. Alfa MJ, Sitter DL. In-hospital evaluation of orthophthalaldehyde as a high level disinfectant for flexible endoscopes. *J Hosp Infect* 1994;26:15-26.
21. Duc DL, Ribiollet A, Dode X et al. Evaluation of the microbicidal activity of Steris ® system for digestive endoscopes using Germande and ASTM validation protocols. *J Hosp Infect* 2001;48:135-41.
22. Stanley PM. Efficacy of peroxygen compounds against glutaraldehyde-resistant mycobacteria. *Am J Infect Control* 1999;27:339-43.
23. Lynam PA, Babb JR, Fraise AP. Comparison of the mycobactericidal activity of 2% alkaline glutaraldehyde and NuCidex ® (0.35% peracetic acid). *J Hosp Infect* 1995;30:237-40.
24. Cronmiller JR, Nelson DK, Jackson DK et al. Efficacy of conventional endoscopic disinfection and sterilisation methods against *Helicobacter pylori* contamination. *Helicobacter* 1999;4:198-203.
25. Cronmiller JR, Nelson DK, Salman G et al. Antimicrobial efficacy of endoscopic disinfection procedures: a controlled, multifactorial investigation. *Gastrointest Endosc* 1999;50:152-8.
26. Foliente RL, Kovacs BJ, Aprecio RM et al. Efficacy of high level disinfectants for reprocessing GI endoscopes in simulated-use testing. *Gastrointest Endosc* 2001;53:456-62.
27. Selkon JB, Babb JR, Morris R. Evaluation of the antimicrobial activity of a new super-oxidised water, Sterilox®, for the disinfection of endoscopes. *J Hosp Infect* 1999;41:59-70.
28. Shetty N, Srinivasan S, Holton J et al. Evaluation of microbicidal activity of a new disinfectant, Sterilox 2500® against *Clostridium difficile* spores, *Helicobacter pylori*, Vancomycin resistant enterococcus species, *Candida albicans* and several mycobacterium species. *J Hosp Infect* 1999;41:101-5.
29. Tsuji S, Kawano S, Oshita M et al. Endoscope disinfection using acidic electrolytic water. *Endoscopy* 1999;31:528-35.
30. Coates D. An evaluation of the use of chlorine dioxide (Tristel® One Shot) in an automated washer/disinfector (Medivator) fitted with a chlorine dioxide generator for decontamination of flexible endoscopes. *J Hosp Infect* 2001;48:55-65.
31. Griffiths PA, Babb JR, Fraise AP. Mycobactericidal activity of selected disinfectants using a quantitative suppression test. *J Hosp Infect* 1999;41:111-21.
32. Tyler R, Ayliffe GA, Bradley C. Virucidal activity of disinfectants: studies with the polio virus. *J Hosp Infect* 1990;15:339-45.
33. Kovacs BJ, Aprecio RM, Kettering JD et al. Efficacy of various disinfectants at killing a resistant strain of *Pseudomonas aeruginosa* by comparing zones of inhibition: implications for endoscopic equipment reprocessing. *Am J Gastroenterol* 1998;93: 2057-9.
34. Alfa MJ, Sittar DC. In hospital evaluation of contamination of duodenoscopes: a qualitative

assessment of the effects of drying. J Hosp Infect 1991; 19: 89-98.

35. NHS Estates (1997) Health Technical Memorandum HTM 2030, Washer Disinfectors. HMSO.
36. Working Party Report: Provision of endoscopy related services in District General Hospitals. British Society of Gastroenterology 2001.
37. Wilkinson M, Simmons N, Bramble M et al. Report of the working party of the endoscopy committee of the British Society of Gastroenterology on the reuse of endoscopic accessories. Gut 1998;42:304-6.
38. Medical Devices Agency Device Bulletin. The reuse of medical devices supplied for single use only. (January 1995) MDA DB 9501.
39. Multi-society guideline for reprocessing flexible gastrointestinal endoscopes. Gastrointest Endosc 2003; 58: 1-8.

Box 1: Personnel Protection during Endoscope Decontamination

1. Wear long-sleeved waterproof gowns. These should be changed between patients.
2. Use nitrile gloves which are long enough to protect the forearms from splashes.
3. Goggles prevent conjunctival irritation and protect the wearer from splashes.
4. Disposable charcoal-impregnated face masks may reduce inhalation of vapour from disinfectants, but experience with them is not yet widespread.
5. An HSE-approved vapour respirator should be available in case of spillage or other emergencies. It should be stored away from disinfectants as the charcoal adsorbs fumes and respirators should be regularly replaced.

Box 2: Steps in Endoscope Decontamination

As soon as possible after use:

- 1 Wipe down insertion tube
- 2 Flush air/water channels
- 3 Aspirate water through biopsy/suction channel
- 4 Dismantle detachable parts (e.g. valves)
- 5 Manually clean with enzymatic detergent followed by rinsing
- 6 Disinfect and rinse in an automatic reprocessor
- 7 Dry
- 8 Store appropriately

