LOW TEMPERATURE STERILISATION

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Intoduction

Sterilisation is the total elimination or destruction of all forms of microbial life. Low temperature sterilisation refers to sterilisation at temperatures much lower than that for steam autoclaving in order to be able to sterilise delicate and heat-sensitive items. Disinfection eliminates many or all pathogenic organisms except bacterial spores. This assessment considers ethylene oxide (EtO) formaldehyde, peracetic acid, hydrogen peroxide gas plasma and gas plasma sterilisation, as well as disinfection by glutaraldehyde.

EtO is currently used in combination with carbon dioxide or hydrofluorocarbons. It sterilises by alkylation of DNA and RNA of microorganisms, Its advantages are the long cycle time, high cost, and potential hazards to patients and staff, and to the environment. In addition, it requires a remote location, steam, water, electricity and gas supply, as well as ventilation and drainage systems. Precautions also need to be taken by staff to avoid hazards of inflammability and toxicity.

Formaldehyde is commonly used in northern Europe. It inactivates viruses, bacterial spores, vegetative bacteria and fungi by heating formalin and steam. There is often consideration of paraformaldehyde on the sterelised products causing a grey appearance and an irritant smell. It causes irritation of the conjuctiva and respiratory tract. There are associated allergic reactions and it is also mutagenic and carcinogenic.

Peracetic acid has a rapid cycle time of 30-45 min. and its by-products are water, acetic acid and oxygen. There are no adverse effects on operators and it is easy to install and operate. However, only a single scope or small number of instruments can be sterelised at one cycle, and it can be used for immersible products only. There is some incompatibility with anodized surfaces and some epoxies and nylon become brittle. Sterelised products are wet and have to be used soon after sterelisation.

Hydrogen peroxide plasma sterelisation is safe for the environment and health care workers and does not leave any toxic residue. The cycle time is 75 min. and no aeration is necessary. It is simple to operate and monitor. However, it needs special synthetic packaging and a special container. The sterilisation chamber is small and cellulose, linen, and liquids cannot be sterilised. Endoscopes or devices with long lumens (>31 cm) or small diameter (<6mm) cannot be sterilised. Sterilisation also will not occur in the presence of organic material.

Gas plasma sterilisation uses a mixture of peracetic acid, hydrogen peroxide in the vapour phase. Special trays have to be used, while flexible endoscopes with lumens have to be connected to channel irrigators. It has microbial efficiency against a wide variety of microorganisms and is compatible with common polymeric materials in medical devices. However, this too has a small sterilisation chamber, and there are problems in the presence of organic material.

Glutaraldehyde is used in hospitals mostly for high level disinfection of endoscopes. It has a wide spectrum of anti-bacterial activity and is effective against viruses including HIV viruses. It is non-corrosive to lensed instruments, metal, rubber and plastic. Currently, there is disagreement over sterilisation times for various types of instruments. It has a shelf-life of at least 14-28 days. However, it is toxic, irritant and allergenic causing skin, eye and respiratory irritation and can produce skin sensitisation. It is also fetotoxic.

Conclusion

All the methods of sterilisation and high-level disinfection are effective. However, consideration may need to be given to costs, both capital and installation costs, as well as cost of infrastructure, and operating costs. In addition, consideration needs also to be given to duration of the sterilisation cycle. Finally, for certain sterilisation methods, especially formaldehyde and ethylene oxide, consideration has to be given to safety implications.