INTRAH Training Information Packet (INTRAH TIP)

Sterilization, Disinfection, Decontamination and Cleaning of FP/MCH Clinic Equipment

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March 1989

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training information packet

March 1989

Dear Colleague:

Trainers, managers and service providers of family planning (FP) and maternal child health (MCH) clinical services are increasingly concerned about preventing the acquired immune deficiency syndrome (AIDS). In addition to community education and distribution of condoms, AIDS prevention should include avoiding accidental transmission of AIDS by contaminated needles or other equipment.

Many disease-causing microorganisms besides AIDS can be spread by contaminated equipment. This INTRAH TIP outlines the cleaning, sterilization, disinfection, and decontamination procedures necessary to prevent accidental disease transmission in FP/MCH clinics, based on supplies available in Africa and Asia.

We hope this INTRAH TIP will be a useful reference for you and your colleagues. Comments or suggestions on this INTRAH TIP will be received with appreciation. Single copies of this TIP, or any INTRAH TIP, can be obtained by writing:

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Note: At the back of this TIP is a pull out wallchart of Section 8, pp 20-21, Which Method to Choose for Different Types of Equipment. The idea for this wallchart was contributed by Stembile Matatu, Tutor ZNFPC Impilo Centre in Bulawayo, Zimbabwe

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INTENDED AUDIENCES

- Trainers of clinical family planning/maternal-child health (FP/MCH) personnel,
- FP/MCH clinic managers, and
- Other professional FP/MCH clinic staff.

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Pull-Out Wallchart

ACKNOWLEGEMENTS

This INTRAH Training Information Packet (INTRAH TIP) was reviewed by a number of professionals who train family planning service providers or who themselves provide family planning services in Africa or Asia. The authors gratefully acknowledge their valuable contributions.

Grace Mtawali, Regional Training Officer, INTRAH Office for East and Southern Africa, Nairobi, Kenya.

Djaritou Thiam, Regional Training Officer, INTRAH Office for West and Central Africa, Abidjan, Côte d'Ivoire.

The staff of the Integrated Maternal Child Care Services and Development, Inc. (IMCCSDI), Quezon City, The Philippines.

Siembile Matatu, Tutor, Zimbabwe National Family Planning Council, Harare, Zimbabwe.

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We are also grateful to Ms. Susan Eudy for wordprocessing and revising the manuscript and to Dr. James Lea, INTRAH Director, for his support and valuable suggestions.

Developed under USAID Contract #AID/DPE-3031-C-00-4077. The views expressed in this document are the responsibility of INTRAH and do not represent the policy of the U.S. Agency for International Development.

INTRODUCTION

In recent years, service providers in family planning (FP) and maternal child health (MCH) clinics have become more concerned about preventing the acquired immune deficiency syndrome (AIDS). AIDS prevention in the FP/MCH clinic includes education of the public, distribution of condoms, and proper processing of clinic equipment.

Many disease-causing microorganisms besides AIDS can be spread by contaminated needles, syringes and other clinic equipment. This INTRAH TIP will serve as a reference for trainers, clinic managers and service providers who want to minimize the risk of spreading disease from contaminated FP/MCH clinic equipment.

1. WHAT PROCEDURES KILL MICROORGANISMS, INCLUDING THE HUMAN IMMUNODEFICIENCY VIRUS (HIV)

Microorganisms are microscopic plants or animals. Disease-causing microorganisms include fungi, parasites, viruses, bacteria and bacterial endospores. Bacteria, parasites, fungi and viruses, including human immunodeficiency virus (HIV, the virus which causes AIDS) will be killed by carefully following the sterilization and disinfection procedures listed in this INTRAH TIP.

The human immunodeficiency virus (HIV) can be transmitted through the use of needles, syringes and other invasive equipment contaminated with blood of an infected person. Vaginal and cervical secretions and semen have also been shown to transmit HIV. Because all body fluids may contain blood or white blood cells, all medical instruments for invasive procedures (including needles and syringes) should be cleaned after each use, then sterilized or given high-level disinfection to prevent transmission of HIV (WHO, June, 1988). HIV is a fragile (lipophilic) virus. HIV is very sensitive to chlorine solutions (bleach) and is rapidly killed on exposure, making bleach an ideal decontamination agent, especially for large surface areas. (Concentrations and preparation of chlorine solutions are discussed in section 5). HIV is also rapidly killed by high heat.

If medical equipment, linens or clothing has large amount of blood or other body fluids, then pre-soaking in a 0.5% (5000 ppm=5 grams/liter) bleach solution will kill HIV, making the article safe to touch during cleaning. For cleaning medical instruments, gloves should be worn; see section 3.

HIV is not transmitted by routine household objects. Routine washing in warm, soapy water of dishes, glasses, and utensils is sufficient. Routine laundry of linens is also sufficient.

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 they have with tissue and skin..

