Sri Lakshmi Narayana Institute of Medical Sciences

Date:16-03-2020

From

Dr.G.SOMASUNDRAM
Principal of Allied Health Sciences,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

To

The Dean,
Sri Lakshmi Narayana Institute of Medical College
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Permission to conduct value-added course: CSSD

Dear Sir,

With reference to the subject mentioned above, the department proposes to conduct a value-added course titled CSSD from April to May 2020 . We solicit your kind permission for the same.

Kind Regards

Dr.G.Somasundram

FOR THE USE OF DEANS OFFICE

Names of Committee members for evaluating the course:

The Dean: **Dr. Balagurunathan. K**

The HOD: **Dr. Somasundram. G**

The Expert: **Dr. Manjunath**

The committee has discussed about the course and is approved.

Dean	Subject Expert	HOD
(Sign & Seal)	(Sign & Seal)	(Sign & Seal)

Dr. G. JAYALAKSHMI, BSC., MBBS., DTCD., M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Agaram, Kudapakkam Post,
Villianur Commune, Puducherry - 605502.

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

OFFICE OF THE DEAN

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGARAM VILLAGE, VILLIANUR COMMUNE, KUDAPAKKAM POST,
PUDUCHERRY - 605 502.
[Recognised by Medical Council of India, Ministry of Health letter No. U/12012/249/2005-ME (P -II) dt. 11/07/2011]
[Affliated to Bharath University, Chennai - TN]

Circular

01.03.2020

Sub: Organizing Value-added Course: "sterilization techniques ".reg

With reference to the above-mentioned subject, it is to bring to your notice that Sri Lakshmi Narayana Institute of Medical Sciences, **Bharath Institute of Higher Education and Research** is organizing **"CSSD"**. The course content and registration form is enclosed below."

The application must reach the institution along with all the necessary documents as mentioned. The hard copy of the application should be sent to the institution by registered/ speed post only so as to reach on or before April to May 2020 Applications received after the mentioned date shall not be entertained under any circumstances.

Dean

Dr. G. JAYALAKSHMI, BSC., MBBS., DTCD., M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Agaram, Kudapakkam Post,
Villianur Commune, Puducherry - 605502.

Encl: Copy of Course content

VALUE ADDED COURSE

1. Name of the programme & Code

"Sterilization techniques"

2. Duration & Period

30 hrs. &

3. Information Brochure and Course Content of Value-Added Courses

Enclosed as Annexure- I

4. List of students enrolled

Enclosed as Annexure- II

5. Assessment procedures:

Assessment - *Enclosed as Annexure- III*

6. Certificate model

Enclosed as Annexure- IV

7. No. of times offered during the same year:

1 time July to August 2017

8. Year of discontinuation:

9. Summary report of each program year-wise

Value Added Course- July to August 2017					
Sl. No	**Course Code**	**Course Name**	**Resource Persons**	**Target Students**	**Strength & Year**
1		Sterilization techniques	**DR.MANJUNATH**	AHS	25 & APRIL TO MAY 2020

10. Course Feed Back

Enclosed as Annexure- V

RESOURCE PERSON

COORDINATOR
Dr.G. Somasundaram

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

Course Proposal

Course Title: "**sterilization techniques"**

Course Objective:

1. To enhance the performance skill in sterilization techniques.
2. To assess the objectives and protocols in sterilization techniques.
3. To assess the reaction of target allied Health students towards the Basic and Advanced cardiac life support by getting their feedback.

Course Outcome: Improvement in the "sterilization techniques"
Course Audience: Students of AHS Batch
Course Coordinator: Dr.G. Somasundaram
Course Faculties with Qualification and Designation:
1.Course Curriculum/Topics with schedule (Min of 30 hours)

SlNo	Date	Topic	Time	Hours
1.	16.04.2020	Introduction to sterilization techniques, Background, Objectives,	4-5p.m	1
2.	17.04.2020	Ionizing sterilizers	2-3p.m	1
3.	18.04.2020	Dry heat sterilizers	4-6p.m	2
4.	21.04.2020	Liquid chemicals used for sterilization	4-6p.m	2
5.	22.04.2020	microwave	4-6p.m	2
6.	23.04.2020	Gas bead sterilizers	4-5p.m	2
7.	24.04.2020	conventional didactic lecture and video	4-5P.M	1
8.	25.04.2020	Vaporized hydrogen peroxide	4-5p.m	1
9.	23.04.2020	Formaldehyde steam	4-6p.m	1
10.	27.04.2020	Gaseous chloride dioxide	4-6p.m	2
11.	28.04.2020	Safe Handling of Sharps, needles and management of needle stick injuries	4-6p.m	1
12.	29.04.2020	Infrared radiation	4-6p.m	2
13.	30.04.2020	Pre course and Post Course evaluation	2-5p.m	3
		Practical Class I		
13.	02.05.2020	Steps model explanation and various performance assessment methods		1
14.	04.05.2020	Orientation of the students about the training program and assessment methodology by DOPS		1
15.	05.05.2020	Video demonstration of sterilization techniques		2

