Appendix 11

Infection Prevention in FP/MCH Clinics

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A Reference for Trainers

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Guidelines for Clinical Procedures in Family Planning: A Reference for Trainers, Appendix 11: Infection Prevention in FP/MCH Clinics

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APPENDIX 11
Infection Prevention in FP/MCH Clinics*

INTRODUCTION

In recent years, service providers in family planning (FP) and maternal child health (MCH) clinics have become increasingly concerned about preventing the acquired immune deficiency syndrome (AIDS). It is important to remember that many other disease-causing microorganisms besides the human immunodeficiency virus (HIV) can be spread by contaminated needles, syringes and other clinic equipment.

Prevention of accidental infection in the FP/MCH clinic includes use of aseptic technique, avoidance of cross-infection, and proper processing of clinic equipment. This document will serve as a reference for trainers, clinic managers and service providers who want to minimize the risk of spreading disease in FP/MCH clinics.

This document addresses the following topics:

1. **What procedures kill microorganisms**
2. **When to use what procedure**
3. **General infection prevention procedures**
4. **Decontamination**
5. **High-level disinfection (HLD)**
6. **Sterilization**
7. **Antiseptics**
8. **Matching procedure to type of equipment**
9. **Handwashing and gloving**
10. **Minimum supplies for infection prevention**

1. WHAT PROCEDURES KILL MICROORGANISMS

Microorganisms are microscopic plants or animals. Disease-causing microorganisms include bacterial endospores, bacteria, parasites, fungi, and viruses.

Bacterial endospores can only be destroyed by **sterilization** techniques (see section 6). Bacteria, parasites, fungi and viruses, including human immunodeficiency virus (HIV, the virus which causes AIDS) can be killed by carefully following **either the sterilization or the high-level disinfection** procedures discussed in sections 5 and 6. **Decontamination** (see section 4) can destroy HIV and other easily-killed microorganisms. **Handwashing**, which removes many types of easily-killed microorganisms, may be the single most important infection prevention procedure in a clinic (see section 9).

* INTRAH is deeply indebted to the expert contribution to this document of Eugene C. Cole, DrPH, who at the time of the 1989 edition of this publication was Research Associate, Division of Infectious Diseases, Department of Medicine, University of North Carolina at Chapel Hill and is now Senior Research Microbiologist at the Research Triangle Institute, Research Triangle Park, NC.

2. WHEN TO USE WHAT PROCEDURE

The terms "decontamination," "disinfection" and "sterilization" are often confused. Not all objects require the same procedure. The table below shows the procedure needed for different objects, depending on the extent of contact the object will have with tissue and skin.

How to Decide What Procedure to Use: Decontamination, High-Level Disinfection, or Sterilization

Human tissues the instrument or object will touch	Examples of instruments/objects	APPROPRIATE PROCEDURE
intact (unbroken) skin	pelvic exam table top or other surfaces contaminated by body fluids	**decontamination**, to destroy easily-killed viruses (such as HIV and HBV), and other microorganisms.
mucous membranes or broken skin	uterine sounds, specula, IUDs, gloves for pelvic exam	**high-level disinfection,** to destroy all live micro-organisms **except** bacterial endospores*. HLD is used after decontamination and cleaning.
all tissue beneath skin	invasive instruments such as needles, and syringes, scalpels, trochars for NORPLANT®	**sterilization,** to destroy all live micro-organisms **including** bacterial endospores*. Sterilization is used after decontamination and cleaning.

* Bacterial spores (endospores) are forms of bacteria which are very difficult to kill due to their casing or coating; types of bacteria which can make endospores include the bacteria *Clostridia*, which causes tetanus and gangrene. Bacterial endospores can only be reliably killed by **sterilization**.

3. GENERAL INFECTION PREVENTION PROCEDURES

Blood, semen, vaginal secretions, and body fluids containing blood can carry disease-causing microorganisms such as human immunodeficiency virus (HIV) or hepatitis B virus (HBV). In order to prevent accidental infection during clinic procedures, service providers should assume that all blood and other body fluids are infectious when handling contaminated clinic equipment.

HIV is a fragile (lipophilic) virus. HIV is very sensitive to chlorine solutions (e.g., bleach) and is rapidly killed on exposure, making chlorine solutions ideal for decontamination, especially for large surface areas. (Concentrations and preparation of chlorine solutions are discussed in section 5). HIV is also rapidly killed by high heat.

Linens, dishware
HIV is **not** transmitted by routine contact with household objects. Routine washing in warm, soapy water of dishes, glasses, and utensils is sufficient. Routine laundry of most linens is also sufficient. Linens which have large amounts of blood or body fluid should be presoaked in a 0.5% chlorine solution.

Liquid and solid wastes
Potentially infectious liquid wastes should be poured into a pit latrine (or, where available, into an appropriate sewer system). Potentially infectious solid wastes (dressings, laboratory specimens, etc.) should preferably be burned, or disposed of in a pit latrine or "hygienically controlled sanitary landfill" (WHO, 1990).

Disposable needles and syringes
When disposable syringes and needles are discarded after use, care must be taken to avoid their re-use or accidental contamination of workers during refuse removal. Do not recap needles. Place the needle-syringe unit in a puncture-proof container for sharp objects. When full, this container must be buried (or burned, then buried).

Medical instruments
To prevent accidental infection, all reusable medical instruments which may have come into contact with blood, semen, vaginal secretions, or body fluids containing blood should be taken through the three step cleaning process described below.

THREE STEP CLEANING PROCESS

Step 1: DECONTAMINATE INSTRUMENTS

"Decontamination" is a procedure that makes safe any contact between infectious objects and intact (unbroken) skin. Immediate decontamination of such objects will help protect the persons who then clean and disinfect or sterilize them. Although this presoak step can "decontaminate" the instruments, FP/MCH equipment may still be contaminated with microorganisms which could enter broken skin. Thus, **workers must wear gloves when cleaning instruments.**

Once used, contaminated clinic instruments should be placed in a container and soaked with water before cleaning. This will loosen and prevent drying of organic material (WHO, 1990).

If medical instruments are contaminated with **large** amounts of blood or other body fluids, a pre-soaking in a 0.5% (5000 ppm=5 grams/liter) chlorine solution is recommended. This will kill HIV and other

microorganisms, making the instrument less dangerous to touch during cleaning. For cleaning medical instruments, **gloves should be worn.**

Decontaminate by soaking any reusable needles, syringes, blades or other instruments for at least 10 minutes in one of the following solutions:

- 0.5% chlorine bleach solution (see section 4, Decontamination), or
- an antiseptic solution such as Savlon® or Hibitane® (see section 7, Antiseptics), or
- any disinfectant solution.

Step 2: CLEAN INSTRUMENTS

"Cleaning" is the removal of foreign matter (e.g., soil, rust, feces, food) from objects, using water and detergents. Proper cleaning of objects **before** sterilization or high-level disinfection is **very important**. When objects are not first adequately cleaned, procedures to sterilize or disinfect will fail because:

- When a layer of foreign matter is covering an instrument, the disinfectant will not be able to reach the instrument underneath, allowing microorganisms to remain.
- If organic materials are not adequately removed before soaking in some disinfectants, the disinfectant will be partially inactivated and become less effective.

NOTE: Gloves must be worn while cleaning instruments. Heavy utility gloves are best as they provide the maximum protection and can be cleaned and used repeatedly. In addition to wearing gloves, extreme care must be taken to prevent needle sticks and/or cuts. Replace gloves when tears appear.

