Water related microbial disease guidelines

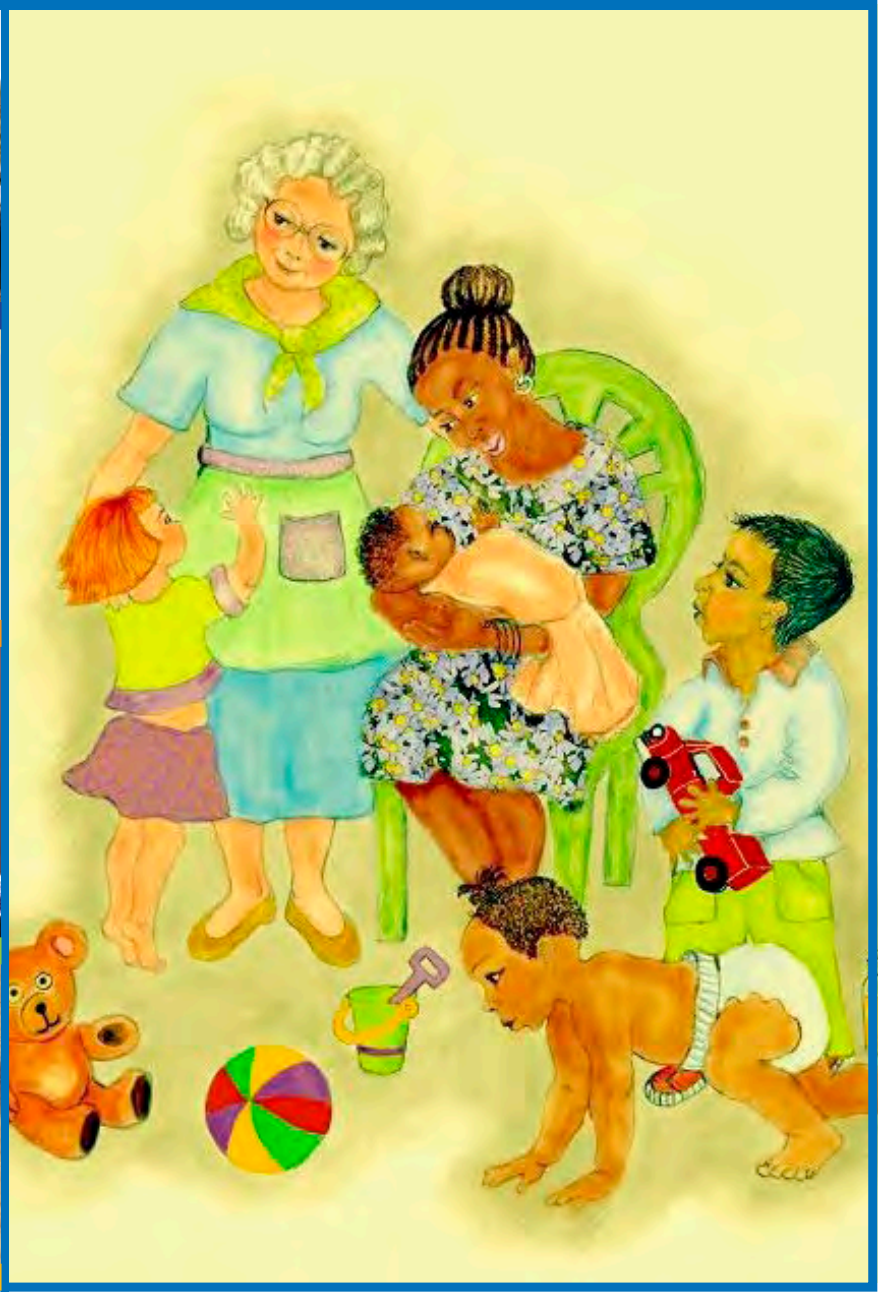
Volume 5: What we and our children need to know – Health and hygiene awareness

VOL 1: What is the problem?

VOL 2: What causes the problem?

VOL 3: How great is the problem?

VOL 4: How dangerous is the problem?



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WATER RESEARCH COMMISSION

TT 460/11

Volume 5

WHAT WE AND OUR CHILDREN NEED TO KNOW:

HEALTH AND HYGIENE AWARENESS

Report to the
Water Research Commission

by

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The publication on this report emanates from WRC consultancy no 431: Guide on water-related microbial diseases.

This guide forms part of a series which is aimed at water supply agencies, water resources managers, workers in health-related fields as well as communities throughout South Africa. The guide is intended to provide awareness-building information to keep water supplies clean of microbial contaminations and thus reduce the incidence of water-related diseases.

The following documents form part of this series of Guides on the Management of Water-related Microbial Diseases:

Volume 1: What is the problem? – Disease characteristics (TT 175/03)
Volume 2: What causes the problem? – A what to do for water suppliers following diarrhoea incidents (TT 297/07)
Volume 3: How great is the problem? – Health Impact Assessment (TT 429/10)
Volume 4: How dangerous is the problem? – Communicating the risk (TT 298/07)
Volume 5: What we and our children need to know – Health and hygiene awareness (TT460/11)

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FOREWORD

More than 1 billion people worldwide do not have access to safe water sources and 2.5 billion people lack adequate sanitation. Due to this, people suffer the consequences of health problems, economic difficulties and social injustices. In addition, nearly one in five child deaths – about 1.5 million each year – is due to diarrhoea. Several studies have shown that improvements in access to safe water and adequate sanitation, along with the promotion of good hygiene practices, can help prevent childhood diarrhoea.

People need to improve attitudes, both with respect to hygiene in the home and with regards to faecal contamination. The home environment is generally where all human activities occur. In the home, the main transmission routes for infection include hands, cloths, and hand and food contact surfaces. The participation of women in hygiene promotion activities is important because of their central role in domestic activities such as bathing/washing clothes or utensils, collection of water and selection of water sources, educating children about personal hygiene, cleaning babies and disposing of their faeces, safe water storage, disposal of human excreta and refuse, prevention of accumulation of water in the home and peri-domestic environment and preventing vector breeding.

This guideline document presents the fifth in a five volume series aimed at addressing the question of how best South Africans can protect themselves from water-related microbial diseases. It provides practical guidelines and awareness of hygiene and sanitation practices at the household level from the point of view of the family and the range of actions which the family members need to undertake in order to protect themselves from infectious and emerging diseases. If every member in the family understands the means how to prevent infections through proper hygiene practices and improve hygiene behaviour, the transmission of diseases will be eliminated and healthier life styles will be achieved. Several sources world-wide have been used in the preparation of this guideline document. Other aspects (and actions) related to action to promote hygiene are also included.

The primary target audience for this guideline includes mothers, mothers-in-law, grandmothers, caretakers of children and males (where appropriate) who have responsibility for improving hygiene standards at the household level, community workers and teachers (school teachers, public health educators, community nurses, etc.) who have responsibility for implementing programmes and school children who can use the guideline for learning how to improve their living environment.

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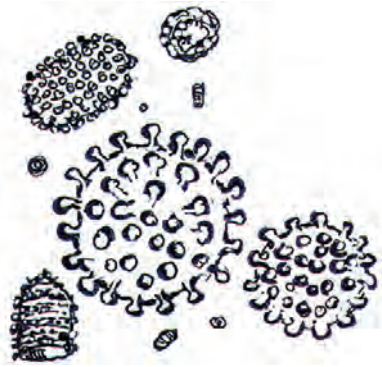
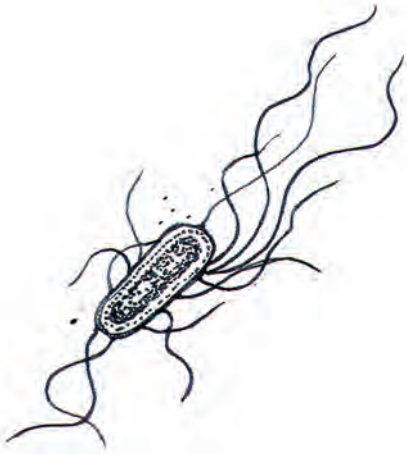
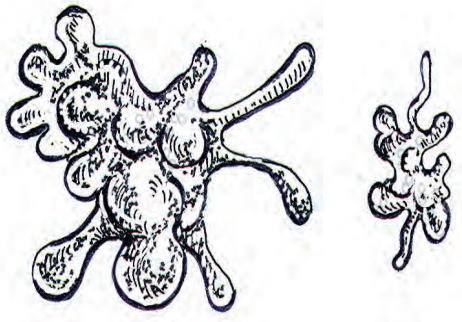


PART 1

What are germs?





WHAT ARE GERMS?

- Germs are small living organisms which cannot be seen with the naked eye and are everywhere (omni-present)
- They can only be seen with a microscope and are called micro-organisms
- They are harmful micro-organisms (pathogens) such as bacteria, viruses, parasites or fungi that could cause infections and diseases and make you sick.

- A person get germs from contact with other infected or sick people, from handling contaminated food or dirty utensils (such as cloths, cups, spoons, etc.) during their daily activities.
- These germs can then be passed on to other people, or to other foods or water.
- Hands are very important “germ spreaders” in the home because hands can spread germs from faeces to food or water.
- Some germs such as fungi spores, or bacteria attached to skin scales, are carried in the air.
- Some germs are carried in aerosol droplets produced by coughing, sneezing or vomiting.
- Sometime direct contact between an infected/sick person and a healthy person can transmit germs (such as kissing or touching).
- Germs which cause diarrhoeal diseases are shed in very large numbers in the faeces and vomit from an infected or sick person.
- Some infections are transmitted by direct contact from person-to-person (such as measles, HIV, etc.) through bodily excretions like sexual contact or blood. This means that hygiene practices can do little to prevent transmission of infection.
- Clothing and linens can also transfer germs if it is dirty.