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

Human tissues the instrument/ object will touch	Examples of instruments/objects	APPROPRIATE PROCEDURE (sterilization, high-level disinfection, or decontamination)
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*
mucus membranes or broken skin	uterine sounds, specula, IUDs, gloves for pelvic exam	**high-level disinfection**, to destroy all live micro-organisms **except** bacterial endospores*
intact (unbroken) skin	pelvic exam table top or other surfaces contaminated by body fluids	**decontamination**, to destroy easily killed viruses (such as HIV), and other fungi, parasites and bacteria

* bacterial 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. WHY CLEANING OBJECTS BEFORE STERILIZATION, DISINFECTION OR DECONTAMINATION IS IMPORTANT

"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, disinfection or decontamination is very important: When objects are not first adequately cleaned, procedures to sterilize, disinfect or decontaminate will fail.

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

NOTE: Gloves must be worn while cleaning instruments. This pair of gloves should be discarded (or left at the end of the day for cleaning the following day). In addition to wearing gloves, extreme care must be taken to prevent needle sticks and/or cuts.

HOW TO CLEAN METAL INSTRUMENTS BEFORE STERILIZATION OR DISINFECTION

1. After use, rinse instruments in cold water to remove any blood.
   NOTE: If instruments are contaminated with large amounts of body fluids and if HIV or Hepatitis B virus (HBV) is prevalent in the area, add bleach to make a .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, June 1988, and Wenzel, 1987).
2. Next, scrub instruments with a brush in hot soapy water (be sure to clean the teeth, joints and screws).
3. Rinse again in cold, clean water until no soap remains (soap can interfere with disinfection).
4. Proceed with sterilization (see section 4) or high-level disinfection (see section 5).

HOW TO CLEAN GLOVES, INSERTERS, PLUNGERS AND OTHER RUBBER EQUIPMENT BEFORE STERILIZATION OR HIGH-LEVEL DISINFECTION

1. Rinse by soaking in cold water (for equipment soiled with blood, cervical secretions or semen, it is best to soak for ten minutes with bleach added to make an 0.5% solution, in order to kill HIV, before handling, even though gloves are used).
2. Wash in lukewarm, soapy water.
3. Rinse in clean, cold water until no soap remains (soap can interfere with disinfection).
4. Proceed with sterilization (see section 4) or high-level disinfection (see section 5).

HOW TO CLEAN NEEDLES AND SYRINGES BEFORE STERILIZATION

1. Leave needle attached to syringe.
2. Fill syringe with high-level disinfectant solution (by drawing up through needle). (See section 5).
3. Cover syringe and attached needle with disinfectant solution (by laying them horizontally in flat tray), and leave immersed in disinfectant solution for 30 minutes.
4. Expel disinfectant solution from syringe and needle.
5. Rinse syringe and needle in boiled water (see section 4 for boiling times) by filling and expelling water at least twice (fill and expel through needle).
6. Detach needle from syringe and make sure hub area is clean.
7. 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).
8. After the cleaning discribed above, it is critical that the syringe and needle be STERILIZED prior to reuse (see section 4).

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.

CAUTIONS ON RE-USABLE NEEDLES AND SYRINGES

- When needles and syringes are to be re-used, it is imperative that both be cleaned before sterilization and re-use.
- Where needles (disposable or re-usable) are to be re-used, it is important that both be cleaned then sterilized BEFORE EVERY NEW USE.

CAUTION ON 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. Dispose of used needles and syringes in special container for sharp objects; when full this container must be burned or buried.

Adapted from: WHO: *Guidelines for Prevention and Control of Infection with LAV/HTLV III.* Geneva, monograph WHO/CDS/AIDS/86-1, May 1986 and WHO: Injectable Contraceptives - Sterilization Alert, cited in UNFPA - PIACT: *Product Information Memo* 1988; 10(3):5-6.

4. HOW TO STERILIZE

Definition: "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. Methods of sterilization include autoclaving, using dry heat, boiling and "cold sterilization" (by overnight soaking in a "high level disinfectant"); these methods are described below.

Storage: Sterile equipment will not remain sterile unless properly stored. Sterile equipment should be either carefully packaged in a sterile wrapping, or stored in a sterile container with a tight-fitting lid. Where alcohol is available, store all unwrapped sterilized equipment 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).

Water: A supply of sterile water will be needed for sterilization. Prepare a new supply of sterile water in a sterile, covered container every day either by boiling (see section 6 for instructions on how long to boil) or by adding chlorine to make a .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 sterile, 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.

STEAM STERILIZATION BY AUTOCLAVING OR USING A PRESSURE COOKER: THE PREFERRED METHOD

Instructions:

1. Pre-clean all instruments to be sterilized.
2. 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.
3. If using autoclave, it is best to wrap clean instruments or other clean objects in cotton cloth, a double thickness muslin, paper wrapper or newsprint. (Unwrapped instruments are only sterile if used immediately after removal from autoclave, unless kept in a covered, sterile container).
4. 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.
5. 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 101 kPa (1 atmosphere above atmospheric pressure).

