Types and Classes of Chemical Agents as Disinfectants

ALCOHOLS - Ethyl or isopropyl at a concentration of 50-70% are used for some surfaces where a rapid evaporation of the chemical and leaving no residue may be important, such as on laboratory equipment, etc. Alcohols are low in sporocidal activity and must remain wet on the surface for several minutes to achieve any reasonable disinfection.

ALDEHYDES - Formaldehyde or more usually glutaraldehyde are used as instrument and catheter disinfectants. The glutaraldehyde is the basic chemical for various trademarks, such as Cidex, or Sonacide and newer ones such as Sporocidin or Glutacide or Totacide, etc. These are used for disinfectants or sterilization of instruments and catheters but not for environmental surfaces. They may also be used for pipettes and clinical thermometers, etc.

DETERGENTS - The term detergent refers to a removal of soil or dirt and various types of detergents are available. The anionic detergent such as soap and sodium lauryl sulfate and its close chemical relative which are the ingredients in the various dish and laundry detergents have very low level in antimicrobial activity and work by the removal of dirt and microorganisms and rinsing them down the drain.

GASEOUS AGENTS - Ethylene oxide as a gaseous agent may best be used as a sterilant, but has been used in liquids for antimicrobial action. The use of formaldehyde as a liquid at the 8% level in alcohol (for many hours) may have sterilizing capability as well as 20% 0 aqueous formalin and formaldehyde with low temperature steam (75 C).

HALOGENS - Chlorine and iodine are the usual halogens used as antimicrobial chemicals. The chlorine is used as a gas for disinfection of water and swimming pools. (It is used as the hypochlorite (Clorox) for sanitizing.) Chlorine dioxide has been utilized for disinfection and is a rapid oxidizing sterilant when used under certain conditions. Iodine as the tincture is probably the best of the skin antiseptics, but is more frequently used as the iodophor which is a so-called tamed iodine which releases iodine slowly to the environmental surfaces. It is used as a sanitizer in food preparation areas and also as a skin antiseptic, a surgical scrub, etc.

HEAVY METALS - The mercurial salts and other heavy metal preparations have lost favor in the laboratory and hospital scene since they are more bacteriostatic than bactericidal and may be extremely toxic. This would include trademark names such as Mercurochrome, Merthiolate (Thiomerosal), Merbak, Metaphen and others.

PEROXIDES - The use of weak peroxides on skin wounds of various small area has negligible antimicrobial activity and its effect probably due to a washing away of

extraneous dirt and microorganisms. A newer, highly concentrated peroxide at a low pH has been proposed as a disinfectant-sterilant, under the trademark of Sterisyl and may disinfect very rapidly.

PHENOLICS - The chemicals based on phenol, i.e., a benzene ring with hydroxyl (OH) group are among the more common disinfectants for environmental surfaces. Instead of phenol or cresol, today it is more common to use a mixture of highly substituted phenolics (such as orthophenylphenol) which may be diluted out further (1:128-1:256) to achieve their bactericidal activity.

QUANTERNARY AMMONIUM COMPOUNDS - This class of compounds are commonly called quats. They were first used as detergents, but in 1935, Domagk disclosed the antibacterial activity of the long chain quaternary ammonium salts. Early experiments utilized benzalkonium or cetyl pyridium chlorides which, while good disinfectants, unfortunately, become contaminated on sitting in low concentrated solution and have lost favor in the health care scene. The newer, more concentrated "dual" or "dialky" quaternaries used for hard surface disinfection exhibit higher activity and are more acceptable. The number of newer quaternaries is extensive and future technologies and applications are being
constantly developed on this class of compounds.

OTHER CHEMICALS - Various dyes, acetic acid, carbonates, bicarbonates, chlorites, essential oils, etc., have been used with more or less success, (usually less success) as antimicrobial chemicals and should give way to the more effective ones noted above.

PHYSICAL METHODS OF DISINFECTION

PASTEURIZATION
A modification of the 0 procedure utilized by Pasteur for wine and dairies for milk (62+ C for 30 minutes) has been adapted for disinfecting laboratory and health care facilities heat labile instruments that might be damaged by some temperatures. This consists, essentially, of a washing process to remove 99+% of the organic 0 matter and organisms followed by immersing into water at 60 C-65 C for at least 30 minutes.

RADIATION
Ultra-violet lights as it is used in laboratories and health care facilities may reduce the number of organisms to low level in the air and on surfaces but it is not a sterilizing process. It must be well engineered and installed very carefully to prevent burning of skin and eyes.

FILTRATION
The filtration in the laboratory of fluids that are heat labile such as antibiotics, vitamins and other growth factors may be carried out with very fine pore membrane filters below 0.45 microns in diameter. These fluids should be checked for sterility by subculture before use. Filtration of air as carried out in the health care facilities is not a process of sterilization or even disinfection. The HEPA filtration reduces the number of organisms

on dustladen particles by 99.9+% down to 0.3 micron size, etc., but does not achieve real sterilization. The use of 6-10 or more air changes per hour in a non-infectious facility helps dilute out the numbers of organisms in the air.