16.	06.05.2020	Sterilization techniques procedure by STEPS model		2
17.	9.05.2020	Assessment by DOPS procedure and giving feedback in weaker areas	2-6p.m	4
		Total		30 hrs

REFERENCE BOOKS:

1. Miller GE(1990), The assessment of clinical skills/competence/performance. Academic medicine, 65(9), 63-67.

2. Syndneysmee ABC of skill learning BMJ 2003; 326.703-706.

3. Biomedical Waste Management & Handling Rules (2016) with Amendment, updated on 2018.

4. BangBangal V. Training and assessment of medical interns using “direct observation of procedural skills (DOPS)” tool in obstetrics and gynecology.*MOJ Womens Health.* 2018;7(4):120–123. DOI: 10.15406/mojwh.2018.07.00181al V. Training and assessment of medical interns using “direct observation of procedural skills (DOPS)” tool in obstetrics and gynecology. *MOJ Womens Health.* 2018;7(4):120–123. DOI: 10.15406/mojwh.2018.07.00181

CSSD

- **Sterilization** refers to any process that removes, kills, or deactivates all forms of life (in particular referring to microorganisms such as fungi, bacteria, spores, unicellular eukaryotic organisms such as Plasmodium, etc.) and other biological agents like prions present in a specific surface, object or fluid, for example food or biological culture media.
- Sterilization can be achieved through various means, including heat, chemicals, irradiation, high pressure, and filtration. Sterilization is distinct from disinfection, sanitization, and pasteurization, in that those methods reduce rather than eliminate all forms of life and biological agents present. After sterilization, an object is referred to as being sterile or aseptic.

Ionizing Radiation

- Sterilization by ionizing radiation, primarily by cobalt 60 gamma rays or electron accelerators, is a low-temperature sterilization method that has been used for a number of medical products (e.g., tissue for transplantation, pharmaceuticals, medical devices).
- There are no FDA-cleared ionizing radiation sterilization processes for use in healthcare facilities.
- Because of high sterilization costs, this method is an unfavorable alternative to ETO and plasma sterilization in healthcare facilities but is suitable for large-scale sterilization.
- Some deleterious effects on patient-care equipment associated with gamma radiation include induced oxidation in polyethylene and delamination and cracking in polyethylene knee bearings.

Dry-Heat Sterilizers

- This method should be used only for materials that might be damaged by moist heat or that are impenetrable to moist heat (e.g., powders, petroleum products, sharp instruments).
- The advantages for dry heat include the following: it is nontoxic and does not harm the environment; a dry heat cabinet is easy to install and has relatively low operating costs; it penetrates materials; and it is noncorrosive for metal and sharp instruments.
- The disadvantages for dry heat are the slow rate of heat penetration and microbial killing makes this a time-consuming method. In addition, the high temperatures are not suitable for most materials
- The most common time-temperature relationships for sterilization with hot air sterilizers are 170°C (340°F) for 60 minutes, 160°C (320°F) for 120 minutes, and 150°C (300°F) for 150 minutes. *B. atrophaeus* spores should be used to monitor the sterilization process for dry heat because they are more resistant to dry heat than are *G. stearothermophilus* spores.
- The primary lethal process is considered to be oxidation of cell constituents.
- There are two types of dry-heat sterilizers: the static-air type and the forced-air type.
- The static-air type is referred to as the oven-type sterilizer as heating coils in the bottom of the unit cause the hot air to rise inside the chamber via gravity convection.
- This type of dry-heat sterilizer is much slower in heating, requires longer time to reach sterilizing temperature, and is less uniform in temperature control throughout the chamber than is the forced-air type.
- The forced-air or mechanical convection sterilizer is equipped with a motor-driven blower that circulates heated air throughout the chamber at a high velocity, permitting a more rapid transfer of energy from the air to the instruments