Step 3: STERILIZE OR HIGH-LEVEL DISINFECT INSTRUMENTS

After decontamination and cleaning, the instruments are ready for sterilization or high-level disinfection (see sections 5 and 6).

- Use sterilization for objects (such as needles and NORPLANT® trochars) which will touch tissue beneath the skin.
- High-level disinfection is sufficient (although sterilization is preferred) for other objects (such as specula, tenacula, uterine sounds) which will touch intact mucous membranes or broken skin.

APPLYING THE 3 STEP CLEANING PROCESS TO DIFFERENT TYPES OF EQUIPMENT

Metal Instruments (specula, tenacula, sounds and others)

Step 1. **Decontaminate**: After use, soak the instruments in a decontamination solution, in order to a) help remove any blood or other body fluids and b) inactivate HIV and hepatitis B virus (HBV). To make the decontamination solution, add bleach to make a 0.5% solution of the first rinse water, and soak the instruments for ten minutes. This will kill HIV and HBV, and protect personnel during the process of cleaning (WHO, 1988, and Wenzel, 1987).

Step 2. **Clean**: Next, scrub instruments with a brush in soapy water (hot if possible). Be sure to clean the teeth, joints and screws. Rinse again in cold, clean water until no soap remains (soap can interfere with disinfection).

Step 3. **Sterilize** (see section 6) or **high-level disinfect** (see section 5), as needed.

Rubber Equipment (gloves, inserters, plungers and others)

Step 1. **Decontaminate**: Rinse by soaking for ten minutes in decontamination solution (bleach added to make an 0.5% solution) in order to kill HIV before handling.

Step 2. **Clean**: Wash in lukewarm, soapy water. Rinse in clean, cold water until no soap remains (soap can interfere with disinfection). Air dry.

Step 3. **Sterilize** (see section 6) or **high-level disinfect** (see section 5), as needed.

Needles and Syringes

Step 1. **Decontaminate**: Leave needle attached to syringe. Draw high-level disinfectant solution up through needle to fill the syringe (see section 5). Cover syringe and attached needle with disinfectant solution (by laying them horizontally in flat tray), and leave immersed in disinfectant solution for 30 minutes. Expel disinfectant solution from syringe and needle.

Step 2. **Clean**: Rinse syringe and needle in clean water by filling with and expelling water at least twice (fill and expel through needle). Detach needle from syringe and make sure hub area is clean. Air dry. Examine needle and syringe for bent needle tips or other damage, syringe seal condition (rubber ring), needle hub fit to syringe, readable syringe markings, etc. Dispose of damaged needles and syringes in a special container for sharp objects (when full, the container must be burned or buried).

Step 3. After the cleaning described above, it is critical to **sterilize** the syringe and needle prior to reuse (see section 6). When sterilization is not possible, syringes and needles should be boiled (20 minutes, with all items completely submerged, at a rolling boil in a covered pot).

NOTE: Choosing Disposable versus Re-usable Needles and Syringes

- When available and affordable, disposable, single-use syringes and needles are generally preferred for all client care and laboratory procedures.
- Do **not** choose disposable syringes and needles if it is likely they will be re-used without proper sterilization.
- If, for economic and practical reasons, it is likely syringes and needles **will** be re-used, choose one piece needle-syringe units or needle-locking syringes. These units make cleaning the needle easier, because the syringe can be used to draw up and expel the disinfecting solution through the needle as described above.
- Where needles (disposable or re-usable) are to be re-used, it is important that both be:
  - cleaned before sterilization and then
  - sterilized **before every new use**.
- Where needles are to be disposed of, protect health care providers and persons who handle refuse by disposing of needles (and other sharp disposable objects) in a puncture-resistant container (a metal or heavy plastic container with a lid, or a thick cardboard box). To prevent injury while filling the container, stop once it is three-fourths full. Once three-fourths full, dispose of the sharps container, preferably by burying it; incineration is also possible. Thought must be given to protecting persons who may handle refuse.

Adapted from: 1) *Guidelines for Prevention and Control of Infection with LAV/HTLV III*. Monograph WHO/CDS/AIDS/86-1; 2) World Health Organization: Injectable Contraceptives - Sterilization Alert, cited in UNFPA - PIACT: *Product Information Memo* 1988;10(3):5-6; 3) World Health Organization, Global Programme on AIDS: *AIDS Prevention: Guidelines for MCH/FP Programme Managers: II. AIDS and Maternal and Child Health*. Monograph WHO/MCH/GPA/90.2; and 4) Tietjen L, Cronin W, McIntosh N: *Infection Prevention for Family Planning Service Providers*, 2nd ed., Baltimore, Johns Hopkins Program for Education in Reproductive Health (JHPIEGO), 1992.

4. DECONTAMINATION

"Decontamination" is a procedure that makes safe any contact between infectious objects and intact (unbroken) skin. Such objects include pelvic exam tables, laboratory bench tops, sinks, faucets and other surfaces onto which contaminated body fluids have fallen or come into contact. **The best agent for decontamination of large surface areas is a chlorine solution.** Other disinfectants and antiseptics, including those listed on page A11-11, can also be used as decontaminants.

Chlorine-Releasing Solutions for Decontamination

For large surface areas, the best decontaminants are chlorine solutions, in a dilute and inexpensive solution of 5000 parts per million (ppm) = 0.5% = 5 grams per liter. (See section 5 for dilution instructions.)

NOTE: WHO recommends that sodium hypochlorite and calcium hypochlorite solutions used for **disinfection** be replaced **daily**. However, this is not necessary for solutions used **only** for **decontamination** of large areas. One-month old chlorine solutions can kill many bacteria, so when chlorine bleach is used for decontamination of large surfaces, e.g., floors, it is acceptable to use up one solution before making a new solution (Rutala, 1988).

Carbolic Acid, Lysol® and Other Phenolics for Decontamination

A 5% solution of carbolic acid, or Lysol® or other commercial phenolics are also suitable for decontamination of large surface areas. Unlike chlorine-containing solutions, these phenolics are **not high-level disinfectants**. Phenolics should be relied on for decontamination only.

Some Antiseptics Can Be Used for Decontamination

Antiseptics are intended for decreasing bacterial contamination of the skin. The following antiseptics are acceptable for use as decontaminants, but they cost more than chlorine-releasing solutions, and are not preferred:

- alcohol (60-90% ethyl or isopropyl) solutions,
- chlorhexidine gluconate 4% (e.g., Hibiclens®, Hibiscrub®, Hibitane®),
- centrimede with chlorhexidene gluconate (Savlon®), and
- iodine and iodofor (e.g., Betadine®) solutions, at 1:2500 (dark orange) concentration.

What Solutions Should Be Avoided for Use as Decontaminants?

The following solutions should **not** be used as decontaminants (Block, 1983):

- benzalkonium chloride (Zephiran®), because *Pseudomonas* bacteria can grow in it, it is slow to kill viruses, and is easily inactivated by organic material;
- mercury laurel or other mercury compounds, because mercury is toxic, especially for fetal exposure through maternal skin contact;
- hexachlorophene 3% (Phisohex®), which does not quickly kill viruses; and

- Eusol® (chlorinated lime and boric acid), which contains only 2500 ppm chlorine.

5. HIGH-LEVEL DISINFECTION (HLD)

"High-Level Disinfection" (HLD) is the process that kills all disease-causing microorganisms **except** bacterial endospores. Because normal mucous membranes are resistant to infection by common bacterial endospores, high-level disinfection is sufficient for objects that will touch mucous membranes or broken skin.