TABLE 1: INSTRUMENT DISINFECTANTS: PROPERTIES

Disinfectant	Microbicidal Activity						Inactivation					Irritant (I)
	Spores	Mycobacteria	Bacteria	Viruses	Stable	by organic matter	Corrosive/damaging	Non Env.	Env.	I/S		
Glutaraldehyde 2%	Moderate 3 hours	Good 20 mins	Good <5 mins	Good <5 mins	Good <5 mins	Moderate (e.g. 14-28 days)	No (fixative)				No	I/S
Ortho-phthalaldehyde (0.55%)	Poor	Good	Good	Good	Moderate	No	No				No	
Peracetic acid 0.2 - 0.35%*	>6 hours Varies	<5 mins Varies	<5 mins Good	<5 mins Good	<5 mins Good	(30 days) No	(fixative)				(staining)	
Alcohol (usually 70%)	10 - 20 mins None	5 - 20 mins Good	<5 mins Good	<5 mins Good	<5 mins Moderate	(1-3 days) Yes	No (fixative)				Slight	
Chlorine dioxide	Good	Good	Good	Good	Good	No	Yes				Slight (lens cements)	No
Superoxidised water	10 mins Good	<5 mins Good	<5 mins Good	<5 mins Good	<5 mins Good	(1-5 days) No	Yes				Yes	
	10 mins	<5 mins	<5 mins	<5 mins	<5 mins	(< 1 day)	Yes				Yes	No

* activity varies with concentration of product

Summary of Recommendations

KEY TO GRADING OF RECOMMENDATIONS

- A) Recommendation based on at least one meta-analysis, systematic review, or a body of evidence from RCTs.
- B) Recommendation based on high quality case control or cohort studies with overall consistency or extrapolated from systematic reviews, RCTs or meta- analyses.
- C) Recommendation based on lesser quality case control or cohort studies with overall consistency or extrapolated from high quality studies.
- D) Recommendation from case series or report and expert opinion including consensus.
1. Decontamination of endoscopes should be undertaken at the beginning and end of each endoscopy list and between patients by trained staff in dedicated rooms. C.
 2. Thorough manual cleaning with a low foaming enzymatic detergent which is compatible with the endoscope is an essential step before endoscope disinfection. C.
 3. The use of automated endoscope reprocessors is mandatory; manual disinfection is no longer acceptable. D
 4. An effective disinfectant which is compatible with the endoscope and automatic endoscope reprocessor should be used in decontamination. D
 5. A record should be kept of the model and serial number of each endoscope used (including loan endoscopes) for each patient. This is important for any future contact tracing when possible endoscopic disease transmission is being investigated. D.
 6. The risk of transmission of variant Creutzfeld Jakob disease (vCJD) is probably very low, but scrupulous attention to detail must be employed in the decontamination process. All accessible channels of endoscopes should be exposed to an enzymatic detergent, which should be brushed through these channels using single use purpose made brushes. The brushes should have an appropriate length and diameter for each endoscope channel. D.
 7. Endoscopy should be avoided whenever possible in patients with suspected or confirmed vCJD. When deemed essential either a dedicated endoscope should be used or one nearing the end of its useful life can be employed and subsequently quarantined and reserved for similar patients in future. Endoscopes dedicated for use in such patients can be loaned via the National CJD Surveillance Unit. D.
 8. When percutaneous feeding gastrostomy or jejunostomy is required in patients with vCJD a dedicated endoscope should be used or the feeding tube deployed by radiological or surgical means. D.
 9. The Working Party recommends that in future some components and accessories should be considered single use only. These include endoscopic biopsy forceps and brush-tipped wires used for manual cleaning. Rubber biopsy valve channel caps should be discarded after any endoscopic procedures that involve passage of biopsy forceps or other accessories through the valves. For other accessories "single use" or autoclavable accessories should be used in preference to reusable accessories wherever possible. D.

10. Health surveillance of staff is mandatory and should include a pre-employment enquiry regarding asthma, skin and mucosal sensitivity problems and lung function by spirometry. Occupational health departments should conduct a COSHH risk assessment and draw up local staff surveillance policies which may include annual health questionnaires and spirometry. D.
11. All health care workers involved in endoscopic practice should have been immunised in accordance with local occupational health policy. B.
12. Staff carrying out endoscope decontamination should wear single use gloves which should be changed between each endoscope decontamination cycle. Eye and face protection with goggles and masks is essential. Staff should cover wounds and abrasions. D.
13. Safe working practices in the decontamination area of each unit should be written down and understood by all staff. D.
14. If an emergency endoscopic procedure is performed out of hours, an assistant with specialist knowledge of endoscopes and their decontamination should be available to be responsible for decontamination of equipment. D.
15. Bacteria-free water should be used in the rinse cycle of automatic endoscope reprocessors. To achieve this water can be passed through bacteria retaining filters, or biocides can be added. It is recommended that the final rinse water from each reprocessor should be confirmed as free of micro-organisms on a weekly basis. D.
16. Each endoscopy unit must have a policy for dealing with disinfectant spillage. This policy should be agreed with local health and safety advisors and should be prominently displayed within the unit. All staff must be trained in its implementation. D.
17. Every unit must have a protocol for dealing with body fluid spillage. Written policy should be agreed with the local infection control team. C.
18. Disinfectants used in automatic endoscope reprocessors must be used at the correct temperature according to the manufacturer's instructions. D.
19. All endoscopes to be used each day must have been exposed to a full decontamination cycle not more than three hours prior to use. D.
20. The use of isopropyl alcohol for flushing endoscope channels is recommended as part of the drying process at the end of the working day prior to storage. C.
21. Endoscopes should be stored hanging vertically in a designated dry and well-ventilated storage cupboard. All detachable components should have been previously removed and should not be replaced until the endoscope is next used. D.
22. Given the "universal precautions" for endoscope decontamination there is little logic to placing "high risk" patients at the end of procedure lists. The exceptions would be patients known to have atypical mycobacterial chest infections. Nonetheless local infection control policies may dictate that patients with methicillin-resistant *Staphylococcus aureus* or other resistant organisms should be examined after other patients and before the final theatre cleaning is carried out. D.

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