Liquid Chemicals

- Several FDA-cleared liquid chemical sterilants include indications for sterilization of medical devices
- The indicated contact times range from 3 hours to 12 hours. However, except for a few of the products, the contact time is based only on the conditions to pass the AOAC Sporicidal Test as a sterilant and not on simulated use testing with devices.
- These solutions are commonly used as high-level disinfectants when a shorter processing time is required. Generally, chemical liquid sterilants cannot be monitored using a biological indicator to verify sterility
- The survival kinetics for thermal sterilization methods, such as steam and dry heat, have been studied and characterized extensively, whereas the kinetics for sterilization with liquid sterilants are less well understood.
- The information that is available in the literature suggests that sterilization processes based on liquid chemical sterilants, in general, may not convey the same sterility assurance level as sterilization achieved using thermal or physical method.
- The data indicate that the survival curves for liquid chemical sterilants may not exhibit log-linear kinetics and the shape of the survivor curve may vary depending of the formulation, chemical nature and stability of the liquid chemical sterilant. In addition, the design of the AOAC Sporicidal Test does not provide quantification of the microbial challenge. Therefore, sterilization with a liquid chemical sterilant may not convey the same sterility assurance as other sterilization methods.
- One of the differences between thermal and liquid chemical processes for sterilization of devices is the accessibility of microorganisms to the sterilant.
- Heat can penetrate barriers, such as biofilm, tissue, and blood, to attain organism kill, whereas liquids cannot adequately penetrate these barriers.
- In addition, the viscosity of some liquid chemical sterilants impedes their access to organisms in the narrow lumens and mated surfaces of devices.
- Another limitation to sterilization of devices with liquid chemical germicides is the post-processing environment of the device. Devices cannot be wrapped or adequately contained during processing in a liquid chemical sterilant to maintain sterility following processing and

during storage. Furthermore, devices may require rinsing following exposure to the liquid chemical sterilant with water that typically is not sterile.

- Therefore, due to the inherent limitations of using liquid chemical sterilants, their use should be restricted to reprocessing critical devices that are heat-sensitive and incompatible with other sterilization methods.

Performic Acid

Performic acid is a fast-acting sporicide that was incorporated into an automated endoscope reprocessing system[400]. Systems using performic acid are not currently FDA cleared

Filtration

Although filtration is not a lethality-based process and is not an FDA-cleared sterilization method, this technology is used to remove bacteria from thermolabile pharmaceutical fluids that cannot be purified by any other means. In order to remove bacteria, the membrane pore size (e.g., 0.22 mm) must be smaller than the bacteria and uniform throughout[923]. Some investigators have appropriately questioned whether the removal of microorganisms by filtration really is a sterilization method because of slight bacterial passage through filters, viral passage through filters, and transference of the sterile filtrate into the final container under aseptic conditions entail a risk of contamination

Microwave

- Microwaves are used in medicine for disinfection of soft contact lenses, dental instruments, dentures, milk, and urinary catheters for intermittent self-catheterization.
- However, microwaves must only be used with products that are compatible (e.g., do not melt).
- Microwaves are radio-frequency waves, which are usually used at a frequency of 2450 MHz.

- The microwaves produce friction of water molecules in an alternating electrical field.
- The intermolecular friction derived from the vibrations generates heat and some authors believe that the effect of microwaves depends on the heat produced while others postulate a nonthermal lethal effect.
- The initial reports showed microwaves to be an effective microbicide.
- The microwaves produced by a “home-type” microwave oven (2.45 GHz) completely inactivate bacterial cultures, mycobacteria, viruses, and *G. stearothermophilus* spores within 60 seconds to 5 minutes depending on the challenge organism.
- Another study confirmed these results but also found that higher power microwaves in the presence of water may be needed for sterilization [2].
- Complete destruction of *Mycobacterium bovis* was obtained with 4 minutes of microwave exposure (600W, 2450 MHz).
- The effectiveness of microwave ovens for different sterilization and disinfection purposes should be tested and demonstrated as test conditions affect the results (e.g., presence of water, microwave power). Sterilization of metal instruments can be accomplished but requires certain precautions.
- Of concern is that home-type microwave ovens may not have even distribution of microwave energy over the entire dry device (there may be hot and cold spots on solid medical devices); hence there may be areas that are not sterilized or disinfected.
- The use of microwave ovens to disinfect intermittent-use catheters also has been suggested. Researchers found that test bacteria (e.g., *E. coli*, *Klebsiella pneumoniae*, *Candida albicans*) were eliminated from red rubber catheters within 5 minutes
- Microwaves used for sterilization of medical devices have not been FDA cleared.