HOW ARE GERMS SPREAD?

The transmission cycle of disease has different elements:

The pathogen: the micro-organism that makes you sick and cause the infection or disease.

The host: the person or animal who are infected (carrying the pathogen).

The exit: the method the pathogen uses to leave the body of the host.

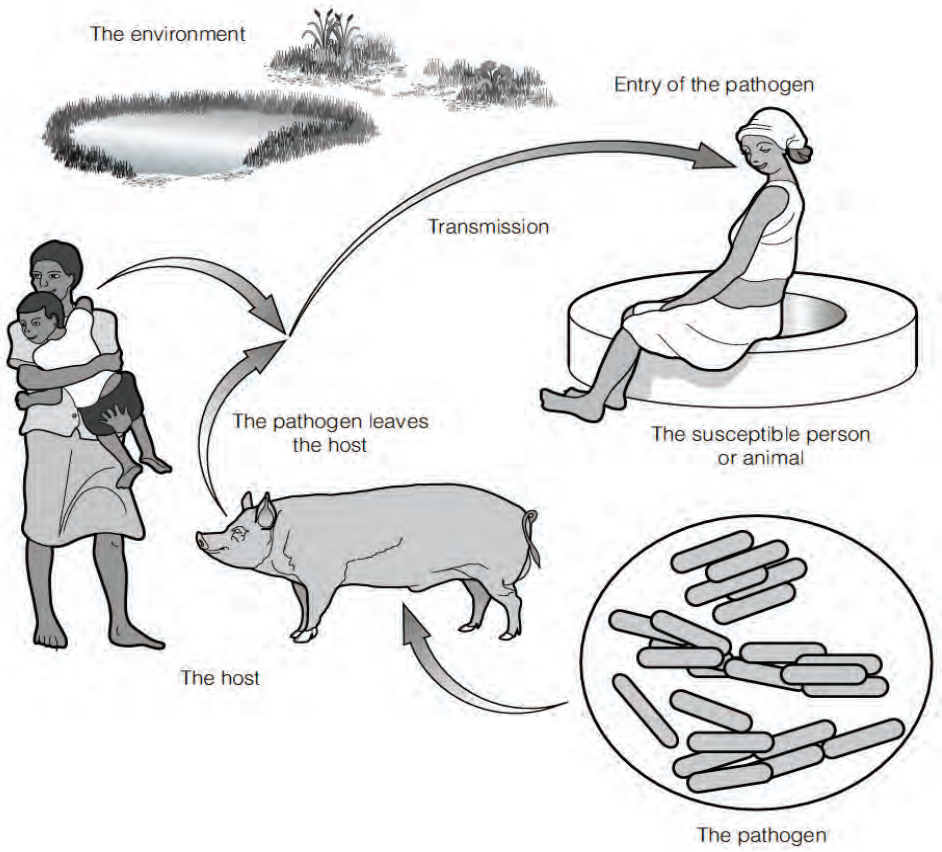
Transmission: how the pathogen is transferred from the host to another person or animal. It could include different stages in the life cycle of the pathogen in the environment.

The environment: the area/region in which transmission of the pathogen takes place.

The entry: the method the pathogen uses to enter the body of the person or animal (susceptible host).

The susceptible host: the potential future person/animal who is infected with the pathogen.

Vehicle of transmission: this can be blood, sputum, through coughing, hands, other bodily fluids, faeces, shared needles.



WHO CAN BECOME SICK?

People with indwelling catheters

People undergoing a specific drug treatment which affects the immune system (such as steroids and anti-cancer drugs)

People older than 65 years (the elderly) because their immune system becomes “weaker

People who have a disease which weakens the immune system (such as HIV and AIDS or diabetes)

People who have open wounds and/or pressure sores

People who are under the age of five years (the very young) because their immune system is still developing

Woman who are pregnant

People who are under stress, have a poor diet or drink too much alcohol

WHY IS PERSONAL HYGIENE IMPORTANT?

Micro-organisms are found in all areas of the skin and mucous membranes (the mouth and nose) and can either be transient or resident flora.

- **Resident flora** (normal flora) is those micro-organisms that colonise or live on, and are normally found on, the skin. They are not generally pathogenic (disease causing) except if transferred to other areas of the body, e.g. the urinary tract, or if they enter a cut or abrasion.

- **Transient flora** is those micro-organisms that are picked up onto the skin (mainly the hands) by touching surfaces, food, infected/sick people and animals/pets during our day to day activities.

THE IMPORTANCE OF HAND WASHING

When to wash hands:

- After using the toilet
- After disposing of faeces
- After changing baby's nappies and disposing of their faeces
- Before preparing food
- Before eating
- Before feeding children
- Immediately after handling raw food
- After contact with contaminated surfaces, e.g. rubbish bins, cleaning cloths
- After handling pets and domestic animals
- After contact with blood or bodily fluids, e.g. faeces, vomit
- Before and after dressing wounds or giving care to a sick person
- After wiping or blowing your nose.

What to use to wash hands

Alcohol-based products:

- Also called hygienic hand rubs (concentration of alcohol should be 60% v/v)
- Make the hands hygienically clean by killing germs in situations where hand-washing is not possible
- It is not effective on dirty hands because alcohol does not penetrate soil very well.

Soap-based products:

- Also called hygienic hand washes
- Rely on a combination of germ kill and germ removal
- Using a soap-based product containing an antimicrobial (e.g. antibacterial soap bar) that kills germs, for hand washing, may be recommended in situations of extra risk, such as when caring for people who are immune-compromised and therefore more vulnerable to infection, or for people who are infected.

How to wash your hands:

Always wash hands under warm running water

Apply soap/ash/soil

Rub hands together for 15 to 30 seconds

Pay particular attention to fingertips, thumbs and between fingers

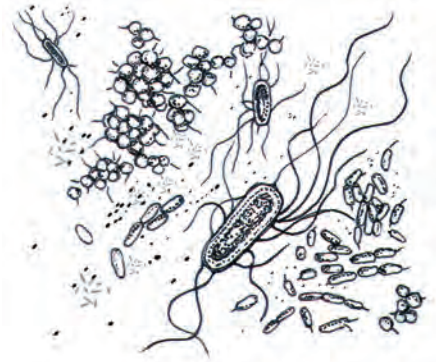
Rinse well under running water

Dry thoroughly using a clean towel

COMMONLY OCCURING HYGIENE RELATED DISEASES CAUSED BY GERMS

(Please refer to Volume 1: What is the problem? – Disease characteristics. TT 175/03)

Bacteria



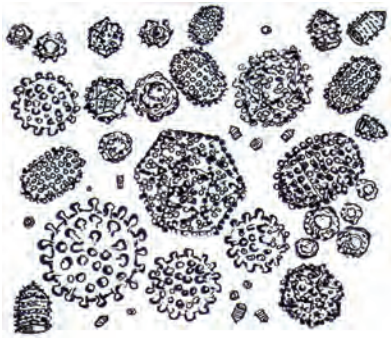
Diarrhoeal diseases:
Cholera (Vibrio cholera),
typhoid (Salmonella typhii),
dysentery (Shigella spp),
Salmonella,
Campylobacter,
Escherichia coli

Others:
Staphylococcus aureus (food poisoning),
Legionella pneumophila (respiratory),
Chlamydia trachomatis (trachoma

Fungi

Candida albicans (thrush),
Aspergillus

Viruses

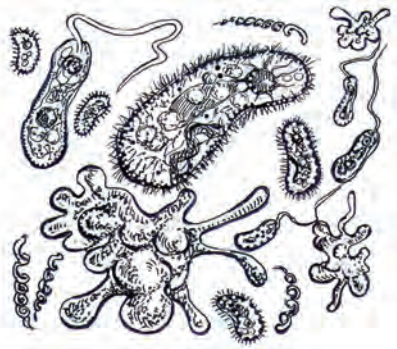


Diarrhoeal diseases:
Norovirus
Rotavirus

Colds and influenza:
Rhinovirus,
Influenza virus

Others:
Hepatitis and poliovirus

Protozoa



Diarrhoeal diseases:
Cryptosporidium
Giardia
Entamoeba

Vector-borne diseases (diseases which is transmitted by pathogenic microorganisms from an infected person to another person by an arthropod or other agent (insect/rodent), sometimes with other animals serving as intermediary hosts)

Malaria (protozoa)
Dengue (virus)
Shistosomiasis (helminth)
Trypanosomiasis (protozoa),
Yellow fever (virus)
Filariasis (helminth),

WHAT IS DIARRHOEA?

Definition:

If a person is having loose or watery stools at least three times per day, or more frequently than normal for an individual.

Types of diarrhoea:

1) Acute watery diarrhoea:
    - Is associated with significant fluid loss and rapid dehydration in an infected person.
    - It usually lasts for several hours or days (less than 14 days).
2) Bloody diarrhoea:
    - Often referred to as dysentery.
    - Has visible blood in the stools.
    - Is associated with intestinal damage and nutrient losses in an infected person.
3) Persistent diarrhoea:
    - Is an episode of diarrhoea with or without blood.
    - The episode lasts at least 14 days.
4) Diarrhoea with severe malnutrition:
    - Often referred to as marasmus or kwashiorkor.
    - Is associated with severe systemic infection, heart failure and vitamin and mineral deficiency.

