

ETHYLENE OXIDE STERILIZATION

By

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SULPHUR dioxide, chlorine gas and Formaldehyde were used 200 years ago to fumigate room. Ethylene oxide has also been used as fumigant for spices imported from abroad and as an agent for the destruction of organisms in the oil.

Up to the years 1955-56 the only gas sterilization procedure in medical use was the Formaldehyde cabinet. Recently two other chemicals have been introduced: Ethylene oxide and B-propiolactone.

Sterilization by gases is a special form of chemical disinfection but subject to the same basic principles as chemical disinfection. Gas is a better penetrating agent, and it can be applied to some articles not suitable for treatment with liquids, for example blankets.

Dry heat kills by an oxidation process and moist heat causes death by coagulating proteins within the cells. The mechanism by which ethylene oxide causes death is attributed to its alkylation properties which initiate intracellular reactions that apparently interfere with essential metabolic processes within the cell. Ethylene oxide sterilization is a special purpose method rather than a general one. This is due to the expense involved and the time factor which is critical.

Ethylene oxide is extremely flammable and explosive, but if used in combination with carbon dioxide—e.g.—carboxide 90 per cent. Carbon dioxide and 10 per cent. Ethylene oxide, or with Freon—89 per cent. Freon and 11 per cent. Ethylene oxide that is *cryoxide*, or *Steroxide* i.e. 88 per cent. Freon and 12 per cent. Ethylene oxide is non-flammable and non-explosive. It is poisonous in pure form and if inhaled Ethylene oxide is as irritating to the respiratory tract as ammonia gas. Prolonged exposure may cause irritation to the eyes and nose, dizziness, nausea, or headache. Inhalation of fresh air is an effective antidote.

Ethylene oxide is a good bactericidal agent at room temperature so long as sufficient exposure time, 16 to 18 hours is permitted. The relative humidity 50 per cent. and temperature 130°F are most practical. Ethylene oxide penetrates with extreme ease the plastic cellophane, paper, cardboard and rubber. It can seep through the most minute cracks and crevices. Since Ethylene oxide is colourless, odourless and poisonous, provisions must be made to prevent its escape into the room. The larger models are connected to the outdoors by an exhaust line.

Advantages

Ethylene oxide is remarkably free of damaging effects on inanimate objects. It sterilizes heat sensitive articles such as gloves, cardiac catheters, ureteral catheters, cystoscopes, all plastic things. Gloves do not become sticky, change colour nor do they lose their elasticity. The life of cardiac and ureteral catheters is increased. The widest application of Ethylene oxide in the hospital will be in the form of a large, plainly constructed gas chamber to hold blankets, pillows, mattresses, linens and other bulky objects which presently constitute a major problem in the control of staphylococcal infection. Ethylene oxide kills all the organisms including spores. It is only slightly toxic when combined with Freon, rapidly dissipated in air, forms no film, nor is it greasy. It is easily stored and handled.

Disadvantages

The gas process is slow. It is very expensive. If misused it is expensive to repair. Special plumbing must be done to vent gas to the outside. Initial cost is expensive. The gas process is slow and expensive when compared with the cost of steam.

However the advantages outweigh the disadvantages. It provides a positive sterilization for the

many articles which cannot be subjected to steam. It can be safely used on supplies prepacked in dust proof and moisture resistant packages, and it does not destroy materials which have a low degree of thermostability. Cataract knives can be left in their plastic boxes, sealed with tape, they are sterilized and kept ready for indefinite period of time. Commonly used methods of sterilization of cardiac catheterisation equipment was shown by culture methods to be inadequate. A simple procedure of cold sterilization with Ethylene oxide gas was derived and has proved to be an inexpensive, time-saving, safe and effective means of obtaining sterility of fragile, expensive instruments.

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