NOTE TO OUR READERS: The goal of Practical Pharmacy is to provide accessible, objective and accurate information on medicines issues for front-line health workers who may not have had any pharmaceutical training. This issue of Practical Pharmacy focuses on antiseptics, disinfectants and hand-washing. Hand-washing is a crucial primary measure to reduce transmission of infections among health workers, patients and the general population. In countries where there is scarcity of clean water, it is important that the recommended procedures and alternative choices for hand-washing are understood and practiced. In this issue you will find:

- Description of antiseptics and their use in woundcare
- Description of disinfectants and their use in infection control
- Hand hygiene using soap: WHO guidelines
- Information on hand sanitizers
- Necessary hand hygiene before performing surgery

We welcome your feedback to know if we have been successful in achieving our goal with this issue. Contact us at practical.pharmacy@gmail.com

Antiseptics and disinfectants

The above diagram describes the chain of infection within a health facility like a hospital or clinic. The source of the infection includes people and the environment. The infection is spread from the source via the air or through direct or indirect contact. The person who gets infected is the host. How ill the host will become depends on the factors listed in the diagram - for example the host could become very sick if his/her nutritional or immune status is poor, or if the host has other diseases, is a very young child or elderly. It is important to block the chain of infection by preventing or limiting the spread from the source to the host. This edition of Practical Pharmacy focuses on the use of antiseptics and disinfectants which work at the source. We also discuss how to limit the spread of infections through proper hand washing techniques.
Use of antiseptics

**Antiseptics** destroy or inhibit microorganisms without harming body tissues and are designed to be applied on the skin but should not be taken internally. **Disinfectants** are agents that reduce the number of microorganisms on non-living surfaces. They are not generally safe for application to living tissues, but for benches, floors and equipment.

The most important property of these antimicrobials is their selective toxicity—acting in a specific way that inhibits or kills bacteria, but with little or no toxic effect on people.

Many harmless and sometimes useful bacteria normally live and grow on the skin and help prevent harmful bacteria invading. They can, however, cause infection when the skin barrier is broken. Other bacteria can be acquired from the environment and may be disease-causing. Hygiene measures such as hand washing prevent transfer of these.

Antiseptic agents such as ethanol 70%, povidone iodine 10% and chlorhexidine are useful for cleansing non-broken skin before giving an injection or taking a blood sample. However, using these to prevent infection in open wounds is debatable.

On the positive side, use of antiseptics on wounds can reduce risk of infection but on the negative side, they also kill some cells essential to the healing process. Also, the effectiveness of antiseptics in wounds is reduced because of blood and other fluid present.

Wound treatment depends on the area it covers and how deep it is. Surface wounds like skin scrapes need to be cleaned with sterile water, to have pressure applied to stop bleeding if necessary and be covered with a sterile bandage.

For a deeper wound it is usually best to bring the edges of the wound close together with stitches if necessary and to use a dressing that keeps in moisture and keeps out bacteria.

### Antiseptic types

Alcohols such as ethanol 70% (denatured) in antiseptic solutions reduce the number of bacteria living on skin. When applied to skin they kill rapidly by dehydrating bacteria and they must be allowed to evaporate to have this effect. They have no lasting effect so they can be combined with another antiseptic to prolong their action. Alcohols do not require water so they are easy and convenient to use and are the safest known antiseptic agents.

Iodine related agents such as povidone iodine 10% are widely used for antisepsis of skin and wounds as they kill many kinds of bacteria and some fungi and viruses.

Chlorhexidine is used as an antiseptic either alone or in combination with other agents. It is effective against many bacteria, though some are highly resistant. Use is mainly for hand hygiene though it is also used before surgery and in dentistry. Skin irritation is uncommon but direct contact with eyes and ears should be avoided as damage can occur.

**Caution:** Povidone iodine and chlorhexidine solutions can become contaminated with bacteria if left open for a long time and contribute to spread of infection.
Disinfection of surfaces and equipment

What is Disinfection?
Disinfection is defined as any process, chemical or physical, that destroys pathogens such that an item is safe to handle for its intended use.

Why is there need to disinfect surfaces and equipment?
In healthcare settings, surfaces and equipment are in constant use. This creates a potential risk of infection and the spread of disease-producing agents if adequate steps are not taken to keep work areas and equipment clean and safe.