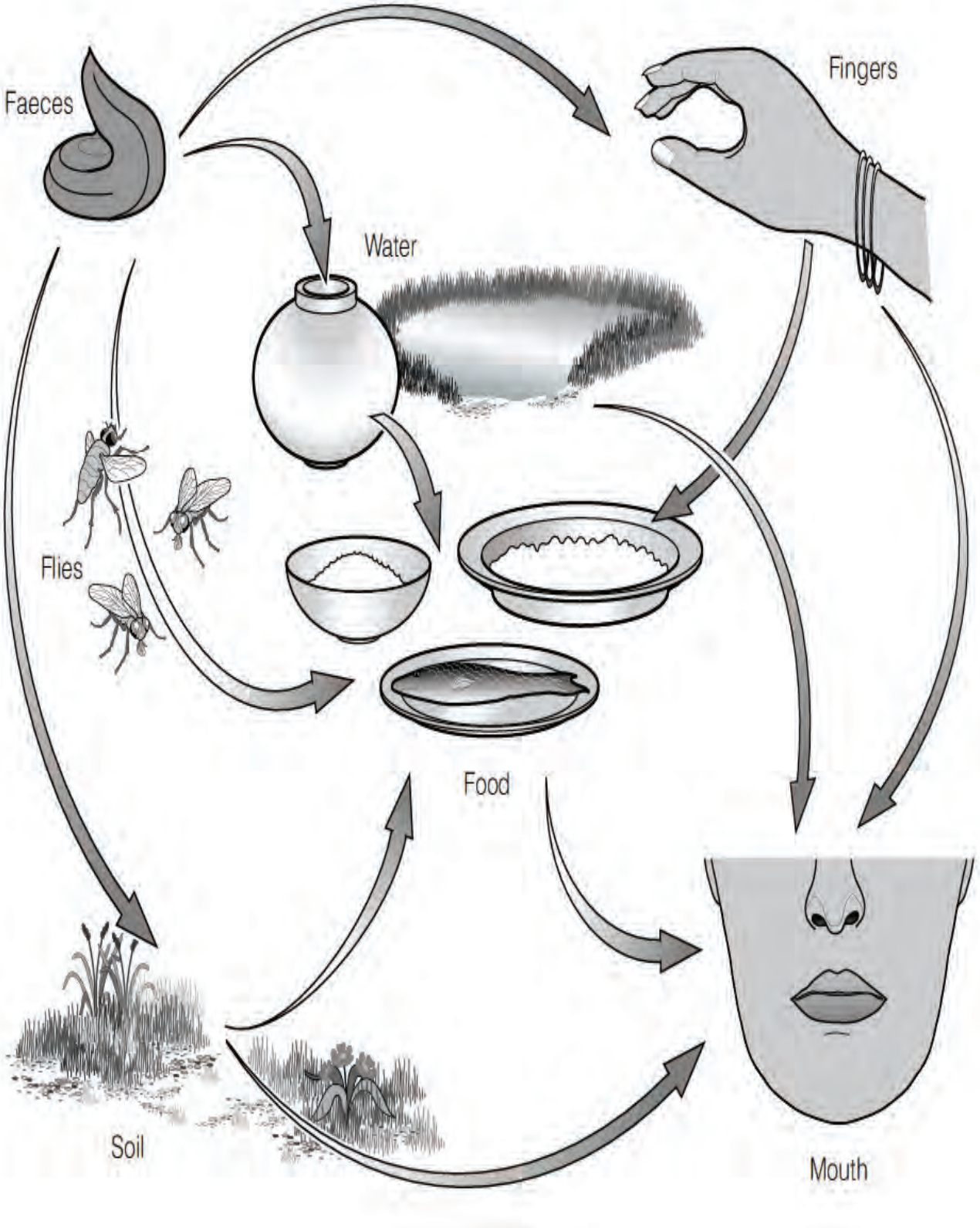
How is diarrhoea pathogens transmitted?

- Most pathogens that cause diarrhoea share a similar mode of transmission: from the stool of one person to the mouth of another (faecal-oral transmission)
- There may be differences in the number of micro-organisms (pathogens) needed to cause the illness or disease
- There may be differences in the contamination route the micro-organisms (pathogens) takes while travelling between two persons.

How can diarrhoea be prevented?

- Improving access to clean water and safe sanitation
- Promoting hygiene education
- Exclusive breastfeeding (consult doctor)
- Improved weaning practices
- Immunizing all children (especially against measles)
- Using proper sanitation infrastructures (latrines)
- Keeping food and water safe
- Washing hands with soap before touching food
- Sanitary disposal of stools.

FAECAL ORAL TRANSMISSION ROUTE



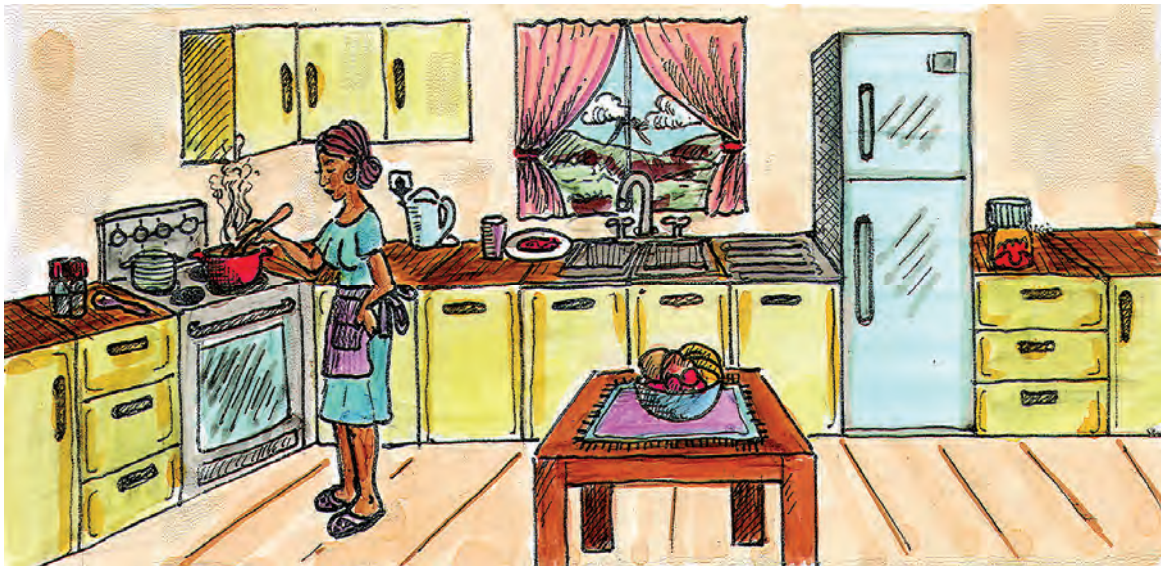

CONTAMINATION ROUTES
POLLUTION
DIRTY HANDS WHEN EATING PROMOTES DISEASE
UNCOVERED FOOD & WATER IS UNHYGIENIC


UNACCEPTABLE HABITS
STORING OF FOOD OR WATER CARELESSLY
BAD HOUSEKEEPING
NO HAND WASHING:
BEFORE: HANDLING FOOD
EATING
AFTER: GOING TO THE TOILET AND CHANGING BABY'S NAPPY
DEFECATE IN VELD/OPEN SPACE


CONTAMINATION BARRIERS
WELL WASHED HANDS COVERED FOOD & WATER IS IMPORTANT
GOOD HOUSEKEEPING
SAFE REMOVAL OF CHILDREN'S FAECES WASH HANDS
EMPTY & WASH POTTY
SOAP
WASHING HANDS

PART 2

A clean domestic environment



THE ROLE OF THE HOME ENVIRONMENT IN THE SPREAD OF GERMS

- Most germs can survive for some time on dry surfaces.
- Germs survive better if they are protected by dirt or other soil such as food material.
- Germs can be spread from one site or surface to another during our normal daily activities. The main surfaces which spread germs are the hands, hand contact surfaces, food contact surfaces and cleaning utensils such as cloths, mops, etc.
- Germs can also be spread from one surface to another by insects such as flies.
- Germs can also be spread through the air on the surface of dust particles or in aerosol particles generated by coughing, sneezing or toilet flushing.
- Germs can be spread by flies, cockroaches, rats and mice which thrive in refuse such as food scraps and peelings from fruit and vegetables.
- Indiscriminate disposal of household solid waste in the vicinity of the home, adds to fly breeding and harbouring of rats and insects.
- Other aspects in and around the home environment can also play a role in the transmission of germs. These include:
  - Dirty courtyards
  - Presence of domestic animals and pets
  - Animal and human faeces in and around the home
  - Rain water, silage and wastewater
  - Inadequate disposal of household refuse
  - Storage of fodder and grain
  - Children's play area.
- Hygiene-related problems include damp floors, overcrowding and lack of adequate ventilation.
- Women, who spend the most time in the home, are particularly exposed to serious smoke hazards due to lack of proper exhaust arrangements in the kitchen.
- Many homes do not have a separate kitchen or cooking area, hence indoor air pollution permeates the entire dwelling, contributing to high mortality rates in children under five, from respiratory infections.
- Allergens from house dust mite faeces are also implicated in respiratory disease such as asthma.

