

ASEPSIS AND THE TECHNICIAN

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All persons who handle sterile articles or take part in sterile procedures, must be aware of why adequate sterilization is necessary, how to accomplish it and how to maintain it. As a technician in charge of operating various types of machines with multiple sterile attachments in an area where sterility is maintained, we fall into the category of persons who must be familiar with the how's and why's of sterilization.

WHY IS STERILIZATION NECESSARY?

A fantastic number of tiny living creatures, not visible to the naked eye, are found everywhere on this earth. A microscope is necessary to make them visible and thus study their structure and function. These minute beings are referred to as microorganisms. The vast majority of them are not harmful to man but rather have a very useful purpose. Of the seven main groups of microorganisms, we are only concerned with that one referred to as bacteria. This type causes most diseases and infections in man. They are referred to as pathogenic or disease producing. They are so minute that a drop of milk may contain as many as 100 million, and a particle the size of a pinhead may contain 8 million.

They are divided into many subdivisions, each of which causes a distinctive type of disease.

Cocci: ball-shaped group characterized by the formation of pus.

- a. staphylococci-resemble a bunch of grapes; most prevalent of the group and form thick yellowish or white pus.
- b. streptococci-resemble a chain and form a thin watery type pus.
- c. gonococci-arranged in pairs; cause an inflammation which produces a copious pus in the genital tract and eyes.

Bacilli: rod shaped organisms.

- a. Bacillus Coli (Escherichia coli)—normally inhibits intestinal tract.

b. Bacillus Pycocyanus - produces a greenish pus with distinctive musty odor.

c. Bacillus Tuberculosis (Mycobacterium) - causes tuberculosis.

d. Bacillus Tetani (Clostridium tetani) - causes tetanus.

This organism may live during part of its life in a dense envelope at one end of the rod. It is referred to as a spore when in this state and is much more resistant to destruction. This organism has another characteristic in that it cannot live in the presence of oxygen and is thus referred to as an anaerobe.

e. Bacillus Welchii (Clostridium welchii) - gas bacillus causing gas gangrene. It is also spore forming and anaerobic.

Any break in the protective covering of our bodies permits the entrance of any of these bacteria. They may remain at their entry point or they may be carried by the blood stream or lymphatics to distant parts. Finding warmth, moisture and food, they multiply rapidly.

Knowing only this little about bacteria, one can understand the importance of eliminating as many of these organisms as possible, anytime the protective covering of the body is broken. The process of accomplishing this is called sterilization.

HOW IS STERILIZATION ACCOMPLISHED?

A major factor to bear in mind is that no process of sterilization is instantaneous. All methods require time for effectiveness. Each method will be effective only if the person accomplishes it is thorough and understands its limitations.

Methods of sterilization are usually classified as mechanical, radiant energy, physical, and chemical. The most effective method is physical (heat).

- a. Mechanical: not a true method; primarily used for cleansing the skin of the patient and personnel. Personal cleanliness is essential in conjunction with any other method.

b. Radiant Energy: Limited use as far as we are concerned. Points to remember about it is that ultraviolet light is injurious to bacteria and will decrease bacterial content in the air.

c. Physical (sterilization by heat) The effect of heat on bacteria is well known—cold inhibits growth, optimum temperature stimulates growth and high temperatures destroy growth. Both types of heat, moist and dry, destroy the living part of a cell (protoplasm) but moist heat is by far the more effective. Although there are various types of equipment available for both methods, the one with which we come in contact is called a pressure sterilizer or autoclave. If we are called upon to operate this piece of equipment, it is essential that we understand its parts, what to check with every load we run, how to pack it properly, the significance of the gauges, its maximum temperature and the required exposure time. There are manuals available for all autoclaves or any person who works with them in an operating room, or central supply area could explain these things to us. Temperature and exposure time may vary in different hospitals but principles of operation remain the same.

d. Chemical: This method is used where high temperatures would, in addition to destroying bacteria, also destroy the article. One of the latest methods of sterilization falls into this category in the form of gas sterilization. The gas most commonly used is ethylene oxide. The theory involved is that this gas kills bacteria by reacting on the chemicals in the protein of the cell, preventing them from fulfilling their biological function. Most items that are delivered from companies in a presterilized package, have been through this process. This method has particular value to us in sterilization of clear plastic materials. It is expensive and time consuming but very effective. One precaution to be remembered is that items should be aired for 24 hours after removal from the gas sterilizer to al-

low the absorbed gas to be eliminated.

Various chemical solutions are still in use routinely where gas sterilizers are not available. Many solutions are available and of varied concentration. All methods of accomplishing chemical disinfection are time consuming and for the most part destructive to the article being soaked. Very few chemicals are able to kill spores. It is extremely important that you know the amount of time necessary to kill bacteria and spores with any solution used. Time varies with solutions but the company providing the solution will denote exposure requirements.

Remember, all articles used in a sterile setup, must have gone through one of these processes. One unsterile part, will destroy immediately the sterility of all other components.

HOW IS STERILIZATION MAINTAINED?

All persons who work in an operating room have a list of principles of aseptic technic which, when thoroughly understood, guide their every move. These are strictly adhered to and any break in this technic must be corrected immediately. Some of these prin-

ciples are pertinent to us since we set up and operate sterile equipment.

1. Sterile surfaces must contact sterile articles only; unsterile surfaces must touch unsterile articles only.

(If you are connecting a piece of sterile tubing to your machine, you can handle the outside of the tubing and the inside will remain sterile so long as you do not touch the end of the tube thus contaminating the lumen. The adaptor of your machine to which you attach the tubing, must also be sterile or it will contaminate the tube the moment you attach it.)

2. If in doubt about the sterility of anything consider it unsterile. (If you think you might have touched a sterile part that you should not have touched, discard the item and start anew. Sterile wrapped packages that are dropped on the floor are discarded because you do not know what might have been there to penetrate the wrapper. If you have forgotten the termination time of a method of sterilization, retime it from the time you realize it.)
3. Moisture is a source of contamination. (If moisture is in contact with both a sterile and unsterile area, it provides an

ideal media through which bacteria may travel.)

4. Whenever you pass by a sterile item, face it so you can see whether you touch it and thus accidentally contaminate it.
5. Good personal hygiene and sterilization go hand in hand.
6. Bacterial content in the air must be kept to a minimum by careful handling of linen, wearing a mask and keeping as clean an environment as possible.

We must exercise all the principles of asepsis to give each patient the best possible and safest atmosphere in which to be. Remember, if the patient develops complications following a sterile procedure, due to bacterial invasion, it could be your fault. Ask yourself this question every time you are involved in a sterile procedure; **WOULD I HAVE DONE ANYTHING DIFFERENTLY IF THIS PROCEDURE HAD BEEN PERFORMED ON ME?**

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Report On A Disposable Debubbling Canister

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Since 1959, debubbling in the DeWall-Lillehei Oxygenator has been accomplished through the employment of stainless steel sponges coated with a silicone antifoaming agent. These sponges have been encased in a nylon filter for gravity filtration. Finally, the entire assembly was contained in a stainless steel canister.

The cost of each canister assembly prohibited the practice of preparing several units, sterilizing, and stockpiling them for future use. Also, a certain amount of time was involved in dismantling the unit after use and cleaning it. On the other hand, a disposable unit would allow the preparation of several units in advance to cover any emergen-

cies or periods of increased activity with the added advantage of being able to throw it away without cleaning.

Such a unit has been produced by Phelan Manufacturing Company, Inc. It incorporates a central bubble column in a plastic canister with a built-in nylon filter and it is used in conjunction with stainless steel sponges, a length of 1½" ID tubing, and a plastic bubbler.

Earliest experiences with the unit were not always pleasant. Under certain conditions usually associated with high blood flows and high oxygen flows, the blood would foam out of the gas exhaust ports. This was decreased by the use of stainless steel sponges with a heavier wire. Continued observations showed that this "foaming over" would cease when the cover of the

unit was removed and the uppermost sponge was allowed to lie on top.

It was then apparent that, though the disposable canister was almost identical in volume to the stainless unit, the complete diffusion of the gas out of the blood was unable to take place in the space allotted. A canister was placed in a lathe and the height of the bubble column inside the unit was shortened by two inches. During successive experiments, the altered unit would routinely operate without complications for six hours at blood flows up to five liters per minute and oxygen flows of ten liters per minute. The maximum limits of the unit were not reached during these tests.

It is believed that a new evaluation of this product incorporating this modification would be in order.