Instruments and objects which will touch mucous membranes or broken skin include gloves for pelvic exams, vaginal specula, cervical tenacula, uterine sounds, forceps, cervical dilators, and IUDs. These objects must be either **sterilized** (see section 6) or **high-level disinfected** by one of the methods listed below.

THREE METHODS OF HIGH-LEVEL DISINFECTION (HLD)

HLD Method 1: BOIL OBJECTS

After water reaches a rolling boil, continue boiling objects **for 20 minutes** with the lid in place. 20 minutes boiling time is sufficient to kill all organisms in the water except endospores.

Instructions:

1. Pre-clean all instruments to be high-level disinfected. (**NOTE**: Do **not** use this method for needles or syringes).
2. Completely submerge pre-cleaned objects in the water (putting syringes into a net bag with a pre-cleaned weight will guarantee that syringes remain submerged; make sure there are no air pockets inside syringes or other instruments).
3. Close lid over pan and bring water to a rapid boil.
4. Start timer or note time on clock and record time boiling began on high-level disinfection log.
5. Boil for 20 minutes. Do not add any more instruments to the pot during this time.
6. Remove objects with previously sterilized or disinfected large forceps/pick-ups.
7. Place objects to dry in a disinfected rack. Once dry, store in a sterile/disinfected container.

Advantages:

- Inactivates most bacteria, fungi, parasites and viruses, including HIV (virus causing AIDS).
- Heat source, clean water, and pan with cover are commonly available.

Disadvantage:

- Boiling alone is **not** reliable for killing bacterial endospores (e.g., clostridial endospores which cause gangrene or tetanus). The highest temperature that boiling water will reach is 100ºC (212ºF) at sea level. At higher altitudes, water will boil at a lower temperature. However, for all practical purposes, a full 20 minutes exposure of pre-cleaned objects to a rapid boil will kill almost all microorganisms except endospores (Tietjen, 1992).

HLD Method 2: SOAK OBJECTS IN 2% GLUTARALDEHYDE SOLUTION OR 8% FORMALDEHYDE SOLUTION

Instructions:

1. Pre-clean all instruments needing high-level disinfection.

2. Cover clean items completely with an undiluted solution for 20-30 minutes.
3. Remove with disinfected large forceps/pickups.
4. Carefully rinse with boiled (not chlorinated) water.
5. Air dry.
6. Store in a disinfected, dry, covered container.

Advantage:

- Formaldehyde and glutaraldehyde (for example, Cidex®, or Metricide®, or Omnicide®) are not easily inactivated by organic materials. However, objects should still be cleaned before being immersed in any disinfectant solution and the soap thoroughly rinsed off.

Disadvantages:

These solutions:

- Must be replaced every 2 weeks or sooner if solution becomes turbid (cloudy).
- Are expensive.
- Will cause skin irritation if not completely rinsed off.
- Do not reliably kill mycobacterial spores when used for only 20-30 minutes.
- Vapor released from formaldehyde is toxic. Formaldehyde should be used **only** in well-ventilated areas.

NOTE: Hydrogen peroxide 6% is another chemical disinfectant, but WHO does not recommend it for use in tropical areas, because it is not stable in heat or light, is expensive, and corrodes metal (WHO, 1988).

HLD Method 3: SOAK OBJECTS IN CHLORINE-RELEASING SOLUTION

All chlorine-releasing solutions are excellent high-level disinfectants. Four chlorine-releasing solutions (bleach, calcium hypochlorite, sodium dichloroisocyanurate, chloramine) are discussed here.

Instructions (for **all** chlorine-releasing solutions):

1. Pre-clean all instruments needing high-level disinfection.
2. Correctly dilute solution with (preferably boiled) water. Dilution instructions are listed above for each type of chlorine compound.
3. Completely cover clean items in solution for 20-30 minutes.
4. Remove with disinfected large forceps/pickups.
5. Carefully rinse with filtered, sterile water.
6. Air dry.
7. Store in a disinfected, dry, covered container.

Instructions for Dilution of Chlorine-releasing Compounds:

The disinfectant power of all chlorine-releasing compounds is expressed as 'available chlorine' (% for solid compounds; % or parts per million (ppm) for solutions) according to the concentration level. The amount of available chlorine required in solutions for high-level disinfections depends on the amount of organic matter present, since chlorine is inactivated by organic matter such as blood and pus.

WHO recommends a 0.5% (5000 ppm, 5 gm/litre) dilution for all soiled equipment or spills of body fluid. A dilution of .1% (1000 ppm, 1 gm/litre), however, is sufficient for clean medical equipment. When the chlorine is to be diluted with contaminated (non-boiled, impure or unfiltered) water, the higher (0.5%) concentration should be used, since much of the chlorine will be inactivated by microscopic organic matter in the water.

Recommended Dilutions of Chlorine-releasing Compounds

Source: *Guidelines on Sterilization and Disinfection Methods Effective against Human Immunodeficiency Virus (HIV)*, 2nd ed. Geneva, WHO AIDS Series 2, 1988.

	Dirty condition (e.g., blood spills, soiled equipment), or dilution made with contaminated water	**Clean condition** (e.g., cleaned medical equipment)
Available chlorine required	**0.5% (5gm/litre, 5000 ppm)**	0.1% (1gm/litre, 1000 ppm)
Sodium hypochlorite solution	**see table below**	20 ml/litre, if starting with 5% available chlorine
Calcium hypochlorite (70% available chlorine)	**7.0 gm/litre**	1.4 gm/litre
NaDCC (60% available chlorine)	**8.5 gm/litre**	1.7 gm/litre
NaDCC-based tablets (1.5 g of available chlorine per tablet)	**4 tablets/litre**	1 tablet/litre
Chloramine (25% available chlorine)	**20 gm/litre***	20 gm/litre*

*Chloramine releases chlorine at a slower rate than do hypochlorites. Therefore, a higher available chlorine concentration is required of chloramine solutions for the same effectiveness. On the other hand, chloramine solutions are not inactivated by biological materials (e.g., protein and blood) to the same extent as hypochlorites. Therefore, a concentration of 20 gm/litre (0.5% available chlorine) is recommended for both clean and dirty conditions.

Recommended Dilutions of Sodium Hypochlorite (Bleach)

Dilution is necessary when using a pre-made bleach solution because bleach sold by commercial brands is more concentrated than 0.5%. The following chart shows how to mix a **0.5%** solution from pre-made solutions.

Brand of Bleach (Country)	**Percent Available Chlorine**	**Dilution necessary to achieve 5000 ppm = 0.5% = 5gm/litre concentration (for blood spills, soiled equipment)**
Household bleach (USA, Canada)	5%	1 part bleach to 9 parts water
Eau de Javel (France) (15° chlorum**)	5%	1 part bleach to 9 parts water
Eau de Javel (France) (48° chlorum**)	15%	1 part bleach to 29 parts water
Chloros (UK)	10%	1 part to 19 parts water
Chloros (UK)	15%	1 part to 29 parts water
Vim (Lever Brothers)	8%	1 part to 15 parts water

**In some countries the concentration of sodium hypochlorite is expressed in chlorometric degrees (° chlorum); 1° chlorum is approximately equivalent to 0.3% available chlorine.