SAFE DISPOSAL OF HOUSEHOLD WASTES/REFUSE

- Use newspapers to wrap aerosol cans, glass bottles, broken crockery and broken glass.

- Use black bags for paper, paper towels, cardboard, dead flowers and plastic bottles.

In urban areas

- Refuse should never be discarded onto the ground – always put into containers and hand over to the municipal collectors or put directly into the municipal bins regularly.

- Indoor waste bins should be kept clean and dry. Foot-operated pedal bins are preferred. This prevents hands picking up germs by touching the bin lid.

- Outside bins should have tightly fitting lids such that rats, rodents, flies and other insects do not have access to the waste.

- The municipal authorities should make proper arrangements for regular and separate house-to-house collections of infectious and non-infectious wastes, and for their safe and sanitary transportation and disposal.

- Wherever house-to-house collection is not possible, community bins (one bin for 10-20 houses) should be provided. The bins should be designed such that rats, rodents, flies and other insects do not have access to the waste.

- Infectious waste should be stored in separate, secure containers and disposed of as soon as possible.

In rural areas

- Refuse should never be discarded onto the ground, but always put into containers.

- Individual homes or a group of homes should have on-site treatment of garbage, along with animal dung, by way of composting sites, garbage pits or bio-gas generation.

- Infectious waste should be buried in a pit, or disinfected before disposing of with the general refuse.

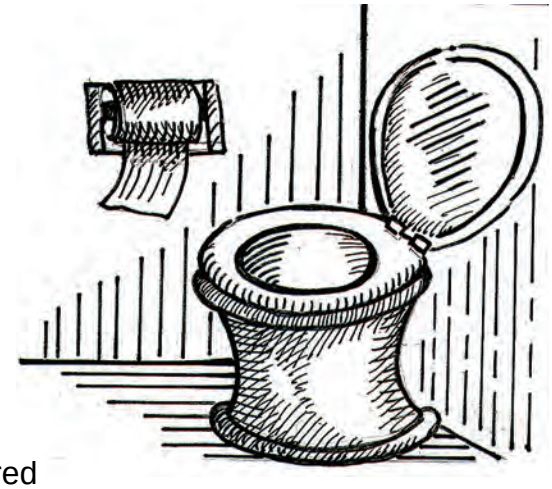
CLOTHS AND SPONGES AND WASHING UP BRUSHES

- Cloths and sponges are considered to be sources and a spreaders of germs
- Never use a dirty cloth or sponge – always use a cloth or sponge that is hygienically clean
- Dirty cloths and sponges pose a high risk of cross-contamination for a number of reasons:
  - they are used to clean items and surfaces that are soiled with dirt and organic matter; therefore, they inevitably become contaminated with micro-organisms and act as reservoirs
  - they are touched by hands, which in turn become contaminated
  - even if they are cleaned thoroughly, it is likely that some micro-organisms will survive and multiply to high numbers over a period of hours
  - they can contribute to the spread of micro-organisms if not adequately decontaminated between uses or discarded
- Cloths and sponges can be hygienically cleaned as follows:
  - cleaning with soap or detergent and warm water and soaking in a disinfectant for 20 minutes, OR
  - cleaning with soap or detergent and warm water and immersing in boiling water for 20 minutes, OR
  - washing in a washing machine at 60°C
- After hygienic cleaning, dry as rapidly as possible
- Use disposable cloths or paper towels where possible, especially for removing raw food residues, faeces and vomit
- Washing up brushes: After each use, clean using detergent or soap, rinse with hot water and leave head-up to dry

MOPS AND BUCKETS

- Clean mops using detergent or soap and warm water and soak in disinfectant for 20 minutes, wring out until dry as possible and leave head-up to dry.
- Clean bucket using detergent or soap and warm water and leave upside down to dry.

TOILETS AND LATRINES



- Toilets act as reservoirs for microbes because they are inevitably wet and contaminated with excreta, thus providing ideal conditions for the growth of micro-organisms.
- Micro-organisms can be transmitted from toilets and latrines either by direct contact with these items or indirectly via contaminated hands, or via insects.
- In general, the risk from a toilet bowl is not high if the toilet is functioning correctly and is kept covered by a lid, although some splashing and aerosol formation can occur during flushing.
- If an individual within the household has diarrhoea, they excrete large numbers of pathogenic micro-organisms during and for some time after their illness. In this situation, there is a considerable increase in the risk of spread arising from splashing and aerosols.
- In the toilet bowl, pathogenic micro-organisms are most usually found under the flushing rim and in the scale that forms on the porcelain surface.
- There is potentially a greater risk of spread from babies with diarrhoea because they have no control over their bowels and they rely on others to meet their hygiene needs.
- Older children and adults, who lose their ability to maintain their own hygiene or lose bowel control due to infection, ill health or age, also have the ability to spread disease.

- The toilet or latrine needs to be kept clean, including any surfaces which are touched by hands.

- The toilet or latrine itself should be flushed with water after each use. Flushing will remove most of the faecal material, but scale and biofilms which can harbour germs quickly build up on the inner surfaces of a toilet and are not removed by flushing alone.

- The toilet or latrine bowl should regularly be scrubbed clean using a soap or detergent solution applied with a brush, followed by flushing or rinsing.

- The toilet or latrine should be kept covered to prevent transfer of germs by flies, etc.

- The surfaces of, and surrounding, a toilet or latrine including the toilet rim, seat, lid and flush handles should also be cleaned regularly using a detergent solution applied with a cloth. If possible these surfaces should also be disinfected, since cleaning with a cloth may leave some residual germs behind.

- A separate cloth should be reserved for cleaning the toilet and toilet area.

- After cleaning the toilet, the toilet brush and cloth should be cleaned with a detergent and then rinsed and thoroughly dried.

- When there is diarrhoea, add disinfectant to the toilet bowl before flushing, with the lid down, to prevent spread of micro-organisms via aerosolised droplets of toilet water.

- After cleaning toilets and latrines, wash hands thoroughly or protect hands from soiling by wearing rubber gloves.

- In homes where sewage is disposed of “on site”, e.g. in septic tanks or pits, take care not to introduce excessive amounts of detergent, soap or disinfectant into the system. These systems rely on biodegradation by environmental micro-organisms to kill faecal germs. The biodegradation can be inhibited by exposure to high levels of soap, detergent or disinfectant.

DISPOSAL OF FAECES

- One gram of faeces can contain up to 1 million bacteria and 10 million viruses and many illnesses, especially diarrhoea, come from germs found in human faeces.

- Some people, domestic animals and pets carry germs without any visible signs of being ill.

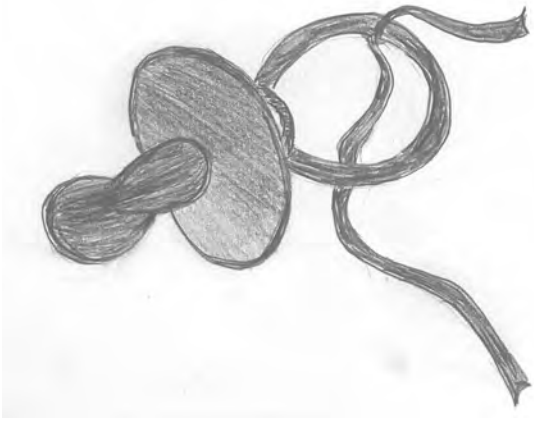
- If the diarrhoeal causing germs get into water or into food, or get onto the hands, utensils or surfaces, particularly those which come into contact with food or which are regularly touched (e.g. door handles, tap handles or toilet flush handles), they can be swallowed and cause illness.

- When someone has been infected they may continue to shed the germs in their faeces for days or weeks after they have recovered.

- If you don’t have a toilet:
    - do not defecate in the vicinity of the house
    - bury faeces immediately – do not leave them lying around

How to dispose of baby faeces

- Disposable nappies should be sealed in a plastic bag and placed in a waste bin
- Reusable nappies
    - transfer the faecal matter to the toilet
    - place nappies in a nappy bucket and soak in bleach disinfectant
    - nappy bucket content should be flushed down the toilet and not poured down the kitchen sink
- Ensure that nappies are washed separately from other laundry items, particularly cloths which are used in the kitchen
- Drying nappies thoroughly, preferably in direct sunlight will kill all germs
- Mothers should wash their hands after cleaning their babies, before undertaking other household activities, including cooking and serving food
- Clean the baby’s bottom with toilet paper and place paper in the toilet
- Surfaces contaminated with faecal matter (e.g.. changing mats) should be cleaned and disinfected



How to dispose of children's faeces

- Small children should be encouraged to use a potty.
- Anal cleansing after defecation is important to get rid of all faecal material which can also contain thousands of germs.
- Use toilet paper to clean the child's bottom.
- ALWAYS wash your hands after cleaning a child following defecation.
- The contents of the potty, toilet tissue, etc. should be disposed of into a toilet or latrine and the potty then rinsed (the rinsing disposed of in the same way) and the rinsing disposed of in the same way. The potty should be rinsed and dried and kept covered to avoid attracting flies.
- If children defecate without using the toilet or potty, the faeces should be cleaned up immediately (not left lying around the environment of the home) and put down the toilet or latrine, or buried. If this occurs inside the home, the floor area should be cleaned and if possible disinfected.
- In rural areas where toilet paper is not available, wash the child's bottom under running water, or water from a bucket, and collect the rinsing in a potty/bucket because the rinsing will also contain germs.