6. After the 30 minutes have elapsed, slightly open lid to allow steam to escape. Allow instrument packs to dry completely before removal (damp wrap around instruments can draw in bacteria, viruses and fungi from the environment).
7. 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 the required amount of time will be observed, even when multiple, new or hurried workers are responsible for overseeing the sterilization.
8. Remove 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 sterile covered container.

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 lid, the autoclave or pressure cooker is not working correctly, and is merely a boiling pot: to sterilize, you will need to refer to the boiling times as listed below.

Advantages:
- Inactivates all microorganisms (bacteria, fungi, parasites and viruses), including HIV (virus causing 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 autoclave or pressure cooker, which must be maintained in working condition.

STERILIZATION BY DRY HEAT (Adapted from: WHO, June, 1988)

Instructions:
1. Pre-clean all instruments to be sterilized.
2. Use only for instruments that can withstand a temperature of 170°C (340°F) (see chart, section 8: Which method for which instrument).
3. Preheat oven to 170° C (340°F).
4. Put pre-cleaned instruments into oven and continue at 170°C (340°F) for 2 hours.
5. Remove items after cooling with sterile forceps/pickups, and store in sterile wrap or container.

Advantages:
- An ordinary electric household oven is satisfactory for dry heat sterilization.
- HIV is very sensitive to heat.
- Very good in humid climates.

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

STERILIZATION BY BOILING IN ALKALINIZED WATER

Where There Is No Autoclave: Will Boiling Sterilize?

Sterilization means the elimination of all forms of microbial life, including bacterial spores. It takes 10-12 hours of vigorous boiling to kill resistant bacterial spores. Thus, WHO does **not** recommend boiling when sterilization (elimination of bacterial endospores) is needed. Fortunately, simple alkalinization (removing acidity) of the boiling water will enable boiling water to kill all endospores in 20 minutes at sea level. Alkalinization raises the boiling point, makes endospores more susceptible to boiling, and also helps prevent rusting of metal instruments. However, a deposit of the alkali will be left on the instruments; thus boiling in alkali is not advised for needles or syringes.

How to Alkalinize (remove acidity from) Water for Sterilization by Boiling

Sodium carbonate is a simple alkali which can be used. Add sufficient alkali by weight to equal the correct percentage of water by weight (assume 1 liter of water weighs 1 kilo). This will render the water very alkaline to a pH of 11-12 after the water is boiled (Perkins, 1969).
Caution: DO NOT BREATHE VAPORS OF BOILING ALKALINIZED WATER! DO NOT DRINK BOILED ALKALINIZED WATER! AVOID SKIN AND EYE CONTACT!

Sodium carbonate (sal soda) makes a 2% (2 parts in 100) solution by adding 20 grams (15 cubic centimeters) of crystal to one liter of water.
Note: sodium bicarbonate will **not** sufficiently alkalinize water to the desired pH of 11-12 (Cole, 1988).

How Long to Boil

The highest temperature that boiling water will reach is 100ºC (212ºF) at sea level. At higher altitudes, water will boil at a lower temperature, thus longer boiling times are needed to sterilize. After reaching the boiling point, continue boiling FOR 20 MINUTES with the lid in place; 20 minutes boiling time is sufficient at sea level to kill nearly all organisms in the water. As the altitude increases so must the boiling time: ADD 5 MINUTES FOR EACH 1000 FEET, or 300 METERS, ABOVE SEA LEVEL (Perkins, 1969, p. 315).

Instructions:

1. Pre-clean all instruments to be sterilized. (NOTE: Do NOT use this method for needles or syringes).
2. Add 20 grams (15 cubic centimeters) of sodium carbonate to each liter of water.
3. Completely submerge pre-cleaned objects in the alkalinized water.
4. Close lid over pan and bring water to a rapid boil.
5. Start timer or note time on clock and record time boiling began on sterilization log.
6. Boil for 20 minutes plus 5 minutes for each 1000 feet (300 meters) above sea level.
7. Remove objects with previously sterilized large forceps/pick-ups.
8. Rinse in boiled water to remove residue of sodium carbonate.
9. Place objects in dry sterile container.

Advantages:

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

Disadvantages:

- Boiling alone is NOT reliable in killing bacterial endospores unless water is alkalinized.
- Alkalinized water (pH 11-12) is irritating to skin and respiratory tract, and is caustic (burning) to gastrointestinal tract if ingested, or to eyes if exposed.

WHERE THERE IS NO AUTOCLAVE, DRY HEAT OR BOILING EQUIPMENT: "COLD STERILIZATION" BY SOAKING IN HIGH-LEVEL DISINFECTANT SOLUTIONS

When steam sterilization, dry heat sterilization, or boiling in alkaline water is not possible, objects which will touch sterile tissues require sterilization by available "high-level disinfectants." "High-level disinfectants" are those chemicals which can 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. WHO does not recommend high-level chemical disinfectants for the sterilization of needles or syringes.