Glass Bead “Sterilizer”

- Glass bead “sterilization” uses small glass beads (1.2-1.5 mm diameter) and high temperature (217 °C -232°C) for brief exposure times (e.g., 45 seconds) to inactivate microorganisms. These devices have been used for several years in the dental profession[0].
- FDA believes there is a risk of infection with this device because of potential failure to sterilize dental instruments and their use should be discontinued until the device has received FDA clearance.

Vaporized Hydrogen Peroxide

- Hydrogen peroxide solutions have been used as chemical sterilants for many years.
- However, the VHPâ was not developed for the sterilization of medical equipment until the mid-1980s.
- One method for delivering VHP to the reaction site uses a deep vacuum to pull liquid hydrogen peroxide (30-35% concentration) from a disposable cartridge through a heated vaporizer and then, following vaporization, into the sterilization chamber.
- A second approach to VHP delivery is the flow-through approach in which the VHP is carried into the sterilization chamber by a carrier gas such as air using either a slight negative pressure (vacuum) or slight positive pressure.
- Applications of this technology include vacuum systems for industrial sterilization of medical devices and atmospheric systems for decontaminating for large and small areas[853]. VHP offers several appealing features that include rapid cycle time (e.g., 30-45 minutes); low temperature; environmentally safe by-products (H_2O, oxygen [O_2]); good material compatibility; and ease of operation, installation and monitoring.
- VHP has limitations including that cellulose cannot be processed; nylon becomes brittle; and VHP penetration capabilities are less than those of ETO. VHP has not been cleared by FDA for sterilization of medical devices in healthcare facilities.
- The feasibility of utilizing vapor-phase hydrogen peroxide as a surface decontaminant and sterilizer was evaluated in a centrifuge decontamination application. In this study, vapor-phase hydrogen peroxide was shown to possess significant sporicidal activity.

- In preliminary studies, hydrogen peroxide vapor decontamination has been found to be a highly effective method of eradicating MRSA, *Serratia marcescens, Clostridium botulinum spores*and *Clostridium difficile* from rooms, furniture, surfaces and/or equipment; however, further investigation of this method to demonstrate both safety and effectiveness in reducing infection rates are required

Ozone

- Ozone has been used for years as a drinking water disinfectant. Ozone is produced when O_2 is energized and split into two monatomic (O_1) molecules.
- The monatomic oxygen molecules then collide with O_2 molecules to form ozone, which is O_3.
- Thus, ozone consists of O_2 with a loosely bonded third oxygen atom that is readily available to attach to, and oxidize, other molecules. This additional oxygen atom makes ozone a powerful oxidant that destroys microorganisms but is highly unstable (i.e., half-life of 22 minutes at room temperature).
- A new sterilization process, which uses ozone as the sterilant, was cleared by FDA in August 2003 for processing reusable medical devices.
- The sterilizer creates its own sterilant internally from USP grade oxygen, steam-quality water and electricity; the sterilant is converted back to oxygen and water vapor at the end of the cycle by a passing through a catalyst before being exhausted into the room.
- The duration of the sterilization cycle is about 4 h and 15 m, and it occurs at 30-35°C. Microbial efficacy has been demonstrated by achieving a SAL of $10^{-6}$with a variety of microorganisms to include the most resistant microorganism, *Geobacillus stearothermophilus*.
- The ozone process is compatible with a wide range of commonly used materials including stainless steel, titanium, anodized aluminum, ceramic, glass, silica, PVC, Teflon, silicone, polypropylene, polyethylene and acrylic. In addition, rigid lumen devices of the following diameter and length can be processed: internal diameter (ID): > 2 mm, length ≤ 25 cm; ID > 3 mm, length ≤ 47 cm; and ID > 4 mm, length ≤ 60 cm.

- The process should be safe for use by the operator because there is no handling of the sterilant, no toxic emissions, no residue to aerate, and low operating temperature means there is no danger of an accidental burn. The cycle is monitored using a self-contained biological indicator and a chemical indicator. The sterilization chamber is small, about 4 ft^3 (Written communication, S Dufresne, July 2004).
- A gaseous ozone generator was investigated for decontamination of rooms used to house patients colonized with MRSA. The results demonstrated that the device tested would be inadequate for the decontamination of a hospital room