BATHS, SINKS, SHOWERS, AND TILED SURFACES

- People with wounds, catheters or other invasive devices that break the skin may be at risk from contact with dirty baths, showers and whirlpool baths.
- People with underlying respiratory conditions, such as cystic fibrosis, and older people are at increased risk of infection caused by aerosolised micro-organisms spread by showers.
- Mould spores can survive for very long periods of time.
- Damp and mouldy living conditions have an adverse effect on health, especially among children.
- Moulds can exacerbate asthma and other respiratory diseases.

- **Baths and sinks:**
  - Clean using a detergent or disinfectant followed by thorough rinsing and leave to dry.

- **Showers:**
  - Showers need to be kept clean and regularly treated to avoid the build up of biofilms or fungus growth (mildew).
  - If a shower is not used for several days it should be turned on and allowed to run on the hot setting for a few minutes before the next use. This action will flush the system and remove any micro-organisms that may have accumulated.

- **Tiles and shower curtains:**
  - Tiled surfaces need to be cleaned regularly.
  - A solution of bleach (0.5 to 2% w/v available chlorine) in soap or detergent will help mould removal, but an anti-fungal product may also be needed.
  - An anti-fungal product may be needed.
  - Loose tiles should be reapplied and re-grouted to prevent the growth of mould.

FLOORS AND SOFT FURNISHINGS

- Microbes continually enter the home and contaminate floors via shoes, the feet of pets, etc.

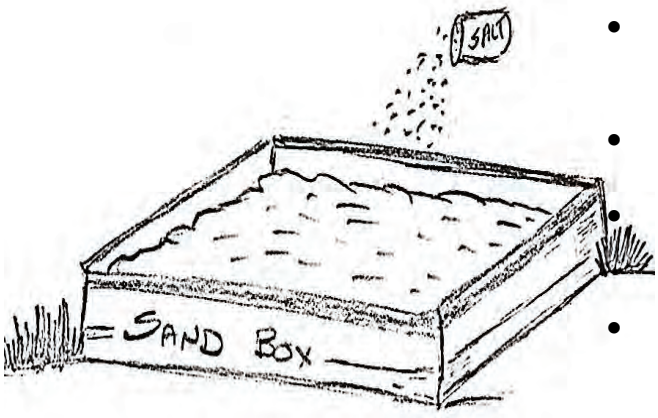
- In general, the risk of infection resulting from contaminated floors or soft furnishings is very small. The risks increase if:
    - there is a spillage of an infectious substance such as faeces, vomit or blood
    - there are young children crawling on the floor
    - there are domestic animals or pets such as dogs, cats, etc. in the home
    - food is prepared on the floor.

- If the floor is contaminated with an infectious substance (infected faeces or vomit), it will need to be hygienically cleaned:
    - disinfectants, particularly bleach based disinfectants, tend to be inactivated by dirt, body fluids, etc.
    - it is important to remove as much of the 'soil' as possible before cleaning the surface with a disinfectant.
    - the person who deals with the contaminated material must protect themselves by wearing disposable gloves and ensures that the contaminated material, cloths, etc. are disposed of safely.
    - if a carpet is affected, any disinfectant will need to be carefully selected to avoid damaging the material.
    - steam cleaning machines are now available and the high temperature of the steam will kill any microbes present.

- Keep other surfaces clean by vacuum cleaning, dusting and brushing

- Detergent or soap and water is sufficient for cleaning floors

SANDPITS



- Indoor and outdoor sandpits should be covered to avoid contamination by pets

- The sand should be changed regularly

- Playing balls from sandpits should be cleaned regularly

- Add coarse salt to eliminate the presence of worms

TOYS

- Toys can become contaminated quite easily
- Toys are passed from child to child and are often put into mouths
- Store toys in a lean container or cupboard
- Ideally children should have their own toys, rather than sharing them
- Clean toys as frequently as possible, but at least whenever soiled
- Infections caused by bacteria and viruses have been isolated from toys. Some viruses such as rotaviruses can easily contaminate surfaces either directly or through droplets from saliva or vomit. These viruses can remain viable on surfaces such as toys for many hours.
- Hard toys which are contaminated can be hygienically cleaned by scrubbing with soapy warm water and a brush, rinsing with clean water and drying and wiping with alcohol wipes or by scrubbing with soapy warm water and a brush, immersing in a mild bleach solution for 20 minutes, rinsing with clean water and air drying or by putting in the dishwasher or washing machine
- Soft toys can be cleaned in the washing machine
- Soft toys that have become heavily contaminated, may need to be thrown away
- Water play equipment should be emptied at the end of the day and stored cleaned and dry
- Play-dough should be changed regularly

CHEMICAL USE IN THE DOMESTIC ENVIRONMENT

- Chemicals used as pesticides and herbicides can be very dangerous if even small quantities get into water or food, or onto hands or feet.

- Chemical containers and clothes worn when handling chemicals should not be washed near a household water source.

- Pesticides and other chemicals should not be used around the household or near a water source.

- Chemicals should not be stored in or near drinking water containers or near food.

- Never store water in containers which was used previously for pesticides or fertilizers

Paraffin

- It is dangerous and can kill if not treated properly
- Keep out of sight for children
- Keep out of reach of children
- Store in a special marked bottle (don't use a cold drink bottle or milk container)
- Put the cap of bottle back on immediately after use
- Use a funnel to pour paraffin – avoid using a cup
- Put the funnel away after usage
- Always pour paraffin in a well-ventilated area to get rid of fumes
- Paraffin should be clear in colour and not contaminated with other fuels such as petrol or diesel – smell the paraffin when you buy it
- Buy a safe stove, heater or lamp to prevent injuries
- Always turn appliances off when you leave home or go to sleep
- Never leave small children alone in the home with paraffin appliances
- Put appliances on a steady and even surface so it cannot be knocked over or pulled over
- Keep a bucket of sand ready to put out paraffin related fires
- **ALWAYS** put paraffin appliances away from anything that can burn such as curtains, soft furnishings, etc.
- Use a funnel to pour paraffin. Avoid using a cup. Also put funnel away after usage.

SELECTING A DISINFECTANT

WHAT PROPERTY DO I NEED	WHAT PROPERTIES DOES THE PRODUCT HAVE			
	Bleach Either chlorine based, e.g. sodium hypochlorite or oxygen based, e.g. hydrogen peroxide	**Alcohol** Ethyl alcohol or isopropyl	**Phenolics** (e.g. Jeyes fluid) and pine fluids	Products containing other active, e.g. quaternary ammonium compounds (quats), chlorhexidine, triclosan
Which types of germs do I need to clean?	Kills all types of bacteria, fungi, viruses and bacterial and fungal spores at the recommended concentration*	Kills bacteria and fungi but is only effective against some viruses	Kills bacteria and fungi but is only effective against some viruses	Action varies according to concentration Some products are only formulated to prevent the growth of germs Active against bacteria and fungi but might have limited action against viruses Check manufacturers information
How quickly does the product need to act?	Acts very quickly within 1 minute Longer contact times are needed for spores	Acts very quickly within 1 minute	Check manufacturers information	
Are there any soil, dirt or food residues on the surface?	Affected by soiling If soiling is light, clean and then disinfect or use combined bleach/cleaner formulation. If heavily soiled, always clean before disinfecting	Not effective on dirty surfaces or dirty hands	Efficacy can be reduced in the presence of soiling You may need to use higher concentrations Follow the manufacturer's guidelines	
How hard is the water?	Not inactivated by hard water	Not relevant – products are used undiluted	Varies, but action may be affected by hard water Check the manufacturer's instructions	
What type of surface needs disinfecting?	Suitable for hard surfaces, including food contact surfaces, cloths and white laundry	Suitable for hands and small surfaces, e.g. work surfaces, thermometers	Suitable for all types of hard surfaces, sinks, drains, etc. Not suitable for food contact surfaces	Suitable for hand and surfaces, e.g. work surfaces Some products suitable for food contact surfaces
Are there any other possible down sides?	Chlorine-based bleaches could damage and/or bleach coloured fabrics, carpets, soft furnishings and erode metal surfaces	May dry the skin Use a product that contains emollient	Phenolics can have a strong odour Can be inactivated by detergents in other cleaning products	Can be inactivated by detergents find in other cleaning products

For bleach, e.g. chlorine based, the recommended concentration can vary from as low as 250 ppm (for infant feeding bottles) up to 10 000 ppm (for treatment of blood) according to how the bleach is to be used and what it is used for. It is therefore very important to follow the specification guidelines of the manufacturer

PART 3

Proper food handling

THE ROLE OF FOOD IN THE SPREAD OF GERMS

- Some foods such as raw meat, poultry, vegetables, dairy products are more likely to be contaminated with germs than others.
- Meat and poultry can become contaminated with germs or worms from the animal from which it is taken, or it can become contaminated during processing, by cross contamination in the processing plant, or from food handlers' dirty hands.
- Vegetables can become contaminated if the crop has been irrigated with contaminated water as well as during handling with dirty hands.
- If the cooked food is incorrectly stored, germs will grow and cause infection when the food is eaten.

WHAT IS FOOD POISONING?

- Food poisoning is any disease (infectious or toxic) caused by the consumption of contaminated food or water.
- It can be caused by bacteria, viruses, fungi or protozoa, but also by chemicals or pesticides.
- Some bacteria produce a poison (toxin) within the food. Cooking may kill the bacteria but doesn't remove the toxin and if the food is eaten, the toxin can cause illness.
- Other bacteria may be in food when eaten and then produce harmful toxins once they have reached the intestines and multiply.
- Viruses cannot grow in food, but can survive.
- Symptoms of food poisoning usually start 1-36 hours after eating contaminated food and can last for up to seven days with abdominal pain, diarrhoea, vomiting, nausea (feeling sick, dizzy and faint) and fever.