Four Chlorine-releasing Solutions

Chlorine Solution 1: Sodium Hypochlorite (Bleach)

Advantages:

- Chlorine bleach is usually a relatively inexpensive disinfectant (despite needing daily replacement).
- It quickly inactivates HIV (virus causing AIDS).
- It is also useful for decontamination of large surface areas (disinfection takes 10-30 minutes, but decontamination can take as little as 10 seconds when the concentration of virus is low).

Disadvantages:

- Chlorine slowly corrodes metal instruments and metal containers. Exposure time of metal to chlorine should not exceed 30 minutes. Metal must be rinsed and allowed to thoroughly air dry after soaking in chlorine, to avoid corrosion.
- In concentrations less than .1%=1 gram per liter=1000 parts per million (ppm), chlorine bleach does not "disinfect"; it will only "decontaminate".
- WHO recommends that bleach solutions be replaced daily, since sodium hypochlorite loses potency rapidly over time or after exposure to sunlight.

Chlorine Solution 2: Calcium Hypochlorite or Chlorinated Lime (WHO, 1988)

Calcium hypochlorite contains approximately 70% available chlorine. Chlorinated lime contains approximately 35% available chlorine. The availability of pre-diluted chlorinated lime solutions can be confusing. **Eusol** is chlorinated lime and boric acid and contains .25% (2500 ppm) available chlorine. While this concentration is sufficient for disinfection of clean equipment, it is half the WHO recommended level for disinfection of very contaminated equipment.

Advantage:

- Calcium hypochlorite will also decompose gradually if not protected from heat and light, but it decomposes more slowly than bleach (sodium hypochlorite).

Disadvantage:

- Like all chlorine compounds, calcium hypochlorite can corrode metal.

Chlorine Solution 3: Sodium Dichloroisocyanurate (WHO, 1988)

Sodium dichloroisocyanurate (NaDCC) forms hyphochlorous acid when dissolved in water. **It is available as a powder or tablet.** NaDCC powder is 60% available chlorine; NaDCC tablets contain 1.5gm available chlorine per tablet.

Advantages:

- NaDCC is much more stable than sodium or calcium hypochlorite.
- Tablets are easy to transport and use.
- NaDCC is not as easily inactivated by organic matter as the hypochlorite solutions are.

Disadvantage:

- Like all chlorine compounds, it corrodes metal.

Chlorine Solution 4: Chloramine

Chloramine (tosylchloramide sodium; chloramine T) is available as a powder or tablets, containing 25% available chlorine.

Advantages:

- Chloramine is more stable than sodium or calcium hypochlorite.

- Chloramine tablets are easy to transport and use.
- Chloramine is not as easily inactivated by organic matter as the hypochlorite solutions are.

Disadvantage:

- Like all chlorine compounds, it corrodes metal.

UNRELIABLE METHODS FOR HIGH-LEVEL DISINFECTION

What Solutions Should Be Avoided for Use as High-Level Disinfectants?

The following solutions should **not** be used for high-level disinfection, due to their **inability** to kill bacterial endospores and some bacteria. However, these solutions can be used as decontaminants.

- benzylchonium chloride (Zephiran®)
- centrimede with chlorhexidene gluconate (Savlon®)
- chlorhexidine gluconate (Hibitane®, Hibiscrub®)
- proflavine and acriflavine (acridine derivatives)
- 5% carbolic acid (Lysol®)
- centrimide with ethyl alcohol (Cétavlon®)
- chlorinated lime and boric acid (Eusol®)
- other skin antiseptics
- 1-2% phenol (Phenol®)

Although carbolization (rinsing item with alcohol and then igniting with match) is often used, data suggests that carbolization is **not** an effective means of high-level disinfection, and is **not** recommended.

Alcohols (70% ethyl or isopropyl 2-propyl alcohol) do not qualify for high-level disinfection, because they do not kill some viruses.

Iodophors do not qualify for high-level disinfection, because certain *Pseudomonas* bacteria can grow in contaminated iodophor solutions. Iodofors are solutions of iodine mixed with stabilizing agents such as provodone or polyvidone, to increase the strength and durability of the iodine. A common provodone-iodine solution is Wescodyne® which contains 1.6% available iodine.

What If No Acceptable Methods of HLD (Boiling, 2% Glutaraldehyde, 8% Formaldehyde, Chlorine-Releasing Solutions) or Sterilization (Dry Heat, Steam Heat and Fresh 6% Hydrogen Peroxide) Are Available?

Use of alcohol (60-90%) and iodophor solution (at 1:400 dilution of elemental iodine, e.g., 1:2500 "dark orange" concentration) is **not** the best choice, but could be used if boiling, glutaraldehyde, formaldehyde, chlorine-releasing solutions, dry heat, steam heat, and hydrogen peroxide are all unavailable (personal communication: Dr. Martin Favero, Chief, Nosocomial Infections, CDC, March 1991). Iodofors and alcohols provide only medium-level disinfection (Rutala, 1990) of equipment in family planning clinics.

Instructions:

1. Pre-clean all instruments needing disinfection.
2. Prepare boiled water for dilution with the iodofor (e.g., polyvidone iodine).
3. For iodofors, add iodofor solution to the water and stir until a **deep orange** color appears, which will be adequate to achieve a strength of 1:400 elemental iodine (2500 ppm elemental iodine). There is no need to measure. If the solution is yellow, instead of deep orange, it is too weak. If dilution during the day occurs, add more iodofor solution to maintain a deep orange color.

For alcohol, cover items completely with a 70% solution of ethanol (ethyl alcohol) or 2-propanol (isopropyl alcohol) alcohol for 20-30 minutes. A 70% solution is the most effective concentration.

4. Completely cover clean items in solution for 20-30 minutes.
5. Remove with disinfected large forceps/pickups. Store in disinfected, dry, covered container.

NOTE: Because iodine and iodofor solutions are inactivated by organic material, and because the solutions may be made with contaminated water, WHO (1988) has recommended a 1:400 solution = 2500 ppm = .25% elemental iodine.

Advantages of Iodophors:

- Iodine or iodofor does not cause deterioration and softening of devices and inserters if they are kept dry between soakings.
- Diluted solutions of iodine and iodofor are non-toxic and non-irritating (unless the person is allergic to iodine).
- It can be used to disinfect plastic and stainless steel gynecologic equipment.

Advantages of Alcohols:

- Ethyl and isopropyl alcohol are excellent disinfectants: both kill all fungi and bacteria including mycobacteria; isopropyl alcohol and ethanol kill most viruses.
- Both are not corrosive to metal.
- Alcohols are not as expensive as glutaraldehyde in bulk (but must be replaced more often).
- Alcohols are useful for occasional soaking of rubber or latex items (e.g., diaphragms).
- Ethanol can be used in its "denatured form" (combined with 10% methyl alcohol), which may be less expensive.

NOTE: Pure methyl alcohol should **not** be used as a high-level disinfectant.

Disadvantages of Iodophors:

- IUDs may lose elasticity, becoming too rigid for proper loading, if left in solution overnight.
- Iodine **is** an oxidizing agent (causing rust), and should only be used for stainless steel equipment or plastic materials.
- Like alcohol and chlorine, iodine and iodofors are inactivated by organic materials, thus only pre-cleaned instruments should be put into iodine or iodofor solutions.
- Because iodine and iodofor solutions are inactivated by organic materials, they should be replaced weekly (daily under very heavy clinic use).
- Iodine can permanently stain plastic and clothes.
- Do not qualify as high-level disinfectants.

Disadvantages of Alcohols:

- Are inactivated by organic materials; thus solutions must be replaced at least weekly (daily under heavy use).
- Will damage rubber or latex over time.
- Are expensive if imported.
- Do not kill bacterial endospores.
- Do not qualify as high-level disinfectants.

6. STERILIZATION

"Sterilization" is the complete elimination of **all** live microorganisms (viruses, fungi, parasites and bacteria), including bacterial endospores. Those objects which will enter a patient's bloodstream or penetrate a patient's tissues, such as needles, syringes, NORPLANT® insertion trochars, and scalpels, must be sterile. The preferred methods of sterilization are autoclaving and dry heat. Boiling and "cold sterilization" (by overnight soaking in a high-level disinfectant) are described below, since dry heat or autoclaving are not always possible.

Sterile equipment will not remain sterile unless **properly stored**. Sterile equipment should be either left carefully packaged in the dry sterile wrapping, or stored dry in a sterile container with a tight-fitting lid. Dry storage is best if the container will remain uncontaminated. Where alcohol is available, unwrapped sterilized equipment can be stored submerged in 70% alcohol, in a sterilized container. Change the alcohol weekly when the container is resterilized. Where alcohol is not available, dry storage in a sterile or high-level-disinfected covered container is best. **Avoid using antiseptics for storage**, since *Pseudomonas* and other common bacteria have been shown to grow in Hibitane®, Savlon®, Zephiran® and other antiseptics. (Block, 1983, p 402, 409). (For a list of common antiseptics, see section 7.)

THREE METHODS OF STERILIZATION

Sterilization Method 1: DRY HEAT

(Adapted from: WHO, 1990; Perkins, 1969; and Tietjen, 1992.) Dry heat and steam are the preferred methods of sterilization.

Instructions:

1. Decontaminate, clean and dry all instruments to be sterilized.
2. If desired, wrap instruments in cotton cloth or metal foil (wrapping will help prevent recontamination of sterilized instruments prior to use) (Tietjen, 1992).
3. Put instruments into oven (do not put plastic or rubber items in oven). Do not overload the dry heat oven. Preheat oven to 170° C (340°F). Lower temperatures require longer sterilization times (see below).
4. **Once the desired temperature is reached,** begin timing (Perkins, 1969):
   - 170° C (340°F): 60 minutes
   - 160° C (320°F): 120 minutes
   - 140° C (285°F): 180 minutes
5. The total cycle time will be about one hour longer, depending on the amount of time the oven requires to reach the desired temperature (preheating), and the time required for the oven to cool down after the required sterilization time is achieved.
6. Remove loose items after cooling with sterile forceps/pickups, and store in dry, covered containers.
7. Weekly (and as needed) monitor the effectiveness of the dry heat sterilizer with a biologic indicator strip, containing *Bacillus subtilis* (Tietjen, 1992, p 67).

Advantages:

- An ordinary electric household oven is satisfactory for dry heat sterilization.
- Kills all microorganisms, including HIV.
- Especially good in humid climates.

- Wrapped items are not in danger of contamination from moist wrapping.
- Leaves no chemical residue.

Disadvantages:

- Requires oven and electricity or other fuel source.
- Cannot be used for plastic syringes or rubber items (steam sterilization preferred for these).

Sterilization Method 2: STEAM

Steam sterilization is performed by using an autoclave or a pressure cooker.

Instructions:

1. Decontaminate all instruments to be sterilized.
2. Pre-clean all instruments to be sterilized.
3. All instruments (scissors, hemostats, etc.) should be open during steam sterilization. To help prevent dulling of sharp points and cutting edges, wrap the sharp edges and needle points in gauze before sterilizing.
4. If using an autoclave, it is best to wrap clean instruments or other clean objects in cotton cloth, a double thickness muslin, or double thickness paper wrapper or newsprint. (Unwrapped instruments are only sterile if used immediately after removal from autoclave, unless kept in a covered, sterile container). Do not overload the steam sterilizer.
5. If using a pressure cooker* or kerosene powered autoclave, bring water to boil until steam escapes from pressure valve only; turn down heat just enough to keep steam coming out of pressure valve. Do not allow to boil dry; steam should always be escaping from pressure valve.
6. Sterilize for 30 minutes for wrapped objects, 20 minutes for unwrapped objects; time with the clock. The temperature should be 121°C (250°F); the pressure should be 15 pounds per square inch (15 $lbs/in^{2)}$ or 106 kPa (1 atmosphere above atmospheric pressure). (Always check the manufacturers' instructions).
7. After the 30 minutes have elapsed, slightly open lid to allow steam to escape. Allow instrument packs to **dry completely** before removal (damp wraps around instruments can draw in bacteria, viruses and fungi from the environment); drying may take another 30 minutes.
8. Ideally, a steam sterilizer log should be kept, noting "time heat begun," "time boiling achieved" (and heat turned down), "time heat turned off," and "time instruments removed." A log can help ensure that the required amount of time will be observed, even when multiple, new or hurried workers are responsible for overseeing the sterilization.
9. Remove dry, sterilized objects with previously sterilized large forceps/pickups. Objects wrapped in sterile cloth or paper are considered sterile for one week. Unwrapped objects must be placed immediately in a dry, sterile, covered container.
10. Weekly (and as needed) monitor the effectiveness of the steam sterilizer with a biologic indicator strip, containing *Bacillus stearothermophilus* (Tietjen, 1992, p 67).

    *__NOTE:__ If using a pressure cooker**:**

    Steam should escape from the pressure valve, **not** from either the safety valve or from under the edge of the lid.

    - If steam escapes from the safety valve instead of the pressure valve, the pressure valve must be cleaned and inspected.

- If steam escapes from under the lid, the gasket (rubber circle) must be cleaned and dried or replaced.
- If steam escapes from safety valve or under the lid, the autoclave or pressure cooker is not working correctly, and is merely a boiling pot.

Advantages:

- Inactivates **all** microorganisms (bacteria, fungi, parasites and viruses), including HIV (the virus that causes AIDS).
- Inactivates **all** bacterial endospores, including those causing tetanus and gangrene.
- Where there is no electricity, kerosene-powered steam autoclaves can be used.

Disadvantages:

- Requires source of heat (fire, kerosene or electricity).
- Requires an autoclave or pressure cooker, which must be maintained in working condition.

Sterilization Method 3: COLD STERILIZATION WITH 2% GLUTARALDEHYDE OR 8% FORMALDEHYDE

When steam sterilization and dry heat sterilization are not possible, or when objects (such as laparoscopes) would be damaged by steam or dry heat, objects which will touch sterile tissues can be sterilized by soaking for a long time in available "high-level disinfectants." High-level disinfectants are chemicals which can, in 20 to 30 minutes, kill all live virus, bacteria, and fungi, except bacterial endospores (forms of bacteria which are very difficult to kill due to their coating). **Some** high-level disinfectants **will** kill endospores after prolonged (overnight) exposure. High-level disinfectants which can be used for sterilization include glutaraldehyde, formaldehyde and hydrogen peroxide. Those which cannot are listed below. WHO does **not** recommend hydrogen peroxide for use in tropical areas, because heat and light inactivate it. WHO also does **not** recommend high-level chemical disinfectants for the sterilization of needles or syringes.

Instructions for Cold Sterilization with 2% Glutaraldehyde (Glutaral or Dialdehyde) Solution or 8% Formaldehyde (as 20% Formal or Formalin) Solution:

1. Decontaminate all instruments to be sterilized.
2. Pre-clean all instruments to be sterilized.
3. For glutaraldehyde:
   - Aqueous solutions of glutaraldehyde must first be buffered (alkalinized) to a pH of 7.5 to 8.5, to act as a "high-level disinfectant." Activate a new glutaraldehyde (glutaral) solution by adding the powder or liquid supplied with the solution; this renders the solution alkaline (WHO, 1988).
   - In this alkaline state, glutaraldehyde is stable for only 2 weeks after opening. Then the solution must be replaced. Discard the solution sooner if it becomes turbid (cloudy).
   - 2% glutaraldehyde should **not** be diluted.
4. For formaldehyde:

- A commercially available solution of formaldehyde (which will contain 35-40% formaldehyde) must be diluted with boiled water 1:5 (final solution contains about 8% formaldehyde). Do **not** dilute with chlorinated water.
- Gaseous paraformaldehyde is also available in the form of tablets which can vaporize, for use in sterilization of endoscopes and other instruments. A concentration of 1 to 2 grams of paraformaldehyde (tablets) per cubic yard of closed airspace is required. The air must be humid. The exposure time will depend on the room temperature (Taylor, 1969).

5. For glutaraldehyde or formaldehyde solutions, cover clean instruments and other clean objects completely with the solutions. For gaseous formaldehyde, follow the instructions of the manufacturer.
6. Allow to soak **at least 10 hours** in glutaraldehyde, and **at least 24 hours** in formaldehyde.
7. Remove objects from solution with sterile large forceps/pickups, rinse in sterile water, air dry, and wrap in sterile paper or cloth without touching either the sterilized instruments or the inside of the sterile wrap.

Advantages:

- Solutions are not readily inactivated by organic materials.
- Both glutaraldehyde and formaldehyde can kill bacteria, fungi, parasites and viruses, including HIV, within 30 minutes.
- Overnight soaking in glutaraldehyde, and 24-hour soaking in formaldehyde, also kills bacterial endospores.
- Glutaraldehyde is commonly found under such brand names as Cidex®, Metricide ®, or Omnicide®.
- Are useful for items which would be damaged by heat sterilization (e.g., laparoscopes).

Disadvantages:

- Glutaraldehyde and formaldehyde are chemicals which cause skin irritation, thus all equipment soaked in either must be **thoroughly** rinsed with sterile water after soaking.
- Glutaraldehyde and formaldehyde are expensive.
- Vapors released by formaldehyde are toxic and cause irritation of the eyes, respiratory tract and skin. This limits its use as a disinfectant. If used, good ventilation and avoidance of skin contact are essential.
- When formaldehyde is mixed with chlorine, a dangerous gas (bis-chloro-methyl-ether) is produced.

UNRELIABLE METHODS FOR STERILIZATION

What Solutions Should Be Avoided for Use with Cold Sterilization?

The following solutions should **not** be used for cold sterilization, due to their **inability** to kill bacterial endospores and some bacteria.:

- benzylchonium chloride (Zephiran®)
- centrimede with chlorhexidene gluconate (Savlon®)
- chlorhexidine gluconate (Hibitane®, Hibiscrub®)
- proflavine and acriflavine (acridine derivatives)
- mercury laurel, or other mercury compounds
- Sporicidin® (although other 2% glutaraldehyde solutions are effective)
- centrimide with ethyl alcohol (Cétavlon®)
- chlorinated lime and boric acid (Eusol®)
- other skin antiseptics
- 1-2% phenol (Phenol®)
- 5% carbolic acid (Lysol®)

Although carbolization (rinsing item with alcohol and then igniting with match) is often used, data suggests that carbolization is **not** an effective means of sterilization, and is **not** recommended.

Can Boiling be Used as a Sterilization Method?

It takes 10-12 **hours** of vigorous boiling to kill resistant bacterial spores. Boiling provides high-level disinfection (HLD). While boiling for 10 minutes alone will eliminate virtually all microorganisms **except** bacterial endospores, WHO does **not** recommend boiling when sterilization (elimination of bacterial endospores) is needed. Since boiling **is** adequate for high-level disinfection, WHO recommends boiling for 20 minutes when steam or dry heat sterilization is not possible (WHO, 1990).

When a supply of sterile water is needed for sterilization, problems arise! Boiling is not sufficient for true sterilization (see above). If cold sterilization solutions must be rinsed off, prepare a new supply of HLD water in a sterile, covered container every day either by boiling for 20 minutes or by adding chlorine to make a 0.5% solution (see section 5 for dilution instructions). It is best to filter the water **before** boiling or chlorinating, if the water is contaminated with microorganisms. Once the water has been made HLD, be careful not to dip unsterile objects into it.

NOTE: Chlorinated water should **not** be used to dilute formaldehyde or compounds containing ammonia (including centrimonium/centrimide compounds). Chlorinated water is not ideal as a final rinse for sterilized metal items, as chlorine does corrode metal; boiled water is preferable.

Can Ultraviolet (UV) Light be Used for Sterilization?

No. UV light does not penetrate dust, mucous or water well, and will only disinfect surfaces it touches (the inside of a needle, for example, will not even be disinfected) (Tietjen, 1992, p 71).

7. ANTISEPTICS: WHEN TO, AND WHEN NOT TO, USE THEM

What is an Antiseptic?

Antiseptics are solutions which are able to kill many of the microorganisms which reside on the skin, but which soap alone cannot kill. Antiseptics are intended to be safe for use on skin or mucous membranes.

Misuse of Antiseptics

An "antiseptic" is a disinfectant for the skin only. Before performing an invasive procedure, washing one's hands and cleansing the client's skin or mucous membranes with an antiseptic are very important steps in infection prevention. Disinfection of the skin does not require killing mycobacteria or bacterial endospores. Skin antiseptics are acceptable as decontaminants but **not** as disinfectants or sterilants. Antiseptics should **not** be used as the sole agent for objects which will touch mucous membranes or broken skin, or which will enter sterile tissue or the vascular space.

Choice of Antiseptics

Many chemicals qualify as safe skin antiseptics. These include alcohols, hexachlorophenes, chlorhexidines and centrimedes. The following are commonly used skin antiseptics available in many countries:

- *Cétavlon® (centrimonium/cetrimede with ethyl alcohol, various concentrations),
- *Dettol® (chloroxylenol 4%),
- Hibiscrub® (chlorhexidine gluconate 4%),
- Hibitane® (chlorhexidine gluconate 1%),
- Phisohex® (hexachlorophene 3%),
- Zephiran® (benzylchonium chloride 17%),
- Betadine® (provodone iodine 10%),
- acridine derivatives, such as acriflavin and proflavine, and
- hydrogen peroxide 3% solution.

Mercury compounds such as mercury laurel are also in use; mercurial compounds are toxic (see below) and **not** recommended.

*__NOTE: Instrument-strength__ Dettol and Cétavlon come in 70% alcohol; since 70% ethyl alcohol is a high-level disinfectant, these instrument-strength compounds are stronger than antiseptics.

Dangers of Mercury-containing Compounds

Although frequently sold for antisepsis, mercury-containing chemicals, such as mercury laurel, should be avoided due to their toxicity (Block, p. 369):

- Skin exposure to low levels of mercury causes blister formation and contact dermatitis.
- Inhalation or ingestion of low levels of mercury can cause central nervous system effects (numbness, speech impairment, deafness), and higher levels (200 mg) are fatal.
- Skin contact alone can result in absorption of measurable amounts of mercury.

- Pregnant women exposed to small doses may not show toxic effects themselves, but their fetuses may be harmed. Mercury is a potent teratogen (causes birth defects, including cleft palate, cerebral palsy, and other central nervous system abnormalities).

8. MATCHING PROCEDURE TO TYPE OF EQUIPMENT

Instruments/ Objects	Step 1: Decontaminate (when necessary)*	Step 2: Clean	Step 3: Sterilize or High-Level Disinfect
Needles, Syringes, and NORPLANT® Trochars	**Soak** in 0.5% chlorine solution (or other decontaminant solution) for 10 minutes before cleaning.	Wearing gloves, **clean** items with soap and water until visibly clean. Rinse and air dry.	• **Autoclave** at 15 lbs (106 kPa) for 20 minutes if unwrapped; 30 minutes if wrapped. • **Dry Heat** at 170° C (340° F) for 2 hours. • If autoclaving or dry heat not possible, then **boil** for at least 20 minutes.
Rubber Gloves	**Soak** in 0.5% chlorine solution (or other decontaminant solution) for 10 minutes before cleaning.	Wearing gloves, **clean** items with soap and water until visibly clean. Rinse and air dry.	**If** used for surgery: • **Autoclave** at 15 lbs. (106 kPa) for 20 minutes. • If autoclaving not possible, then **boil** for 20 minutes. **If** touching only mucous membranes or broken skin: • **Boil** for 20 minutes or • **Soak** for 20-30 minutes in high level disinfectant (e.g., 2% glutaraldehyde or 5000 ppm chlorine), then rinse with boiled water.
Intrauterine Devices and Inserters	Not necessary.	Not necessary.	Often come in sterile packages. If sterile package is broken prior to preparing for use, discard IUD in question. HLD not recommended. If IUDs supplied in bulk, before insertion soak for 20-30 minutes in high-level disinfectant (e.g., 2% glutaraldehyde or 5000 ppm chlorine), then rinse in boiled water before use.

* Decontamination makes safe any contact between infectious objects and intact skin. Personnel handling contaminated objects should wear utility gloves and be very careful with sharp instruments. Where instruments are heavily contaminated with blood or body fluid, initial decontamination may be a prudent step.

Instruments/ Objects	Step 1: Decontaminate (when necessary)*	Step 2: Clean	Step 3: Sterilize or High-Level Disinfect
Metal Instruments for Pelvic Examination (e.g., specula, tenacula, sounds, uterine forceps, sponge forceps)	**Soak** in 0.5% chlorine solution (or other decontaminant solution) for 10 minutes before cleaning.	Wearing gloves, **clean** items with soap and water until visibly clean. Rinse and air dry.	Disinfection is sufficient. **Boil** for 20 minutes or **Soak** for 20-30 minutes in: • Iodofor solution 1:400 (slightly corrosive), or • 70% ethyl or isopropyl alcohol, or • 2% glutaraldehyde. Then **rinse** in clean water before use. Sterilization is always preferred, but not necessary. • **Autoclave** at 15 lbs (106 kPa) for 20 min. (30 min. if wrapped), or • **Dry Heat:** after reading temperature at 170° C (340° F), one hour is required.
Metal Containers for storing clinic instruments (NOTE: stainless steel far less susceptible to corrosion by disinfectants)	**Soak** in 0.5% chlorine solution (or other decontaminant solution) for 10 minutes before cleaning.	Wearing gloves, **clean** items with soap and water until visibly clean. Rinse.	For storing <u>disinfected</u> equipment: • **Boil,** autoclave, or use dry heat once a week. • **If container is too large to boil, autoclave, or use dry heat, soak** interior surface for 20-30 minutes in any of the solutions listed for metal instruments above. Then rinse in clean water before use. For storing <u>sterile</u> equipment (if the containers are emptied or contaminated at any time, they should be re-sterilized before using): • **Autoclave**, or use dry heat once a week (or boil). • If container too large to boil, autoclave, or use dry heat, **soak interior surface overnight** in 2% glutaraldehyde, then rinse in boiled water before use.
Pelvic Exam Table Top, or other large surface areas	Wearing gloves, **wipe off** with a dilute and inexpensive chlorine solution of 5000 parts per million (ppm) = 0.5% = 5 grams per liter.	If dirt or organic material is still present after decontamination, **clean** with soap and water.	Not necessary.

* Decontamination makes safe any contact between infectious objects and intact skin. Personnel handling contaminated objects should wear utility gloves and be very careful with sharp instruments. Where instruments are heavily contaminated with blood or body fluid, initial decontamination may be a prudent step.

9. HANDWASHING AND GLOVING*

Handwashing (Tietjen, 1992, p 14-15)

Handwashing may be the single most important infection prevention procedure. Handwashing should always be done before examining (direct contact with) a client and putting on **sterile** or **high-level disinfected** gloves for surgical procedures. Handwashing should always be done after any situation in which hands may be contaminated (such as handling objects, including soiled instruments, or touching mucous membranes, blood and body fluids). Handwashing should also be done after removing gloves.

To encourage handwashing, program managers should make every effort to provide a continuous supply of fresh water, either from the tap or a bucket, and soap. For most activities, a brief handwashing with plain or antimicrobial soap for about 15 or 30 seconds followed by rinsing in a stream of water is sufficient.

Microorganisms grow and multiply in moisture and in standing water; therefore:

- If bar soap is used, provide small bars and soap racks which drain.
- Avoid dipping hands repeatedly into basins containing standing water, even with the addition of an antiseptic agent, such as Dettol® of Savlon®, because microorganisms may survive and multiply in these solutions.
- Choose from several options when no running water is available:
  - use a bucket with a tap which can be turned off to lather hands and turned on again for rinsing, or a bucket and pitcher; or
  - an antiseptic handrub which does not require water.
- Dry hands with clean towel or air dry. Shared towels readily become contaminated.
- Collect used water in a basin and discard in the latrine if a drain is not available.

When Sterile Gloves are Necessary

Gloves can be sterilized or simply disinfected (see sections 5 and 6). "Sterile" gloves have been through a sterilization process which kills all microorganisms, including bacterial endospores. "High-level disinfected" gloves have been thoroughly washed in soap and water, then soaked in disinfectant solution for 20-30 minutes.

Sterile gloves **must** be used for invasive procedures (such as loading NORPLANT® implants into a trochar) involving vascular or other sterile spaces. Sterile gloves are necessary for IUD insertions **only** if the IUD will be handled in order to load into an inserter tube.

The "no-touch" technique is preferred: when IUDs come in sterile wrappings and can be loaded by touching only the sterile wrapping, gloves need NOT be sterile.

Sterile gloves are NOT necessary for routine speculum or bimanual exams; high-level disinfected gloves are sufficient. High-level disinfected gloves are also sufficient for touching intact mucous membranes such as the vagina and cervix.

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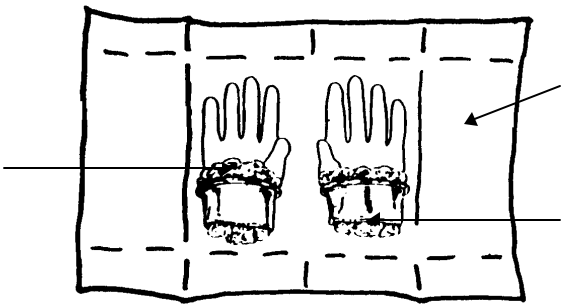
* This section adapted from Tietjen L, Cronin W and McIntosh N: *Infection Prevention Guidelines for Family Planning Service Programs*, 2nd ed., Baltimore, Johns Hopkins Program for Education in Reproductive Health (JHPIEGO), 1992, pp. 14-15.
Sorensen KC, Luckman J: *Basic Nursing: A Psychophysiologic Approach*. Philadelphia, WB Saunders Co, 1979, pp 934-938.

How Sterile Gloves are Packaged

Sterile gloves are packaged in a paper envelope wrap; the outside of the package is unsterile. The inside, including gloves and wrapper, is sterile; thus the unwrapped glove paper may be used as an extra sterile field (unless the wrapper becomes wet).

When gloves are packaged to be sterilized, the cuffs should be rolled up, so the gloves can be put on without contamination. If steam sterilization is used, and the gloves are stacked in piles, penetration of the steam under the rolled cuff may be poor. This problem can be solved by putting gauze inside the glove and under the fold of the cuff (see figure below).



Adapted from: Ministry of Health, Division of Nursing, His Majesty's Government, Nepal: *Infection Control Manual for Health Care Facilities*. Manuscript in Nepali. Project funded in part by USAID, 1984.

After sterilization with steam, gloves should not be used for 24 to 48 hours, to allow the elasticity to be restored and to prevent tackiness/stickiness (Perkins, 1982).

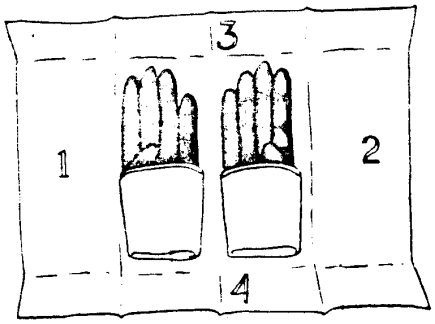
Disinfected gloves do not need paper wrapping. They should be stored in a disinfected container and removed as needed with disinfected large forceps/pickups. Ideally, disinfected gloves will also have the cuffs folded over.

Accidental Contamination of Sterile or Disinfected Gloves

There are several ways to contaminate disinfected or sterile gloves:

- by tearing or puncturing the glove,
- by touching any unsterile object with the sterile glove, or
- by touching the outside of a sterile glove with an ungloved hand (service providers wearing disinfected gloves should be careful to think about the parts of the glove that will be touching the client's mucous membranes, and be sure not to contaminate these areas).

How to Put on Sterile Gloves to Avoid Contamination



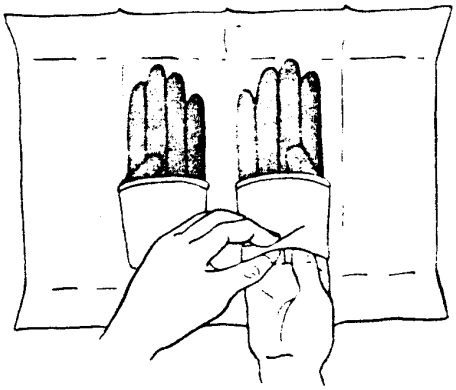
1. Prepare a large, clean, dry area to open gloves.

2. Obtain correct size of sterile gloves.

3. Wash hands and dry well. Lightly powder hands (not gloves), if inside of gloves are not powdered. (**NOTE: Do not use powders for insertions of NORPLANT® or other silastic implants, because the powder will adhere to the silastic capsule, causing a foreign body reaction**).

4. Break open other sterile supplies (e.g., open end of IUD package).

Step 5



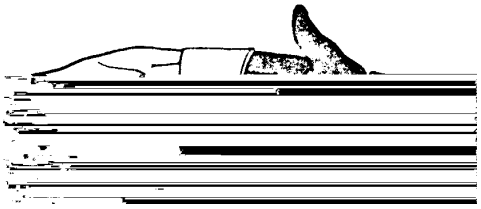
5. Open outer glove wrapper and lay gloves package out on clean surface, with cuffs facing you. Take care not to touch the inner surface of the wrapper if you intend to use it as a sterile field.

6. Pick up a glove by the folded-back cuff. Be careful to touch only the inside portion of the cuff (i.e., the side which will be touching your skin when the glove is on).

Step 6

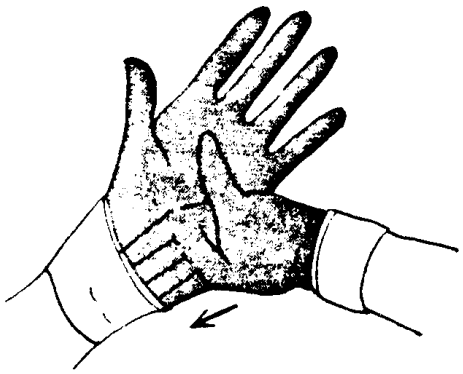
7. While holding the glove as shown, slip the other hand into the glove. Pointing the fingers of the glove to the floor will keep the fingers open by gravity. Be careful not to touch anything; holding the gloves above waist level will help.

8. If the first glove is not fitting correctly, **wait** to make **any** adjustments until the second glove is on. (Then you can use the sterile fingers of one glove to adjust the sterile portion of the other).



Step 9

9. To pick up the second glove, slide the fingers of the **gloved** hand **between** the **folded cuff** and the **sterile** portion of the second glove. **This is very important, in order to avoid contaminating the gloved hand with the ungloved hand**.



Step 10

10. Place second glove on ungloved hand by maintaining a steady pull through the folded cuff.

11. Do not attempt to adjust **cuffs** once gloves are on, since this risks contamination.

12. Adjust position of glove fingers until gloves fit comfortably.

13. Always keep gloved hands above waist level and in sight to avoid accidental contamination.

14. If a glove becomes contaminated, **stop** and ask yourself if the glove will touch a sterile or disinfected instrument or the client's mucous membranes or sterile tissue. If so, either remove that glove and reglove, or put another sterile glove over the contaminated glove.

15. When removing gloves, avoid allowing the surface that was sterile to come into contact with your hands (the exterior of the gloves is now contaminated).

16. If contaminated gloves are untorn and not punctured, put in a container for cleaning (and later disinfection or sterilization). If gloves have become torn, put into a .05% bleach solution before discarding, to avoid accidental contamination of workers responsible for refuse removal.

10. MINIMUM EQUIPMENT AND SUPPLIES FOR INFECTION PREVENTION

The following are the bare minimum equipment and supplies necessary for infection prevention in a FP/MCH clinic not performing VSC:

1. **Water**, including a way to get running water for handwashing (e.g., one person pours over another's hands).

2. **Soap** for handwashing and cleaning equipment.

3. **Examining gloves** for clinicians.

4. **Shallow plastic pan** for 10-minute decontamination step (see section 4).

5. **Chlorine-releasing solution** (chloramine tablets are portable, and chloramine is less easily broken down by the organic material in contaminated water).

6. **Utility gloves** for clean-up personnel.

7. **Plastic bucket** for cleaning.

8. **Scrub brushes** and discarded tooth brushes for cleaning large and small equipment.

9. **Dry heat oven or steam sterilizer and fuel source** (see section 6).

10. **Boiling pot and fuel source** for use when steam or dry heat not available (see section 5).

11. **Tongs or forceps** for removing sterilized equipment.

12. **Antiseptic** for prep of skin, vagina and cervix (see section 7).

13. **Smooth surface on examining table** (rubber mat) which can be wiped with chlorine solution whenever it becomes contaminated.

14. **Clock or timer or watch**.

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