Formaldehyde Steam

- Low-temperature steam with formaldehyde is used as a low-temperature sterilization method in many countries, particularly in Scandinavia, Germany, and the United Kingdom.
- The process involves the use of formalin, which is vaporized into a formaldehyde gas that is admitted into the sterilization chamber.
- A formaldehyde concentration of 8-16 mg/l is generated at an operating temperature of 70-75°C. The sterilization cycle consists of a series of stages that include an initial vacuum to remove air from the chamber and load, followed by steam admission to the chamber with the vacuum pump running to purge the chamber of air and to heat the load, followed by a series of pulses of formaldehyde gas, followed by steam.
- Formaldehyde is removed from the sterilizer and load by repeated alternate evacuations and flushing with steam and air.
- This system has some advantages, e.g., the cycle time for formaldehyde gas is faster than that for ETO and the cost per cycle is relatively low.
- However, ETO is more penetrating and operates at lower temperatures than do steam/formaldehyde sterilizers. Low-temperature steam formaldehyde sterilization has been found effective against vegetative bacteria, mycobacteria, *B. atrophaeus* and *G. stearothermophilus* spores and *Candida albicans*

- Formaldehyde vapor cabinets also may be used in healthcare facilities to sterilize heat-sensitive medical equipment.
- Commonly, there is no circulation of formaldehyde and no temperature and humidity controls.
- The release of gas from paraformaldehyde tablets (placed on the lower tray) is slow and produces a low partial pressure of gas. The microbicidal quality of this procedure is unknown
- Reliable sterilization using formaldehyde is achieved when performed with a high concentration of gas, at a temperature between 60^{o} and 80°C and with a relative humidity of 75 to 100%.
- Studies indicate that formaldehyde is a mutagen and a potential human carcinogen, and OSHA regulates formaldehyde.
- The permissible exposure limit for formaldehyde in work areas is 0.75 ppm measured as a 8-hour TWA. The OSHA standard includes a 2 ppm STEL (i.e., maximum exposure allowed during a 15-minute period). As with the ETO standard, the formaldehyde standard requires that the employer conduct initial monitoring to identify employees who are exposed to formaldehyde at or above the action level or STEL.
- If this exposure level is maintained, employers may discontinue exposure monitoring until there is a change that could affect exposure levels or an employee reports formaldehyde-related signs and symptoms.
- The formaldehyde steam sterilization system has not been FDA cleared for use in healthcare facilities.

Gaseous Chlorine Dioxide

- A gaseous chlorine dioxide system for sterilization of healthcare products was developed in the late 1980s.
- Chlorine dioxide is not mutagenic or carcinogenic in humans. As the chlorine dioxide concentration increases, the time required to achieve sterilization becomes progressively shorter.
- For example, only 30 minutes were required at 40 mg/l to sterilize the 10^{6} *B. atrophaeus* spores at 30^{o} to 32°C[954]. Currently, no gaseous chlorine dioxide system is FDA cleared.

Vaporized Peracetic Acid

The sporicidal activity of peracetic acid vapor at 20, 40, 60, and 80% relative humidity and 25°C was determined on *Bacillus atrophaeus* spores on paper and glass surfaces. Appreciable activity occurred within 10 minutes of exposure to 1 mg of peracetic acid per liter at 40% or higher relative humidity[955]. No vaporized peracetic acid system is FDA cleared

Infrared Radiation

- An infrared radiation prototype sterilizer was investigated and found to destroy *B. atrophaeus* spores. Some of the possible advantages of infrared technology include short cycle time, low energy consumption, no cycle residuals, and no toxicologic or environmental effects.
- This may provide an alternative technology for sterilization of selected heat-resistant instruments but there are no FDA-cleared systems for use in healthcare facilities
- The other sterilization technologies mentioned above may be used for sterilization of critical medical items if cleared by the FDA and ideally, the microbicidal effectiveness of the technology has been published in the scientific literature.
- The selection and use of disinfectants, chemical sterilants and sterilization processes in the healthcare field is dynamic, and products may become available that are not in existence when this guideline was written.
- As newer disinfectants and sterilization processes become available, persons or committees responsible for selecting disinfectants and sterilization processes should be guided by products cleared by FDA and EPA as well as information in the scientific literature

Moist heat sterilization

- A widely used method for heat sterilization is the autoclave, sometimes called a converter or steam sterilizer.