HOW TO PREVENT FOOD POISINING

1. Keep clean – prevent cross contamination

DO	DO NOT
Make food preparation surfaces hygienically clean before preparing food	Wash the meat chopping board in the same bowl as crockery
Wash and dry hands after handling high risk food groups and before handling ready-to-eat food	Use fingers to taste food during preparation. Use a clean spoon
Immediately clean surface which are contaminated by hands, food and cloths	Use a utensil to serve or serve food if previously used with raw food
Wash utensils and cutting board immediately after preparing raw foods in hot soapy water, rinse in clean water and leave to dry	Wash your hands in the washing-up water. Always use clean running water
Wash and dry cloths after every use. Do not use a dirty cloth on a clean surface	
Avoid preparing food if you are sick	
Protect the kitchen area and food from insects, domestic animals and pests	

2. Separate raw and cooked foods

DO	DO NOT
Separate raw meat, poultry and seafood from other foods during storage and during preparation	Use the same utensils for raw food and preparation of salads
Use separate equipment and utensils such as knives and cutting boards for handling raw foods	
Store food in containers to avoid contact between raw and prepared foods	
In the fridge store prepared food above raw meat and chicken to avoid juices dripping into prepared food	
Make sure cloths that have been used for raw food do not touch other foods	

3. Cook food thoroughly

DO	DO NOT
Cook food properly to kill germs	Reheat food more than once
Make sure meat, poultry eggs and seafood is cooked all the way through – juices from meat must run clear when picked by knife	
Keep food cold or stored in refrigerator	
Frozen food should be defrosted prior to cooking – preferably in a refrigerator	
Cooked food should be eaten as soon as possible or thoroughly reheated	
Hot food should be kept hot for a maximum of 2 hours if not eaten immediately	

4. Store food properly

DO	DO NOT
Food should be eaten as soon as possible after cooking	Put hot food into the fridge as this causes the temperature to rise
If food is kept for more than 2 hours, it must be kept steaming hot or very cool	Refreeze food once it has been defrosted – unless you have cooked it first
Pay attention to expiry dates and discard food when the date has passed	Store leftover food in the fridge for more than 3 days
Cooked food should be cooled quickly to prevent regrowth of germs	
Clean the internal surfaces and the door handle of the fridge regularly	

5. Use safe water and raw materials

DO	DO NOT
Use safe water for preparing foods – if necessary treat water first	Use food beyond its expiry date
Select fresh and wholesome foods	
Choose foods processed for safety such as pasteurised milk	
Food and vegetable to be eaten raw should be peeled, washed and rinsed using clean water	

INFANT AND BABY FOOD

- Infants and babies are much more likely than adults to become sick from eating contaminated food or drinking contaminated water because their immune systems are still developing
- Because their immune system is not fully developed, even very small "doses" of germs can cause illness
- Breast milk is the safest for babies
- Expressed breast milk can be stored for up to 8 hrs in a clean covered container
- Animal milk should be freshly boiled or pasteurised
- Powdered infant formula is not a sterile product and should therefore be prepared and used with care to prevent growth of harmful organisms
- Use only safe water to prepare infant feeds
- Feeding bottles and teats should not be used unless they have been cleaned, and then disinfected with boiling water or Milton solution
- Infants should be fed from a clean cup
- Wash your hands before preparing foods and feeding children
- Foods should be prepared and given immediately
- Prepared feeds should not be stored at room temperature
- Prepared feeds should not be stored longer in a fridge for more than 8 hours

RITUAL SLAUGHTERING OF ANIMALS

- **C**lean equipment for slaughtering should be used
- Clean utensils should be used to put the blood and meat in
- The environment should be as clean as possible
- Your hands must be properly washed and cleaned

PART 4

Safe and clean water sources

THE ROLE OF WATER IN THE SPREAD OF GERMS

- Water can be contaminated at the source, in the home, or during the journey in between.

- Pollution of water sources or supplies takes place when the water comes into contact with human and animal wastes.

- Water may be contaminated with faeces (sewage) during floods and other natural disasters.

- Municipalities may introduce safe water into the supply system, but often the quality is not maintained at the point-of-use (household) or during collection by the consumer. This could be due to deficiencies in the distribution system and intermittent water pressure.

- Safe water can become re-contaminated in the home due to hand contact or storage in dirty or uncovered vessels.

- Wastewater can be a breeding ground for insect vectors.

- A water source that is not protected, a dirty container, or unwashed hands can easily turn water, even water that looks and tastes clean, into something that makes people ill.

- A water source can be contaminated through a number of routes including:

    - Leaking septic tanks and poorly constructed toilets.

    - Contaminated surface water run-off entering wells and springs.

    - Collecting water with unwashed hands and/or dirty containers.

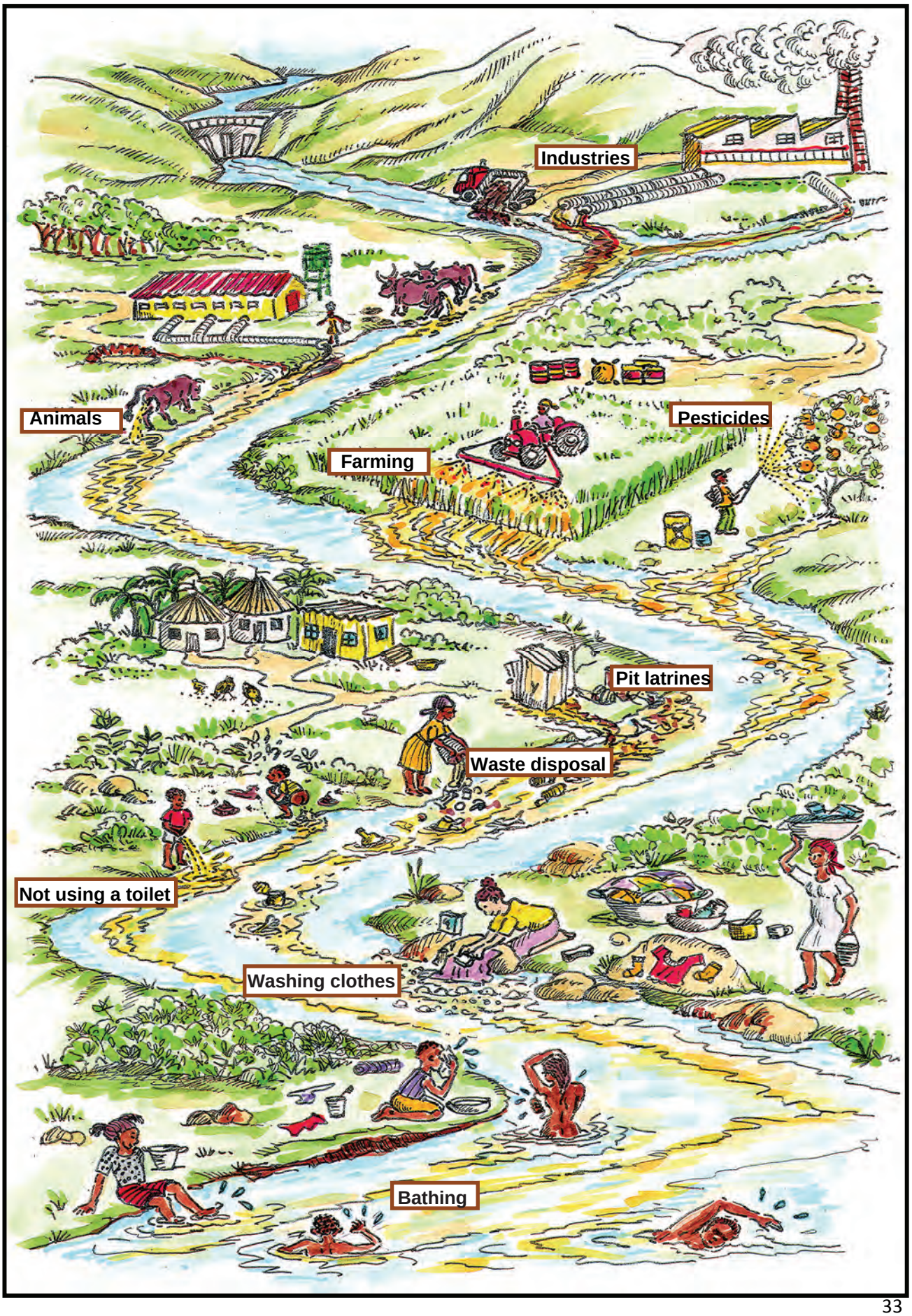
    - Animals using the same source.

    - Objects falling into the well.

    - Farming activities (use of pesticides).

    - Industries next to the source.