NOTE: The following should **never** be used for sterilization, due to their inability to kill bacterial endospores and some bacteria:

- Zephiran® (benzylchonium chloride),
- Hibitane® (chlorhexidine gluconate),
- Lysol® (cresol with soap),
- proflavine and acriflavine (acridine derivatives),
- Eusol® (chlorinated lime and boric acid)
- Cétavlon® (centrimonium with ethyl alcohol),
- mecury lourel, or other mercury compounds,
- Savlon® (centrimede and chlorhexidene), or
- other skin antiseptics

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

2% Glutaraldehyde (Glutaral or Dialdehyde) Solution or 8% Formaldehyde (as 20% Formol or Formalin) for Sterilization

Instructions:

1. Pre-clean all instruments to be sterilized.
2. 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, June, 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% GLUTARALDEHUDE SHOULD NOT BE DILUTED.

3. For formaldehyde:
   - A commercially available solution of formaldehyde (which will contain 35-40% formaldehyde) must be diluted with boiled water 1:5 (final solution containis about 8% formaldehyde).
   - DO NOT DILUTE WITH CHLORINATED WATER.
4. Cover clean instruments and other clean objects completely with the solution of glutaraldehyde or formaldehyde.
5. Allow to soak at least 10 hours in glutaraldehyde, and at least 24 hours in formaldehyde.
6. 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 available as, for example, Cidex®, or Metricide ®, or Omnicide®.

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.

Hydrogen Peroxide (H_2O_2) Solution for "Cold Sterilization"

Commercially mixed hydrogen peroxide solutions are already "stabilized." Stabilized solutions only need to be replaced every one to two weeks, depending on use.

Instructions:
1. Pre-clean all instruments to be sterilized.
2. Dilute 30% hydrogen peroxide to the necessarily dilution. To sterilize, use a 3% concentration for at least 150 minutes (2 1/2 hours); a 10% concentration requires only 60 minutes (1 hour). (For high-level disinfection, use 6% solution for 30 minutes).

To obtain the following concentrations:	**mix one part of 30% hydrogen peroxide with the following number of parts water (preferably boiled and filtered):**
10%	2
6%	4
3%	9

3. Cover clean instruments and other clean objects completely in appropriate solution of hydrogen peroxide, cover container, and leave for necessary time.
4. Remove objects with sterile large forceps/pickups.
5. Rinse carefully with boiled and filtered water (see section 4 for boiling times) air dry, avoiding recontamination. Store sterilized objects in sterile wrappings or container.
6. Exposure to light hastens the loss of potency so the hydrogen peroxide solution should be stored in a covered, opaque container kept away from light. Heat also hastens the loss of potency, so WHO does not recommend hydrogen peroxide for use in a hot (tropical) environment (WHO, June, 1988).

Advantages:

- Hydrogen peroxide is more commonly available and less expensive than glutaraldehyde.
- Kills all microorganisms (bacteria, fungi, parasites and viruses), including HIV.
- Kills bacterial endospores.
- 3%, 6% or 10% solutions can be prepared immediately before use by diluting the stabilized 30% solution with sterile water (eg., 1 part 30% solution to 4 parts water yields a 6% solution).

Disadvantages:

- The solution loses potency over time, especially if exposed to light or heat, and fresh stabilized solution must be used every 1-2 weeks (replace sooner with heavy use).
- Hydrogen peroxide corrodes metals, while glutaraldehyde does not.
- The concentrated stabilized 30% solution should be handled and transported with care because it is corrosive.

5. HOW TO DO HIGH-LEVEL DISINFECTION

"Disinfection" is the process that eliminates all disease-causing microorganisms EXCEPT bacterial endospores. Because normal mucus membranes are resistant to infection by common bacterial endospores, high-level disinfection is sufficient for objects that will touch mucus 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 dialators, and IUDs. These objects must be either sterilized (see section 4. HOW TO STERILIZE) or disinfected by one of the 7 methods listed below.

NOTE: The following should **never** be used for high-level disinfection, due to their inability to kill bacterial endospores and some bacteria:

- Zephiran® (benzylchonium chloride),
- Hibitane® (chlorhexidine gluconate),
- Lysol® (cresol with soap),
- proflavine and acriflavine (acridine derivatives),
- Eusol® (chlorinated lime and boric acid)
- Cétavlon® (centrimonium with ethyl alcohol),
- mecury laurel, or other mercury compounds,
- Savlon® (centrimede and chlorhexidene), or
- other skin antiseptics

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

CHLORINE-RELEASING SOLUTIONS FOR HIGH-LEVEL DISINFECTION (WHO, June, 1988)
All chlorine-releasing solutions are excellent high-level disinfectants, but can corrode metal surfaces.

Instructions:

1. Pre-clean all instruments needing high-level disinfection.
2. Correctly dilute solution with (preferably boiled) water. Dilution instructions are listed on pages 13-14, 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. Rinse with filtered, sterile water.
6. Store in disinfected, dry, covered container.

Sodium Hypochlorite (Bleach)
Dilution is necessary when using 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=.5%=5g/l concentration (for blood spills, soiled equipment)
Household bleach (USA, Canada)	5%	1 part bleach to 10 parts water
Eau de Javel (France) (15° chlorum*)	5%	1 part bleach to 10 parts water
Extrait de Javel (France) (48° chlorum*)	15%	1 part bleach to 30 parts water
Chloros (UK)	10%	1 part to 20 parts water
Chloros (UK)	15%	1 part to 30 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.

Advantages:
- Chlorine bleach is usually the least expensive 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:
- Corrodes metal instruments: dilutions should not be prepared in, or used to disinfect, metal containers. Exposure time should not exceed 30 minutes. Metal must be thoroughly rinsed and dryed 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.

Calcium Hypochlorite or Chlorinated Lime (WHO, June, 1988)

Available Chlorine:
1. Calcium hypochlorite contains approximately 70% available chlorine.
2. Chlorinated lime contains approximately 35% available chlorine.
3. The availability of pre-diluted chlorinated lime solutions can be confusing: **Eusol** is chlorinated lime and boric acid; **Eusol** contains .25% (2,500 ppm) available chlorine; this is sufficient for disinfection of clean equipment, but is half the WHO recommended level for disinfection of very contaminated equipment.

Advantages:
- This substance will also decompose gradually if not protected from heat and light, but it decomposes more slowly than sodium hypochlorite.

Disadvantages:
- Like all chlorine compounds, it corrodes metal.

Sodium Dichloroisocyanurate (WHO, June, 1988)
Sodium dichloroisocyanurate (NaDCC) forms hyphochlorous acid when dissolved in water. It is available as powder or tablets. 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 use.

Disadvantages:
- Like all chlorine compounds, it corrodes metal.

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

Advantages:
- Like NaDCC, chloramine is more stable than sodium or calcium hypochlorite.

Disadvantages:
- Like all chlorine compounds, it corrodes metal.

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 .5% (5000 ppm, 5 gm/L) dilution for all soiled equipment or spills of body fluid; .1% (1000 ppm, 5 gm/L) is sufficient for clean medical equipment.

When the chlorine is to be diluted with contaminated (non-boiled, impure or unfiltered) water, the higher (.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

	Clean condition (e.g., cleaned medical equipment)	Dirty condition (e.g., blood spills, soiled equipment), or dilution with contaminated water
Available chlorine required	0.1% (1g/litre, 1000 ppm)	0.5% (5g/litre, 5000 ppm)
Sodium hypochlorite solution (5% available chlorine)	20 ml/litre	100 ml/litre
Calcium hypochlorite (70% available chlorine)	1.4 g/litre	7.0 g/litre
NaDCC (60% available chlorine)	1.7 g/litre	8.5 g/litre
NaDCC-based tablets (1.5 g of available chlorine per tablet)	1 tablet/litre	4 tablets/litre
Chloramine (25% available chlorine)	20 g/litre*	20 g/litre

*Chloramine releases chlorine at a slower rate than do hypochlorites. Therefore, a higher available chlorine concentration is required in 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 g/litre (0.5% available chlorine) is recommended for both clean and dirty conditions.

IODOFOR (IODOPHOR) SOLUTIONS FOR HIGH-LEVEL DISINFECTION

Iodofor is a solution of iodine mixed with a stabilizing agent such as provodone or polyvidone. A common provodone-iodine solution is Wescodyne® which contains 1.6% available iodine.

Iodofors are an excellent choice for high level disinfection of equipment in family planning clinics.

Instructions:

1. Pre-clean all instruments needing high-level disinfection.
2. Prepare boiled water for dilution with the iodofor (eg., polyvidone iodine).
3. Add iodofor solution to the water and stir until a deep orange color appears, which is a strength of 1:2,500 elemental iodine (400 ppm elemental iodine). There is no need to measure. If the solution is yellow, instead of deep orange, it is too weak; if it is red, it is too strong. If dilution during the day occurs, add more iodofor solution to maintain a deep orange color.
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 recommends a 1:400 solution=2500 ppm = .25% elemental iodine.

Advantages:

- Iodine and iodofors are excellent high-level disinfectants.
- Plain iodine solution is easily made from mixtures of iodine and sodium iodine which are cheap and readily available throughout the world; the addition of a stabilizing agent such as providone greatly increases the strength and durability of the solution.
- 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.
- It can be used to disinfect hands, plastic and stainless steel gynecologic equipment. It does not stain the skin in the 1:2,500 solution.

Disadvantages:

- 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.

70% ETHYL OR ISOPROPYL (2-PROPYL) ALCOHOL FOR HIGH LEVEL DISINFECTION

Instructions:

1. Pre-clean all instruments needing high-level disinfection.
2. 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.
3. Remove with disinfected large forceps/pickups.
4. Store in disinfected, dry, covered container.

Advantages:

- Are excellent disinfectants: both kill all fungi and bacteria including mycobacteria; isopropyl alcohol kills most viruses and ethanol kills all viruses.
- Are not corrosive to metal.
- Are not as expensive as glutaraldehyde in bulk (but must be replaced more often).
- Useful for occassional 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:
- 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.

2% GLUTARALDEHYDE SOLUTION, 6% HYDROGEN PEROXIDE, 3.5-4% FORMALDEHYDE OR OTHER "HIGH-LEVEL" DISINFECTANTS

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. Store in disinfected, dry, covered container.

Advantages:
- Hydrogen peroxide, 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.
- Hydrogen peroxide corrodes metal.
- Vapor released from formaldehyde is toxic.

6. HOW TO DECONTAMINATE

"Decontamination" is a procedure that makes objects safe to touch 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 came in contact. The best agent for decontamination of large surface areas is bleach. See section 5 for dilution instructions.

All sterilants and disinfectants (listed in sections 4 and 5) are useful as decontaminants.

CHLORINE-RELEASING SOLUTIONS FOR DECONTAMINATION

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

Note: WHO recommends sodium hypochlorite and calcium hypochlorite solutions used for disinfection be replaced daily. 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 batch before making a new batch (Rutala, 1988).

CARBOLIC ACID, LYSOL® AND OTHER PHENOLICS

A 5% solution of carbolic acid, or Lysol® or other commercial phenolics are 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.

7. WHEN TO USE ANTISEPTICS, AND WHEN NOT TO

An "antiseptic" is a disinfectant for the skin only. Disinfection of the skin does not require killing mycobacteria or bacterial endo-spores. 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 mucus membranes or broken skin or which will enter sterile tissue or the vascular space.

Many chemicals qualify as safe skin antiseptics. These include hexachlorophenes, chlorhexidines and centrimedes. The following are commonly used skin antiseptics available in different parts of Africa: *Cétavlon® (centrimonium/cetrimede with ethyl alcohol, various concentrations), *Dettol® (chloroxylenol 4%), Hibiscrub® (chlorhexidine gluconate 4%), Hibitane® (chlorhexidine gluconate 1%), Phisohex (hexachlorophene 3%), and Zephiran® (benzylchonium chloride 17%).

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

Acridine derivitives, such as acriflavin and proflavine, are commonly used as skin disinfectants; they are not recommended as high-level disinfectants. Mercury compounds such as mercury laurel are also in use for antisepsis and disinfection. These compounds are highly toxic (see below) and NOT recommended.

DISADVANTAGES OF ANTISEPTICS

- Unreliable for killing bacterial endospores (e.g., Clostridia), and even unreliable for killing some common bacteria (e.g., Pseudomonas).
- Do not kill all viruses.
- Activity is less effective when used with detergents and soap and is decreased by organic materials.
- Cause some rusting of instruments (slightly corrosive).
- Solution must be changed at least weekly, and containers must be resterilized.

SPECIAL DISADVANTAGES OF BENZYLCHONIUM CHLORIDE (EXAMPLE: ZEPHIRAN® 1:750 OR 17%)

- While chlorine and most high-level disinfectants kill HIV (the virus causing AIDS) very quickly, benzylchonium chloride takes at least 10 minutes to kill HIV.
- Solutions of benzylchonium chloride have repeatedly been shown to become contaminated by Pseudomonas and other common bacteria (Block p. 409).
- Solutions of benzylchonium chloride are easily inactivated by cotton gauze and other organic material (Block, p. 409).

8. WHICH METHOD TO CHOOSE FOR DIFFERENT TYPES OF EQUIPMENT

Instruments/ Objects	Sterilization	High-Level Disinfection	Decontamination
Needles, Syringes, and Norplant® Trochars	• **Autoclave** at 15 lbs for 20 minutes. • **Dry Heat** at 170° C (340° F) for 2 hours. • **Soak** overnight in 2% gluteraldehyde, formaldehyde, or hydrogen peroxide, then rinse in boiled water.	Never acceptable.	Never acceptable.
Rubber Gloves	If used for surgery: • **Autoclave** at 15 lbs. for 20 minutes, or • **Boil** for 20 or more minutes in alkalinized water (add 5 min for every 1000 ft or 300 m above sea level).	If touching only mucous membranes or broken skin: **Soak** for 20-30 minutes in: • Iodofor solution 1:2,500 (deep orange color), or • 70% ethyl (or isopropyl) alcohol.	Not adequate (also, bleach would disintegrate gloves).
Intrauterine Devices and Inserters	Often come in sterile packages. Disinfect if sterile package is broken prior to preparing for use.	**Soak** for 20-30 minutes in: • Iodofor solution 1:2,500 (acceptable for but not preferred for copper-containing devices), or • 70% ethyl (or isopropyl) alcohol, or • 6% hydrogen peroxide (this quickly corrodes metal, so do <u>not</u> use for copper containing devices), or • 2% glutaraldehyde. Then rinse in boiled water before use.	Never acceptable.

DANGERS OF USING MERCURY LAUREL OR OTHER MERCURY-CONTAINING COMPOUNDS

Although frequently sold for antisepsis, mercury-containing chemicals should be avoided due to their high 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 causes 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 fetus may be harmed: mercury is a potent teratogen (causes birth defects, including cleft palate, cerebral palsy, and other central nervous system abnormalities).

Instruments/ Objects	Sterilization	High-Level Disinfection	Decontamination
Metal Instruments for Pelvic Examination (e.g., specula, tenacula, sounds, uterine forceps, sponge forceps)	Sterilization is always preferred, but not necessary. • **Boil** for at least 20 minutes in alkalinized water, or • **Autoclave** at 15 lbs for 20 min (30 min. if wrapped), or • **Dry Heat** at 170° C (340° F) for 2 hours.	Disinfection is sufficient. **Soak** for 20-30 minutes in: • Iodofor solution 1:2,500 (slightly corrosive), or • 70% ethyl or isopropyl alcohol, or • 2% glutaraldehyde. Then **rinse** in boiled water before use.	Never acceptable.
Metal Containers for storing clinic instruments (NOTE: stainless steel far less susceptible to corrosion by disinfectants)	For storing sterile equipment (if the containers are emptied or contaminated at any time, they should be re-sterilized before using): • **Boil,** autoclave, or use dry heat once a week, • 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.	For storing disinfected equipment: • **Boil,** autoclave, or use dry heat once a week. • **If container 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 boiled or chlorinated water before use.	Never acceptable.
Pelvic Exam Table Top, or other large surface areas	Not necessary.	Not necessary.	**Wash off** with chlorine solution, in a dilute and inexpensive solution of 5000 parts per million (ppm) = .5% = 5 grams per liter.

9. STERILE GLOVES: WHEN AND HOW TO USE*

WHEN STERILE GLOVES ARE NECESSARY

Gloves can be sterilized or simply disinfected (see sections 4 and 5). "Sterile" gloves have been through a sterilization process which kills all microorganisms, including bacterial endspores. "Disinfected" gloves have been thoroughly washed in soap and water, then soaked in disinfectant solution (e.g., iodine) for 20-30 minutes.

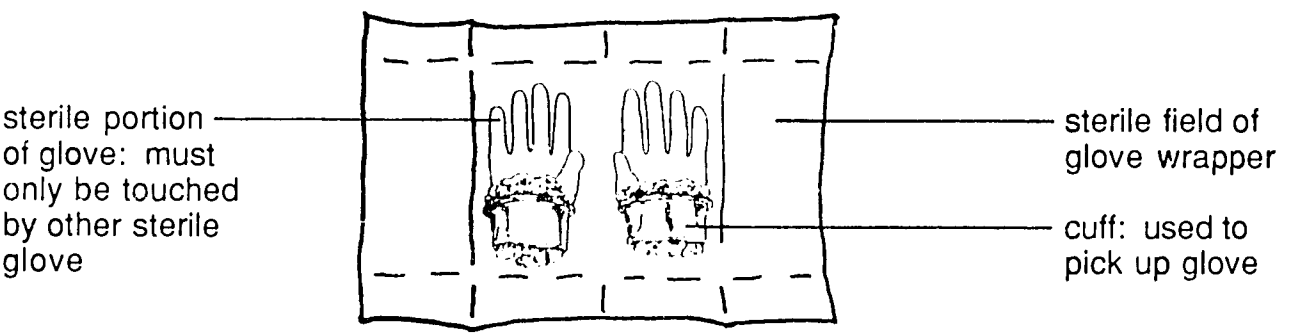
Sterile gloves **must** be used for invasive procedures (such as loading Norplant® implants into a trochar) involving vascular or other sterile spaces. Sterile gloves are necessary for IUD insertions **only** if the IUD will be handled in order to load into an inserter tube. When IUDs come in sterile 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; disinfected gloves are sufficient. Disinfected gloves are also sufficient for touching intact mucus membranes such as the vagina and cervix.

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 Magesty'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).

* This section adapted from Sorensen KC and Luckman J, 1979: pp. 934-938.