- Autoclaves use steam heated to 121–134 °C (250–273 °F) under pressure. To achieve sterility, the article is placed in a chamber and heated by injected steam until the article reaches a temperature and time setpoint.
- Almost all the air is removed from the chamber, because air is undesired in the moist heat sterilization process (this is one trait that differs from a typical pressure cooker used for food cooking).
- The article is held at the temperature setpoint for a period of time which varies depending on what bioburden is present on the article being sterilized and its resistance (D-value) to steam sterilization.
- A general cycle would be anywhere between 3 and 15 minutes, (depending on the generated heat) at 121 °C (250 °F) at 100 kPa (15 psi), which is sufficient to provide a sterility assurance level of 10^{-4} for a product with a bioburden of 10^{6} and a D-value of 2.0 minutes
- Following sterilization, liquids in a pressurized autoclave must be cooled slowly to avoid boiling over when the pressure is released. This may be achieved by gradually depressurizing the sterilization chamber and allowing liquids to evaporate under a negative pressure, while cooling the contents.
- Proper autoclave treatment will inactivate all resistant bacterial spores in addition to fungi, bacteria, and viruses, but is not expected to eliminate all prions, which vary in their resistance.
- For prion elimination, various recommendations state 121–132 °C (250–270 °F) for 60 minutes or 134 °C (273 °F) for at least 18 minutes.
- The 263K scrapie prion is inactivated relatively quickly by such sterilization procedures; however, other strains of scrapie, and strains of Creutzfeldt-Jakob disease (CKD) and bovine spongiform encephalopathy (BSE) are more resistant.
- Using mice as test animals, one experiment showed that heating BSE positive brain tissue at 134–138 °C (273–280 °F) for 18 minutes resulted in only a 2.5 log decrease in prion infectivity

Dry heat

- Dry heat was the first method of sterilization and is a longer process than moist heat sterilization.
- The destruction of microorganisms through the use of dry heat is a gradual phenomenon.
- With longer exposure to lethal temperatures, the number of killed microorganisms increases.
- Forced ventilation of hot air can be used to increase the rate at which heat is transferred to an organism and reduce the temperature and amount of time needed to achieve sterility.
- At higher temperatures, shorter exposure times are required to kill organisms.
- This can reduce heat-induced damage to food products.
- The standard setting for a hot air oven is at least two hours at 160 °C (320 °F).
- A rapid method heats air to 190 °C (374 °F) for 6 minutes for unwrapped objects and 12 minutes for wrapped objects.
- Dry heat has the advantage that it can be used on powders and other heat-stable items that are adversely affected by steam (e.g. it does not cause rusting of steel objects)

Flaming

- Flaming is done to inoculation loops and straight-wires in microbiology labs for streaking.
- Leaving the loop in the flame of a Bunsen burner or alcohol burner until it glows red ensures that any infectious agent is inactivated. This is commonly used for small metal or glass objects, but not for large objects (see Incineration below).
- However, during the initial heating, infectious material may be sprayed from the wire surface before it is killed, contaminating nearby surfaces and objects.

- Therefore, special heaters have been developed that surround the inoculating loop with a heated cage, ensuring that such sprayed material does not further contaminate the area.
- Another problem is that gas flames may leave carbon or other residues on the object if the object is not heated enough.
- A variation on flaming is to dip the object in a 70% or more concentrated solution of ethanol, then briefly touch the object to a Bunsen burner flame. The ethanol will ignite and burn off rapidly, leaving less residue than a gas flame

Incineration

- Incineration is a waste treatment process that involves the combustion of organic substances contained in waste materials.
- This method also burns any organism to ash. It is used to sterilize medical and other biohazardous waste before it is discarded with non-hazardous waste. Bacteria incinerators are mini furnaces that incinerate and kill off any microorganisms that may be on an inoculating loop or wire

SRI LAKSHMI NARAYANA INSTITUTE OF ALLIED HEALTH SCIENCE
MEDICAL EDUCATIONAL PROJECT

CSSD- VAC06/AHS/2020-16/04

S.No.	Name of the Students	University Register Number	Signature
1	AKSHAY SURESH	UAH1803178	
2	ANAGHA SUKUMARAN	UAH1803179	
3	APARNA REMESHAN	UAH1803180	
4	ASHIK.R	UAH1803182	
5	FEBA SUSAN ABRAHAM	UAH1803183	
6	GOKUL A	UAH1803184	
7	JIJI ELZA JOSE	UAH1803185	
8	MINNU MATHACHAN	UAH1803186	
9	MUHAMMED IRFAN.I	UAH1803187	
10	MURALIKRISHNAN.K	UAH1803188	
11	DONALD MORISON.S	UAH1805199	
12	GADDALA PRAVEEN	UAH1805200	
13	PRAVEEN.G	UAH1805201	
14	RAMANAN.V	UAH1805202	
15	SARATH P S	UAH1805203	
16	S.K.DHARSHINI	UAH1804193	
17	GAYATHRI.V	UAH1804194	
18	JAYABHAVANI.J	UAH1804195	
19	MALATHI.S	UAH1804196	
20	NARAYANADASS.M	UAH1804197	
21	SANDRA.S	UAH1803190	
22	SATHISHKUMAR.R	UAH1803191	
23	SHEHANAYI.M	UAH1803192	
24	VENKATESH.S	UAH1805204	
25	YAZHINI.P	UAH1805205	