CONTAMINATION OF OUR RIVER SOURCES



TYPE OF WATER SOURCES

- **Safe water sources**
  - Boreholes
  - Tap water
  - Springs
  - Deep tube wells
- **Unsafe water sources**
  - Ponds
  - Rivers
  - Wells
- **The two main sources of drinking water are surface water and ground water.**
  - Surface water includes rivers, dams, ponds, pools, spring and the sea
  - Groundwater includes water stored underneath the land surface, within the rocks and soils such as borehole water and springs

TRANSMISSION ROUTES OF GERMS BY WATER

- **Water borne transmission:**
  - Germs are already in the water and drunk by a person or animal
- **Water washed transmission:**
  - Germs can be spread via surfaces such as hands or other parts of the body to the water
- **Water based transmission:**
  - Germs spend part of their life cycle in water and depends on a host who lives in water to complete their life cycle
- **Water related insect vector transmission:**
  - Germs are spread through insects that either breed in water or near water

PROTECTING THE WATER SOURCE OR SUPPLY

DO	DO NOT
Keep wells and tanks covered to prevent dust, bird droppings and dirt getting into the water and install a hand pump	Pump more water than is needed
Dispose of faeces and wastewater away from any water source used for cooking, drinking and washing	Water crops, plants and trees in the evening to reduce water loss during hot days – especially in municipal areas
Keep buckets, ropes and jars used in the collection and storage of water, as clean as possible by storing them in a clean place rather than on the ground	Build pit latrines next to boreholes.
Keep animals and children away from drinking water sources by fencing the source	Don't swim, bath or wash clothes at the same place where drinking water is collected
Avoid the use of pesticides or chemicals anywhere near a water sources.	Wash pesticide containers near water collection points
Look for faecal matter near water collection points and upstream	Waste water
Build toilets at least 15 metres away and downhill from a water source Build pit latrine on a slope at least 20 m below the borehole in order to prevent human wastes to move into the underground water and stop the spreading of diseases	
Keep the area around the standpipe clean and drain spilt water away from the standpipe	
Repair taps when they are broken and tap leaks should be repaired	

KEEPING WATER CLEAN AND SAFE IN THE HOME

DO	DO NOT
Keep water vessels/containers and tanks clean	Don't allow anyone to put their hands into the water during collection and storage
Keep water vessels/containers and tanks covered	Don't allow anyone to drink directly from the storage vessel/container or tank during collection and storage
If possible, water storage vessels/containers should have a narrow neck and a tap at the bottom so that hand contact is not possible	Don't continually top up vessels/containers with water – empty at least every 3 days
Take water out of storage vessel/container using clean utensils (cups)	Don't store water close to animals
After each emptying of storage vessels/containers, it must be thoroughly cleaned and disinfected	Never leave buckets of water unattended if there is small children around
Storage tanks should be regularly cleaned and disinfected	Never have electricity and water near each other – people may get electrocuted
Water in storage vessels/containers should be stored in the home for the shortest possible time	Never leave pots of boiling water on a stove unattended
Mosquito proof wire netting should be used in air conditioners and water storage tanks	
Open water storage tanks outside the house must be emptied at least once in 3 days	

TREATING WATER IN THE HOME TO MAKE IT SAFE FOR DRINKING

(Please refer to Emergency Disinfection of Drinking Water Guide – WRC project K5/1737)

- The water at the source is only the first stage of the water chain. Even clean water collected from a source can be contaminated prior to use at critical points due to unsafe hygiene practices such as:
  - Transporting water from the source to the house in dirty water containers.
  - Storing water at home in open and/or dirty water containers.
  - Handling water at home with dirty utensils or hands.

- Household water treatment is any activity performed to improve water quality at the household level.

- Safe water storage includes the use of clean containers with covers AND good hygiene behaviours that prevent contamination during water collection, transport, and storage in the home.

- The minimum amount of water that needs to be treated is the quantity needed for drinking and preparing uncooked foods.

- If the untreated water looks reasonably clear, it will not usually need to be treated before being used for other domestic purposes such as bathing or laundry.

- Clear water does not necessarily mean the water is safe for drinking or cooking purposes.

There are three types of water treatment:

- Sedimentation – allowing dirt to fall to the bottom of a water container over time.
- Filtration – physically removing dirt by passing the water through a material such as ceramic or sand.
- Disinfection – this is done by chemicals, heat (e.g. Boiling), or even sunlight (e.g. Solar).

CHEMICAL DISINFECTION

- There are many chemicals used to disinfect water. However, these chemicals often vary in their effectiveness and safety.
- The water must not be muddy (turbid) or dirty because the particles in the water will decrease the disinfection of the water.
- Where chlorine or iodine tablets are available, they should be used as directed by the manufacturer.
- Alternatively water should be disinfected with hypochlorite in the form of bleaching powder or hypochlorite solution (Jik/bleach) for 30 mins. The final concentration of chlorine should be 0.5-1 mgm/l available chlorine after 30 mins. The amount of chlorine needed depends mainly on the concentration of organic matter in the water and should ideally be determined for each situation using a test kit. If not available, a slight smell of chlorine is a crude indicator.

- Add one teaspoon of bleach to 25 litres of water and allow standing for at least 2 hours (not in sunlight)

Or:

- Add one teaspoon of chlorine granules (HTH) to 200 litres of water and allow standing for at least 2 hours (not in sunlight)

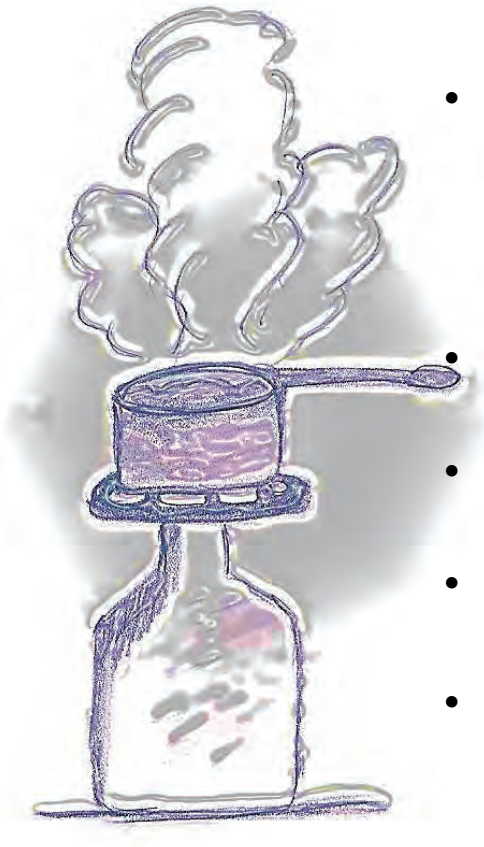
Or:

- For iodine, 3.7 mg/l, contact time 10 min's, is required (6.3 mg/l if virus contamination is suspected). Iodine is not recommended for long term use.

SOLAR DISINFECTION

- Solar disinfection is an effective method, especially when no chemical disinfectants are available.
- Ultra-violet rays from the sun inactivate pathogens present in water.
- Exposing water to sunlight will destroy most germs that cause disease.
- This is even more effective at higher temperature (although the temperature of the water does not need to rise much above 50°C).

- One easy method of treating the water is to expose plastic or glass bottles of water to the sun.
- This method, also known as the SODIS system, uses clear plastic or glass bottles to increase the temperature of the water by placing it direct sunlight.
- In tropical regions, a safe exposure period is about five hours, centred around midday.
- When the water is cloudy, the amount of time the bottle is exposed to the sun will need to be doubled (two days instead of one).
- The exposure time should also be increased if there is not sunny weather (rainy season).
- Water should be filled to three quarters full in clear plastic bottles (empty coke containers) and shaken thoroughly 20 times, before being filled completely.
- Bottles are then exposed to sunlight (e.g. on the roof of a house) for 6 hours (or for 2 days if the days are cloudy – shake every hour.
- The water should be consumed directly from the bottle or transferred to a clean glass for drinking.
- To be effective, solar disinfection must be applied to relatively clear water.
- Solar disinfection has no residual effect, so improper storage can lead to re-contamination. Water treated by this method should be stored safely and used within a few days.



BOILING

- Bringing water to a rolling boil and holding at this temperature for a specified time will kill pathogens. A holding period of 3-5 minutes will ensure that water is safe, except in situations where contamination with spore-forming bacteria, fungal or protozoal cysts or hepatitis virus is suspected.
- Boil water for at least 10 minutes to destroy disease causing micro-organisms.
- Boiled water should be stored safely and used within a few days.
- Boiling should not be promoted in areas where wood is scarce and no other heating options are available.
- Boiling will not make water less cloudy and has no residual effect, so improper storage can lead to re-contamination.

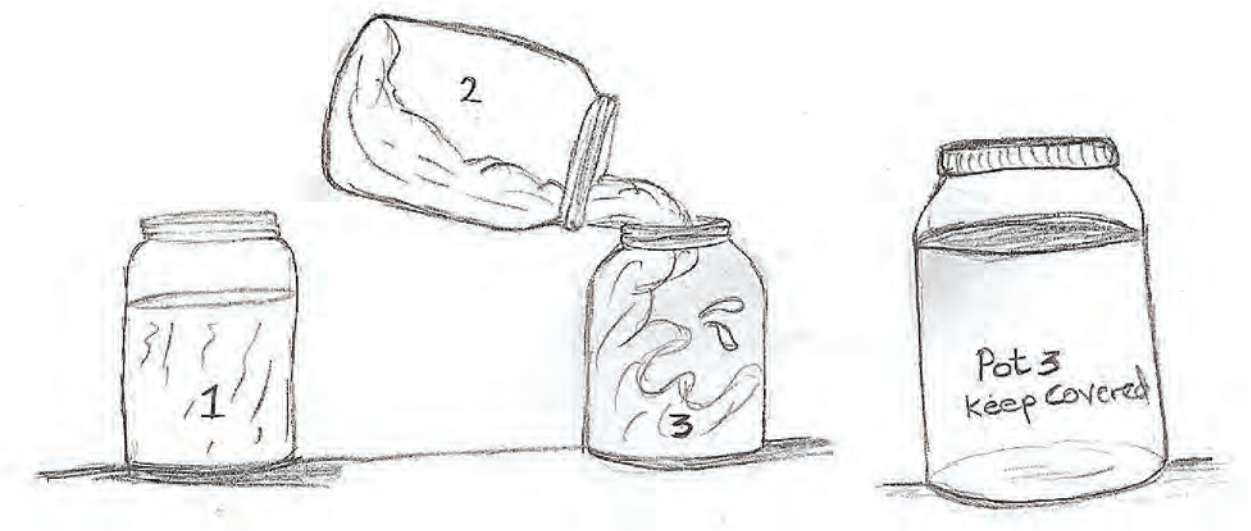
SEDIMENTATION:

Traditional sedimentation:

- If water is muddy, giving it time to settle or adding chemicals can cause the dirt to fall to the bottom of the container and make the water clear. Straining the water through a cloth can make this process more efficient.