How is Disinfection done?
There are different levels of disinfection, based on the type of surface or equipment. For example, cleaning furniture in the dispensing area in a pharmacy would be different from cleaning a thermometer. With the identification of the risk of infection from the surface or equipment, we can choose an appropriate level of disinfection.

A good guideline that has been used in some healthcare facilities is the Spaulding’s Classification (Table 1). Surfaces and Equipment are divided into Critical, Semi-Critical and Non-Critical categories. A disinfection level (Sterilization, High Level, Intermediate Level and Low Level) is subsequently chosen and a disinfectant (Table 2) with an appropriate method is chosen.

<table>
<thead>
<tr>
<th>Category</th>
<th>Levels of Disinfection</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical</td>
<td>Sterilization</td>
<td>Surgical instruments</td>
</tr>
<tr>
<td>In contact with blood stream</td>
<td>High Level Disinfection</td>
<td>Internal scopes</td>
</tr>
<tr>
<td>Semi-critical</td>
<td>High Level Disinfection</td>
<td>Contact lenses, Mouthpieces</td>
</tr>
<tr>
<td>In contact with non-intact skin</td>
<td>Intermediate Level Disinfection</td>
<td>Thermometers</td>
</tr>
<tr>
<td>Non-critical</td>
<td>Intermediate Level Disinfection</td>
<td>Stethoscope, Blood pressure cuff</td>
</tr>
<tr>
<td>In contact with intact skin</td>
<td>Low Level Disinfection</td>
<td>Furniture, Dishes</td>
</tr>
<tr>
<td>Not in contact patient's skin</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Low level</th>
<th>Intermediate Level</th>
<th>High Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Phenolics</td>
<td>• Alcohols 60 – 90%</td>
<td>• Boiling for more than 20 minutes</td>
</tr>
<tr>
<td>• Quaternary Ammonium Compounds</td>
<td>• Hypochlorites Household bleach 1:100 dilution</td>
<td>• Ortho-phthalaldehyde</td>
</tr>
<tr>
<td>• 3% Hydrogen peroxide</td>
<td>• Iodines and Iodophors</td>
<td>• Glutaraldehyde for 20 minutes</td>
</tr>
<tr>
<td>• Hypochlorites</td>
<td></td>
<td>• Hypochlorites household bleach 1:50 dilution</td>
</tr>
<tr>
<td>• Household bleach (1:1000 diluted solution)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Factors to consider when disinfecting surfaces and equipment

- Surfaces or equipment should be cleaned of any visible debris before using disinfectants.
- Different disinfectants work well with different surfaces. It is important to choose a suitable disinfectant in relation to the situation.
- Protect yourself with proper clothing before disinfecting medical equipment.
- Remember to read the instructions that come with the package or are printed on the labels.

Key points

- Disinfection keeps surfaces and equipment safe from disease producing agents.
- The level of disinfection required depends on the type of surface and equipment.
- Read manufacturer’s instructions before disinfecting.
## Important considerations for safe and effective use of disinfectants and antiseptics

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupational exposure</td>
<td>Vapours may cause respiratory problems and skin exposure may cause dermatitis</td>
</tr>
<tr>
<td></td>
<td>Handle with care</td>
</tr>
<tr>
<td></td>
<td>Follow manufacturers’ instructions</td>
</tr>
<tr>
<td></td>
<td>Wear masks and gloves</td>
</tr>
<tr>
<td>Resistance</td>
<td>Improper use means that antimicrobials may no longer work to kill disease-causing bacteria</td>
</tr>
<tr>
<td></td>
<td>Use only when indicated</td>
</tr>
<tr>
<td></td>
<td>Dilute according to manufacturers’ instructions</td>
</tr>
<tr>
<td>Storage</td>
<td>Improper or prolonged storage may lead to growth of bacteria in them</td>
</tr>
<tr>
<td></td>
<td>Store according to manufacturers’ instructions</td>
</tr>
<tr>
<td></td>
<td>Use within expiry dates</td>
</tr>
<tr>
<td>Preparation</td>
<td>Improper dilution may result in contamination of the solution</td>
</tr>
<tr>
<td></td>
<td>Dilute according to manufacturers’ instructions</td>
</tr>
<tr>
<td>Use</td>
<td>Improper use can lead to resistance, growth of bacteria, harm to the environment and to people, loss of potency</td>
</tr>
<tr>
<td></td>
<td>Accurate directions are important for proper use</td>
</tr>
<tr>
<td></td>
<td>Contact time needs to be adequate to achieve desired level of disinfection</td>
</tr>
<tr>
<td>Disposal</td>
<td>Unsafe disposal can harm the environment</td>
</tr>
<tr>
<td></td>
<td>Dispose according to manufacturers’ instructions</td>
</tr>
</tbody>
</table>