SRI LAKSHMI NARAYANA INSTITUTE OF ALLIED HEALTH SCIENCE
MEDICAL EDUCATIONAL PROJECT

CSSD- VAC06/AHS/2020-16/04

S.No.	Name of the Students	University Register Number	Signature
1	AKSHAY SURESH	UAH1803178	
2	ANAGHA SUKUMARAN	UAH1803179	
3	APARNA REMESHAN	UAH1803180	
4	ASHIK.R	UAH1803182	
5	FEBA SUSAN ABRAHAM	UAH1803183	
6	GOKUL A	UAH1803184	
7	JIJI ELZA JOSE	UAH1803185	
8	MINNU MATHACHAN	UAH1803186	
9	MUHAMMED IRFAN.I	UAH1803187	
10	MURALIKRISHNAN.K	UAH1803188	
11	DONALD MORISON.S	UAH1805199	
12	GADDALA PRAVEEN	UAH1805200	
13	PRAVEEN.G	UAH1805201	
14	RAMANAN.V	UAH1805202	
15	SARATH P S	UAH1805203	
16	S.K.DHARSHINI	UAH1804193	
17	GAYATHRI.V	UAH1804194	
18	JAYABHAVANI.J	UAH1804195	
19	MALATHI.S	UAH1804196	
20	NARAYANADASS.M	UAH1804197	
21	SANDRA.S	UAH1803190	
22	SATHISHKUMAR.R	UAH1803191	
23	SHEHANAYI.M	UAH1803192	
24	VENKATESH.S	UAH1805204	
25	YAZHINI.P	UAH1805205	

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure III

Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry

MCQ

1. **……** refers to any process that removes, kills, or deactivates all forms of life
    a) Disinfection
    b) Sterilization
    c) Infection
    d) None of the above
2. Sterilization can be achieved through
    a) Heat
    b) Chemical
    c) Both a&b
    d) Only a
3. After sterilization, an object is referred to as
    a) Aseptic
    b) Infected
    c) Non sterile
    d) None of the above
4. Sterilization by ionizing radiation, primarily by
    a) Cobalt 60 Gama rays
    b) Cobalt 20 Gama rays
    c) Cobalt 30 Gama rays

d) Cobalt 40 Gama rays

5. Ionizing radiation is used to sterilization of
    a) Pharmaceuticals
    b) OT table
    c) Instruments
    d) Heart lung machine
6. Dry heat sterilizers are used to sterilization of
    a) Sharp instruments
    b) Pharmaceuticals
    c) OT table
    d) None of the above
7. One of the advantages of dry heat
    a) Toxic & harm the environment
    b) Non toxic & does not harm the environment
    c) Non toxic
    d) None of the above
8. The disadvantages for dry heat is
    a) Slow rate of heat penetration
    b) Fast rate of heat penetration
    c) Rapid rate of heat penetration
    d) Only heat penetration

9. Temperature for hot air sterilizers
    a) 170*c for 60 minutes
    b) 180*c for 60 minutes
    c) 120*c for 60 minutes
    d) 130*c for 60 minutes
10. Time period for liquid chemical sterilization
    a) 3 to 12 hours
    b) 4 to 12 hours
    c) 6 to 12 hours
    d) 2 to 12 hors
11. Microwaves are radio-frequency waves, which are usually used at a frequency of
    a) 2450MHz

b) 2670 MHz
c) 2756 MHz
d) 2130 MHz

12. Glass beds use temperature of
a) 217*c – 232*c
b) 321* - 345 *c
c) 117*c – 135*c
d) 312 *c – 325*c

13. Hydrogen peroxide solutions have been used as
a) Chemical
b) Radiation
c) Heat
d) Moist heat

14. Ozone has been used for years as a ……. disinfectant
a) Drinking water
b) Cold water
c) Mineral water
d) None of the above

15. …….. is used as low temperature sterilizer
a) Aldehyde
b) Formaldehyde steam
c) Ozone
d) None of the above