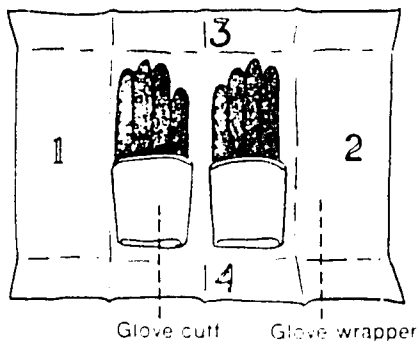
Disinfected gloves do not need paper wrapping. They should be stored in a disinfected container and removed as needed with disinfected large forceps/pickups. Ideally, disinfected gloves will also have the cuffs folded over.

ACCIDENTAL CONTAMINATION OF STERILE OR DISINFECTED GLOVES

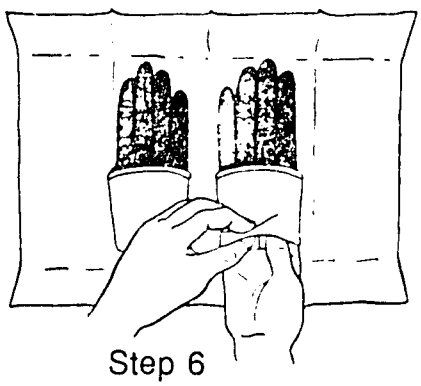
There are several ways to contaminate disinfected or sterile gloves:

- 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 mucus membranes, and be sure not to contaminate these areas).

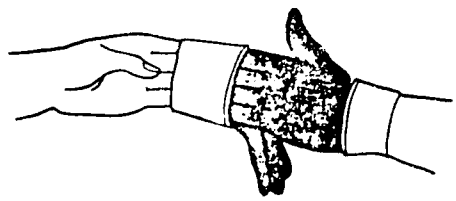
HOW TO PUT ON STERILE GLOVES TO AVOID CONTAMINATION



Step 5


Step 6

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 not powdered. (NOTE: DO NOT USE POWDER 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).
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).
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.



Step 9

Step 10

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).

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.

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 mucus 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.

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WHICH METHOD TO CHOOSE FOR DIFFERENT TYPES OF EQUIPMENT

Instruments/ Objects	Sterilization	High-Level Disinfection	Decontamination
Needles, Syringes, and Norplant® Trochars	• **Autoclave** at 15 lbs for 20 minutes. • **Dry Heat** at 170° C (340° F) for 2 hours. • **Soak** overnight in 2% gluteraldehyde, formaldehyde, or hydrogen peroxide, then rinse in boiled water.	Never acceptable.	Never acceptable.
Rubber Gloves	**If** used for surgery: • **Autoclave** at 15 lbs. for 20 minutes, or • **Boil** for 20 or more minutes in alkalinized water (add 5 min for every 1000 ft or 300 m above sea level).	**If** touching only mucous membranes or broken skin: **Soak** for 20-30 minutes in: • Iodofor solution 1:2,500 (deep orange color), or • 70% ethyl (or isopropyl) alcohol.	Not adequate (also, bleach would disintegrate gloves).
Intrauterine Devices and Inserters	Often come in sterile packages. Disinfect if sterile package is broken prior to preparing for use.	**Soak** for 20-30 minutes in: • Iodofor solution 1:2,500 (acceptable for but not preferred for copper-containing devices), or • 70% ethyl (or isopropyl) alcohol, or • 6% hydrogen peroxide (this quickly corrodes metal, so do <u>not</u> use for copper containing devices), or • 2% glutaraldehyde. Then rinse in boiled water before use.	Never acceptable.

Metal Instruments for Pelvic Examination (e.g., specula, tenacula, sounds, uterine forceps, sponge forceps)	Sterilization is always preferred, but not necessary. • **Boil** for at least 20 minutes in alkalinized water, or • **Autoclave** at 15 lbs for 20 min (30 min. if wrapped), or • **Dry Heat** at 170° C (340° F) for 2 hours.	Disinfection is sufficient. **Soak** for 20-30 minutes in: • Iodofor solution 1:2,500 (slightly corrosive), or • 70% ethyl or isopropyl alcohol, or • 2% glutaraldehyde. Then **rinse** in boiled water before use.	Never acceptable.
Metal Containers for storing clinic instruments (NOTE: stainless steel far less susceptible to corrosion by disinfectants)	For storing sterile equipment (if the containers are emptied or contaminated at any time, they should be re-sterilized before using): • **Boil,** autoclave, or use dry heat once a week. • 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.	For storing disinfected equipment: • **Boil,** autoclave, or use dry heat once a week. • **If container too large to boil or 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 boiled or chlorinated water before use.	Never acceptable.
Pelvic Exam Table Top, or other large surface areas	Not necessary.	Not necessary.	**Wash off** with chlorine solution, in a dilute and inexpensive solution of 5000 parts per million (ppm) = .5% = 5 grams per liter.

Reprinted from INTRAH Training Information Packet (INTRAH TIP) on "Sterilization, Disinfection, Decontamination and Cleaning of FP/MCH Clinic Equipment," March 1989.