### Action point

A chemical may be specifically an antiseptic or a disinfectant or it may be either, depending on how it is used and at what dilution. Accurate dilution and careful use of these is important to ensure they are effective for their purpose.

### Worldwide, at least 1 in 4 patients in intensive care will acquire an infection during their stay in hospital. In developing countries, this estimate may be doubled.

**Source:** World Health Organization (WHO) Guidelines on Hand Hygiene in Healthcare

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**Disinfectant wipes and hand sanitizers**
Washing hands with soap

Soap doesn’t kill the microbes (germs) found on hands. Rubbing the hands together with soap and water and rinsing loosens the microbes so they slide off the hands in the running water. Research has shown that the temperature of the water doesn’t matter for effective hand washing. If using bar soap, use a soap dish so that it minimises wastage of soap. Keep the soap dish as clean as possible.

Washing hands with just water is not enough!

Hand washing is the act of cleansing the hands in order to remove dirt and micro-organisms (germs).

The Problem:
Many people wash their hands with only water. This helps remove dirt from skin but does not reduce the transmission of diseases!

Why does handwashing work?
Hands act as vectors in transmitting diseases such as pneumonia and diarrhoea by being hosts of disease causing bacteria called pathogens. Hand washing reduces these pathogens to a safe level. This interrupts the transmission of diseases from one person to another.

The Problem:
Pneumonia and diarrhoea are the leading causes of child deaths. Handwashing is cheap! It is the most cost effective way to prevent the spread of pneumonia and diarrhoea.

World Health Organization guidelines on hand hygiene in healthcare

In May, 2009, the World Health Organization (WHO) issued its Guidelines on Hand Hygiene in Health Care, offering a thorough review of evidence on hand hygiene in healthcare and specific recommendations to improve hygiene practices and reduce transmission of germs to patients and healthcare workers (HCWs).

The guidelines target hospital administrators and public health officials as well as HCWs, and they are designed to be used in any setting in which healthcare is delivered either to a patient or to a specific group, including all settings where healthcare is permanently or occasionally performed, such as home care by birth attendants. Individual adaptation of the recommendations is encouraged, based on local regulations, settings, needs, and resources.

Indications for hand hygiene

- Wash hands with soap and water when visibly dirty, when soiled with blood or other body fluids, or after using the toilet.
- Handwashing with soap and water is preferred when exposure to potential spore-forming pathogens, such as Clostridium difficile, is strongly suspected or proven.
- In all other clinical situations, use an alcohol-based handrub as the preferred means for routine hand antisepsis, if hands are not visibly soiled. Wash hands with soap and water if alcohol-based handrub is not available.
- Hand hygiene is needed before and after touching the patient; before touching an invasive device used for patient care, whether or not gloves are used; after contact with body fluids or excretions, mucous membranes, nonintact skin, or wound dressings; if moving...
Handwashing technique with soap and water

Source: World Health Organization

0. Wet hands with water
1. apply enough soap to cover all hand surfaces
2. rub hands palm to palm
3. right palm over left dorsum with interlaced fingers and vice versa
4. palm to palm with fingers interlaced
5. backs of fingers to opposing palms with fingers interlocked
6. rotational rubbing of left thumb clasped in right palm and vice versa
7. rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa
8. rinse hands with water
9. dry thoroughly with a single use towel
0. use towel to turn off faucet
1. and your hands are safe
Alcohol-based hand sanitizers can be used when soap and water are not available for hand washing

Alcohol-based hand sanitizers are disinfectants that contain at least 60 percent alcohol. Sanitizers can be used when soap and water are not available for hand washing. Sanitizers are not effective when hands are heavily soiled with dirt. Other studies showed that washing hands with a mild soap and water for 20 seconds was more effective than applying a 70% alcohol hand sanitizer. Alcohol concentration must be above 60% for alcohol rubs to be effective in killing microbes. However, products with less than 60% alcohol (ethanol) exist.

Indications for hand hygiene

Continued from page 5

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• In all other clinical situations, use an alcohol-based handrub as the preferred means for routine hand antisepsis, if hands are not visibly soiled. Wash hands with soap and water.

Extra information

To date, there is no evidence that antibacterial soaps are more effective than regular soaps. Soaps can be drying to the skin. Moisturizing can prevent skin dryness and cracking.

Key point

Hand hygiene involves washing your hands with water AND soap. This is the cheapest and easiest practice to prevent the leading causes of death in children.
Specific recommendations for hand hygiene:

- Rub a palmful of alcohol-based handrub over all hand surfaces until dry.
- When washing hands, wet hands with water and apply enough soap to cover all surfaces; rinse with water and dry thoroughly with a single-use towel. If possible, use clean, running water. Avoid very hot water, which may raise the risk of dermatitis.
- Use the towel to turn off the tap or faucet, and do not reuse the towel.
- Liquid, bar, leaf, or powdered soap is fine; bars should be small and put in racks that allow drainage.

Hand hygiene techniques

Hand hygiene technique with alcohol-based formulation

Apply a palmful of the product in a cupped hand and cover all surfaces.

Rub hands palm to palm

right palm over left dorsum with interlaced fingers and vice versa

palm to palm with fingers interlaced

backs of fingers to opposing palms with fingers interlocked

rotational rubbing of left thumb clasped in right palm and vice versa

rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa

…once dry, your hands are safe.

Selecting hand hygiene agents

Specific recommendations:

- Provide effective products with low potential to cause irritation.
- Ask for HCW input regarding skin tolerance, feel, and fragrance of any products being considered.
- Find out any known interaction between hand-cleaning and skin-care products and gloves used in the institution.
- Provide appropriate, accessible, well-functioning, clean dispensers at the point of care. Do not add products to a partially empty dispenser. Clean the empty dispenser before filling it up.
Necessary hand hygiene before performing surgery

Specific recommendations for surgical hand preparation are as follows:

• Before beginning surgical hand preparation, remove jewelry. Artificial nails are prohibited.

• Sinks should be designed to reduce the risk for splashes.

• Visibly soiled hands should be washed with plain soap before surgical hand preparation, and a nail cleaner should be used to remove debris from underneath the fingernails, preferably under running water.

• Brushes are not recommended.

• Before donning sterile gloves, surgical hand antisepsis should be performed with a suitable antimicrobial soap or alcohol-based handrub, preferably one that ensures sustained activity. Alcohol-based handrub should be used when quality of water is not assured.

• When using an antimicrobial soap, scrub hands and forearms for the length of time recommended by the maker, usually 2 to 5 minutes.

• When using an alcohol-based surgical handrub, always follow the maker’s instructions; apply to dry hands only; do not combine with alcohol-based products sequentially; use enough product to keep hands and forearms wet throughout surgical hand preparation; and allow hands and forearms to dry thoroughly before donning sterile gloves.

Recommendations for skin care

Some specific recommendations for skin care are as follows:

• Educate HCWs about hand-care practices designed to reduce the risk for irritant contact dermatitis and other skin damage.

• Provide alternative hand hygiene products for HCWs with confirmed allergies to standard products.

• Provide HCWs with hand lotions or creams to reduce the risk for irritant contact dermatitis.

• Use of antimicrobial soap is not recommended when alcohol-based handrub is available. Soap and alcohol-based handrub should not be used together.

Health care workers should be provided with hand lotions or creams to hinder irritant contact dermatitis

Credit: HAI Africa
**Recommendations for glove use**

Some specific recommendations for use of gloves are as follows:

- Glove use does not replace the need for hand hygiene.
- Gloves are recommended in situations in which contact with blood or other potentially infectious materials is likely.
- Remove and discard gloves after caring for a patient, and do not reuse.
- Change or remove gloves if moving from a contaminated body site to either another body site within the same patient or the environment.

**References**


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**Guidelines**

WHO guidelines on hand hygiene in health care (Advanced Draft).

Global Handwashing Day Planners’ Guide

**Web sites**


[http://apt.allenpress.com](http://apt.allenpress.com)