16. A gaseous chlorine dioxide system for sterilization of healthcare products was developed in the late
a) 1980
b) 1990
c) 2000
d) 2001

17. An infrared radiation ……. Sterilizer
a) Prototype
b) Genotype
c) Monotype

d) None of the above

18. Example for moist heat sterilization
    a) Hot air oven
    b) Autoclave
    c) Both a & b
    d) None of the above
19. Autoclave uses the temperature of
    a) 121 – 134*c
    b) 131 – 144*c
    c) 123 - 143 *c
    d) 121- 135*c
20.……. Is a waste treatment process
    a) Incineration
    b) Insemination
    c) Inclination
    d) inseration

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure III

Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry

MCQ

1. ..... refers to any process that removes, kills, or deactivates all forms of life
   a) Disinfection
   b) Sterilization
   c) Infection
   d) None of the above
2. Sterilization can be achieved through
   a) Heat
   b) Chemical
   c) Both a&b
   d) Only a
3. After sterilization, an object is referred to as
   a) Aseptic
   b) Infected
   c) Non sterile
   d) None of the above
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   b) Cobalt 20 Gama rays
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15. ……. is used as low temperature sterilizer
a) Aldehyde
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SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure III

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Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that_**MINNU MATHACHAN_UAH1803186**_has actively participated in the Value Added Course on **CSSD** held during month April to May 2020 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

Dr. G.Somasundram

COORDINATOR

RESOURCE PERSON

5Annexure- V

Student Feedback Form

Course Name: CSSD

Subject Code: VAC06/AHS/2020-16/04

Name of Student: _____Roll No.:

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	○	○	○	○	○
2. I will be able to apply the knowledge learned.	○	○	○	○	○
3. The course objectives for each topic were identified and followed.	○	○	○	○	○
4. The content was organised and easy to follow.	○	○	○	○	○
5. The quality of instruction was good.	○	○	○	○	○
6. Class participation and interaction were encouraged.	○	○	○	○	○
7. Adequate time was provided for questions and discussion.	○	○	○	○	○

8. How do you rate the course overall?
   - ○ Excellent
   - ○ Good
   - ○ Average
   - ○ Poor
   - ○ Very poor

9. The aspects of the course could be improved?

10. Other comments?

Signature of the student:
Date:

5Annexure- V

Student Feedback Form

Course Name: CSSD

Subject Code: VAC06/AHS/2020-16/04

Name of Student: Gokul Roll No.: UAH1803184

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	o	o	o	o	o
2. I will be able to apply the knowledge learned.	o	o	o	o	o
3. The course objectives for each topic were identified and followed.	o	o	o	o	o
4. The content was organised and easy to follow.	o	o	o	o	o
5. The quality of instruction was good.	o	o	o	o	o
6. Class participation and interaction were encouraged.	o	o	o	o	o
7. Adequate time was provided for questions and discussion.	o	o	o	o	o

8. How do you rate the course overall?
   - o Excellent
   - o Good
   - o Average
   - o Poor
   - o Very poor

9. The aspects of the course could be improved? yes

10. Other comments?

Signature of the student: Gokul

Date: 9/5/2020

5Annexure- V

Student Feedback Form

Course Name: CSSD

Subject Code: VAC06/AHS/2020-16/04

Name of Student: DONALD MORRISON Roll No.: UAH1805199

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	o	o	o	o	o
2. I will be able to apply the knowledge learned.	o	o	o	o	o
3. The course objectives for each topic were identified and followed.	o	o	o	o	o
4. The content was organised and easy to follow.	o	o	o	o	o
5. The quality of instruction was good.	o	o	o	o	o
6. Class participation and interaction were encouraged.	o	o	o	o	o
7. Adequate time was provided for questions and discussion.	o	o	o	o	o

8. How do you rate the course overall?
   - o Excellent
   - o Good
   - o Average
   - o Poor
   - o Very poor

9. The aspects of the course could be improved? yes

10. Other comments?

Signature of the student: Donaldmorrison
Date: 9-5-2020

Date: 11.05.2020

From

Dr.G.Somasundram
Department of Pharmacology,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Through Proper Channel

To

The Dean,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Completion of value-added course: CSSD

Dear Sir,

With reference to the subject mentioned above, the department has conducted the value-added course titled: "**CSSD "** APRIL TO MAY 2020 for 25 AHS Students . We solicit your kind action to send certificates for the participants that is attached with this letter. Also, I am attaching the photographs captured during the conduct of the course.

Kind Regards,

Dr.G.Somasundram

Encl: Certificates :

Photographs: