STERILE PROCESSING BASIC TRAINING: SPD BOOT CAMP®

Module #12 Part B:
A Basic Survey of Healthcare Sterilization

by

The Central Sterile Processing Initiative

Sterile Processing Basic Training: SPD Boot Camp

Published by:

The Central Sterile Processing Initiative
info@centralsterileprocessing.net
http://www.centralsterileprocessing.net/

Note: This e-Book is optimized for viewing on a computer screen, but it is organized such that one can print it out and assemble it as a print textbook. Since the text is optimized for screen viewing, the text is larger than that found in usual print books.

Disclaimer

The sole purpose of this text is to educate. Neither the author nor publisher warrant that the information contained herein is fully complete and shall not be responsible for errors or omissions. The author and publisher shall have neither liability nor responsibility to any person or entity with respect to any loss or damage caused, or alleged to be caused, directly or indirectly by either use or misuse of the information contained within the following pages.

If you choose to not be bound by the above disclaimer, please return this e-Book *immediately* for a full refund.

Message From The Central Sterile Processing Initiative Director

Thank you for purchasing this e-course, an introductory and review survey of the basics of sterile processing, *Sterile Processing Basic Training: SPD Boot Camp.* Thank you, enjoy the program, and I am always just an e-mail away if you have questions or need my assistance during the course of your studies. Sincerely, Our Sterile Processing Team	www.centralsterileprocessing.net

Preface

This e-course is neither the traditional textbook nor the typical student workbook. It is, rather, a combination of the best and most relevant of information related to the basics of sterile processing education and training presented much like a series of lecture notes with multimedia elements included for a more complete and well rounded educational experience for both sterile processing "newbies" and seasoned veterans simply seeking a comprehensive review alike.

The content is structured as a classroom lecture/text with all relevant points discussed and references provided for further information and investigation.

In this text one will be presented with material contained within the industry standard texts, current field relevant articles, and as well have workspace much like contained within the likewise standard workbooks. Herein, however, the student will find no superfluous material to bog one down unnecessarily. Covered within is only that which one needs to know as a sterile processing tech at the level 1 stage—the ESSENTIALS of sterile processing, that which every tech need know—the prerequisites of the field. References will be cited throughout the course, however, to point students in the right direction should they choose (and we are trusting that they will!) to pursue additional knowledge, training, and advancement in the field of sterile processing.

The course consists of multiple individual modules (at least 15 at the time of this printing). Please read through each module from beginning to end at least once before attempting to complete the assignments and then work your way back through the text completing the required coursework specified in the assignment directions at the end of the module (see contents).

Module 12 Part B: *A Basic Survey of Healthcare Sterilization*

Introduction

It is not within the scope of this course module (nor this specific course) to present a complete science or rationale of sterilization, in terms of both low-temperature and high-temperature sterilization. Rather, the intent and scope of this module is concerned with presenting a condensed outline that will focus upon those "bullet points" of knowledge needed for: 1) a basic, working comprehension of hospital sterilization and; 2) to help the student pass a comprehensive certification exam.

For a more detailed survey of sterilization in the healthcare setting, see a forthcoming, independent module (not part of the SPD Boot Camp series) on the subject or acquire the highly recommended *Principles and Methods of Sterilization in Health Sciences* by John J. Perkins.

The focus of this module will be upon EO sterilization, Plasma sterilization, and steam sterilization. With steam sterilization, the focus will be upon prevac systems as opposed gravity cycles/and systems (commonly referred to as FLASH sterilization) and utilized in the OR. The focus here will be upon basic sterilization systems utilized in the SPD in the typical healthcare setting. For more information on FLASH sterilization, see the forthcoming module on OR sterilization. FLASH will only be touched upon briefly in this module.

EO (EtO) Sterilization

Ethylene oxide (EO or EtO) is one of the most effective and (formerly at least) more common of the typical hospital sterilization modalities. EO deactivates microbiological entities via a process known as *alkylation*. EO is effective against all types of pathogenic and non-pathogenic entities from bacteria to viruses, though direct contact with the surface of of item sterilized by the gas is required for effective mortification of microbes.

EO is, mostly, non-corrosive and can be utilized in the sterilization of heat-sensitive materials such as plastics, rubber, glass, and sensitive electronics (where indicated by the manufacturer of course).

The 4 primary parameters of EO sterilization are:

- EO concentration
- Cycle temperature (a temperature between 99-145 degrees F aids with diffusion of the EO gas in the sterilization chamber)
- Humidity
- Time (exposure time of sterilant with items in chamber)

In most EO systems there are a minimum of 5 distinct phases of a given cycle:

1) Evacuation (air is evacuated from the chamber)
2) Injection of EO
3) Sterilization
4) EO evacuation
5) Aeration

Aeration must now (per the EPA, 2010) be performed in the original chamber of sterilization (previously, items could be removed and placed in stand-alone aerators). Aeration times are dependent upon temperature of aeration chamber and are typically between 8-16 hours in length.

Etylene oxide is a known toxin and exposure limits have been set by OSHA to 1 ppm over an 8 hour work day/40 hour work week.

Some Advantages of EO in Healthcare Sterilization:

- Non-corrosive, can be used to process heat-sensitive items
- Thorough sterilant permeation
- Fairly automated process

Some Disadvantages of EO in Healthcare Sterilization:

- Lengthy cycles and aeration times (slow instrument and equipment turn times)
- Highly toxic (carcinogenic) and flammable at specific concentrations, requires regular monitoring

- Costly to operate and maintain equipment
- EO residues may be left behind on sterilized equipment (known to cause burns and allergic-type reactions in handlers and patients)

Gas Plasma Sterilization

In terms of sterilization technology, gas plasma sterilization is the new kid on the block. Gas plasma is an FDA approved alternative to EO sterilization and consists of sterilization via superheated hydrogen peroxide vapors (plasma).

Gas plasma sterilization is a low-temperature sterilization technology indicated for items sensitive to heat and moisture (in this regard, very similar to EO systems). However, there are exceptions with gas plasma systems—in gas plasma systems, organic matter (e.g., paper composed of cellulose), nor moisture can be in the load as this causes cycle aborts.

Disadvantages:

- Incompatible with many, commonly used sterilization prep and pack materials
- Certain synthetic materials degrade with repeated exposure to H2O2 (e.g., nylon)
- There are restrictions on the size of lumens and cannulae that can be processed in gas plasma systems (varies according to manufacturer—both system and equipment)

Advantages:

- Viable for heat and moisture sensitive devices
- Moisture-free sterilization processing
- Non-toxic (no need for post-cycle aeration)
- Quick cycles (45-60 minutes on average vs. up to 13+ hours for EO)
- Stand-alone system (no drains, no venting, no waste products, etc.)
- No monitoring required

High-Temperature Steam Sterilization

Of the the three sterilization methodologies discussed in this module, steam is the "oldest, cheapest, most reliable, and best understood method of sterilization" (CCI, *Competency Assessment Module*, 33).

The most common steam system in the sterile processing department is the DAR (dynamic air removal) system. In DAR systems (also referred to, more commonly, as "prevac"), air is mechanically evacuated from the sterilization chamber by means of a vacuum and then steam injected into the chamber.

The sterilization chamber cannot be either pressurized or heated immediately to the desired and efficacious parameter settings but rather must be pulsed upward over several cycles to obtain the parameters necessary to achieve sterilization.

Once the sterilization temperature and pressure is obtained, the cycle holds for a prescribed period of time to achieve actual sterilization of the contents of the chamber.

The steam is then evacuated and air returned to the chamber (return to operational atmospheric pressure).

Typical phases:

1) Conditioning Phase
2) Exposure (sterilization occurs here, also referred to as "holding phase")
3) Exhaust (steam removed)
4) Drying (due to the reliance upon steam, moisture is obviously an issue; as such, the contents of a steam load must be dried either via manual cool down or assisted drying)

The four (4) primary, operational parameters of steam sterilization are: *1) temperature, 2) time, 3) pressure, and 4) steam saturation.*

A standard prevac cycle for effective sterilization is 3-4 minutes @ 270-272 degrees F. Cycle times and temperatures may vary and will depend upon item sterilized (per OEM instructions). For example, another common temperature is 250 degrees F, however, at such lower temps the exposure time must be longer (e.g., 30 minutes). *Exposure*

time decreases with an increase in exposure temperature.

Some Disadvantages of Steam Sterilization:

- Cannot be utilized with heat and moisture-sensitive devices
- Items processed must be thoroughly cleaned (steam does not penetrate most soil)
- Items must be placed in chamber in a manner that will allow for thorough steam penetration and sterilant contact

Some Advantages of Steam Sterilization:

- Cost effective
- Can accommodate for large loads; quick turn times
- Safe and efficacious
- Easy to monitor; no environmental monitoring required

Required Reading

Sterilization Methodologies

http://www.eurotherm-lifesciences.com/en-GB/applications/eto-sterilization/

http://en.wikipedia.org/wiki/Ethylene_oxide

http://findarticles.com/p/articles/mi_m0BPC/is_5_27/ai_101797132/

http://www.iupac.org/publications/pac/2002/pdf/7403x0349.pdf

http://www.slideworld.org/slideshow.aspx/Gas-plasma-sterilization-ppt-2844571

http://www.cdc.gov/hicpac/Disinfection_Sterilization/13_0Sterilization.html

Sterilization Monitoring and Validation (not discussed in module, quiz and exam material will come from following)

http://multimedia.3m.com/mws/mediawebserver?mwsId=66666UuZjcFSLXTtmXfEMxfVEVuQEcuZgVs6EVs6E666666--&fn=70-2009-7086-4.pdf

http://multimedia.3m.com/mws/mediawebserver?mwsId=SSSSSu7zK1fslxtUn82BMY_Uev7qe17zHvTSevTSeSSSSSS--&fn=70-2010-7243-9.pdf

http://multimedia.3m.com/mws/mediawebserver?mwsId=SSSSSu7zK1fslxtUnx_Zox_vev7qe17zHvTSevTSeSSSSSS--&fn=70-2009-9700-8.pdf

http://multimedia.3m.com/mws/mediawebserver?mwsId=SSSSSu7zK1fslxtUN8mZm8_eev7qe17zHvTSevTSeSSSSSS--&fn=70-2009-8653-0.pdf

http://multimedia.3m.com/mws/mediawebserver?mwsId=66666UuZjcFSLXTtmXTVOXM6EVuQEcuZgVs6EVs6E666666--&fn=70-2009-7519-4.pdf

END MODULE 12
PART B