- This method reduces, but does not totally remove, disease causing germs.

- The three pot method reduces dirt and germs that cause disease by storing water in containers, allowing dirt to settle, and moving cleaner water to different containers over time.



- Each day when new water is brought to the house:
  - Pour water collected from the source into pot 1. Strain through a cloth if possible. Allow the water to settle for a day.
  - Slowly pour water stored in pot 1 into pot 2. Allow water to settle for a day.
  - Wash out pot 1.
  - Slowly pour water stored in pot 2 into pot 3.
  - Wash out pot 2.
  - Only drink water from Pot 3. This water has been stored for at least 2 days, and the quality has improved. Periodically this pot will be washed out and may be sterilized by scalding with boiling water.
  - Keep the pot 3 covered all the time

Chemical sedimentation:

- The two most common chemical sedimentation products used by the International Federation of Red Cross and Red Crescent Societies in emergencies are PUR and Watermaker.

- These products contain two chemicals. One chemical acts like a glue and makes small particles stick together. This creates bigger particles, called floc, that fall to the bottom of the container faster.

FILTRATION

- Ceramic filters with small pores, often coated with silver, can be effective at removing micro-organisms (especially bacteria) and suspended solids from water.
- Efficacy varies and filters do not remove viruses and parasites from water.
- Filters need to be cleaned regularly to avoid those becoming reservoirs of micro-organisms.
- Monthly maintenance involves scrubbing the filter to unclog pores and washing the receptacle tank and spigot.
- If properly maintained, the ceramic filters have a long life.

STRAINING

- If the water is muddy or turbid it must be pre-treated before disinfection.
- Turbid water should be filtered through a cotton cloth to remove any solid materials.
- Pouring muddy or turbid looking water through a piece of fine, clean cotton cloth will often remove a certain amount of the suspended solids and insect larvae contained in the water.
- A cotton cloth works best and you should not be able to see through the cloth.
- Treat the turbid or muddy water with alum and bleaching powder, stored for at least 2 hours and then decanted or filtered through a clean cloth.
- For pre-treatment add 10 g alum and 5 g lime per 100 litres of turbid or muddy water.
- Straining alone is unlikely to make water from a contaminated source completely safe to drink.

LAUNDRY WASTEWATER

- Germs can be transferred between contaminated and uncontaminated items of clothing and linen during washing, and are only partially removed by subsequent rinse cycles.

- The thorough drying of laundry, in most cases, reduces contamination to a level where it no longer represents a significant risk.

- There are two points where laundry can transfer infection:
  - when it is handled before laundering
  - if laundering remains damp for a period, there is the chance for growth of germs and clothes can then become a source of germs.

In urban households where washing machines are present:

- Wear gloves if laundry is visibly soiled with vomit, blood or faeces.
- Remove residual solid material into the toilet.
- Hand-washing dirty linen before putting it in the washing machine (sluicing) is not recommended as this can create aerosols that may contain germs.
- Two processes are considered suitable for hygienic cleaning of clothing and linen:
  - Washing at 60°C or above: This is considered to remove bacteria, fungi and viruses by a combination of physical removal and heat inactivation
  - Washing at 30-40°C using a bleach-based product: This produces bacterial decontamination of fabrics by a combination of physical removal and chemical inactivation.
- Always wash at temperatures of 40°C or below with a non-bleach product is considered to carry a risk of inadequate decontamination.
- Regularly washing at or below 40ºC, without using a bleach product may allow biofilms to build up in washing machines.
- At least once a week, use a high temperature wash or chemical disinfectant on an empty cycle to prevent the build-up of germs and other micro-organisms in a washing machine.
- Dry laundry as soon as possible after washing.
- Don’t leave it damp for long periods, e.g. in the washing machine overnight, as any remaining germs may multiply rapidly.

In rural households

- Washing of clothing in grossly polluted water (ponds/canals/rivers) is a major infection hazard and you can get bacterial and fungal infection.
- In areas where there is no piped water supply, people should be encouraged to use tubewell/dugwell water as an alternative.
- Wash clothes in a separate bucket and not in the water source.
- Do not throw used water back into water source because it will contaminate the water source which is used by people for drinking and bathing.
- Pour the used water over vegetables grown in the garden.

DOMESTIC WASTEWATER

- Inadequate drainage and accumulation of water in the vicinity of the home is a cause of vector breeding (e.g. mosquitos) and transmission of vector-borne diseases.

- Make sure that empty or discarded cans, wheel-tyres, etc. are not left lying in the courtyard or in the immediate surroundings of the home, which could accumulate water and act as a breeding place for mosquitoes.

- Effluents from septic tanks, pit latrines, laundry and sullage water from kitchen and bathroom should not be allowed to stagnate around the area of the home and provide a breeding ground for insects.

In urban areas:

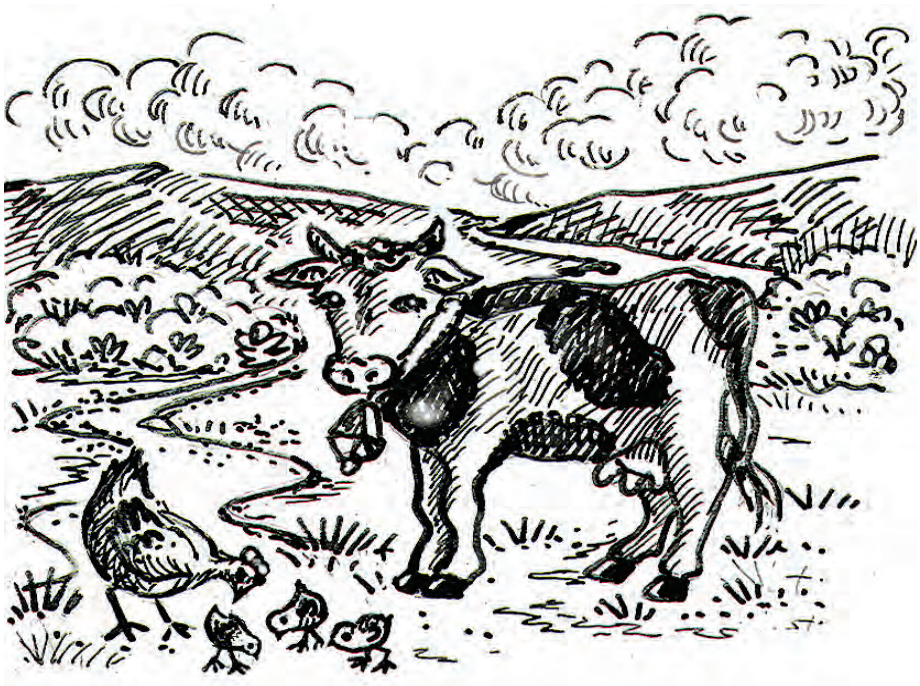
- drainage channels around tap-stand/ bore-wells to flush away wastewater to the municipal drain must be present
- drainage channels to channel wastewater and rainwater from the home to the municipal drain/sewerage must be present.

In rural areas:

- household wastewater and rainwater can be disposed of by digging a soak pit, or digging a channel to the kitchen garden or to the field where vegetables are grown.

PART 5

Role of animals in the spread of germs



ANIMALS IN URBAN AND PERI-URBAN AREAS

- A pet in the home is associated with increased levels of contamination in the kitchen and bathroom.
- Domestic cats, dogs and other types of pets, although apparently healthy, can act as carriers of enteric pathogens.
- Pets can bring pathogens into the home on their paws and contaminate kitchen food surfaces as well as floor surfaces.
- Infections can be passed from animals to humans in several ways:
    - Some infections are carried on the fur of animals.
    - Infections can be transferred by touching and stroking animals and not washing hands.
    - Other germs are excreted in the faeces of animals and they can remain in the environment, especially in moist areas.
    - Survival and transfer via surfaces occurs in the same way as it does for human pathogens.
    - Infections can be passed on from animals in the kitchen.
    - Pregnant women should not handle cat litter trays as germs excreted in animal faeces, e.g. *Toxoplasma gondii*, can affect the developing foetus. Listeria is also a particular risk for pregnant women.
    - If there is a baby in the house, ideally, reptiles should not be kept.
- Pets should be kept and fed elsewhere than in the kitchen and ensure pets have their own dishes and utensils.
- Keep pet food separate from human food.
- Check pets regularly for any signs of infection – if a pet is sick take it to the vet.
- Ensure that all animals have their immunisations, worm treatments and flea treatments.
- Clean cages and bedding regularly and litter trays daily.
- Avoid cleaning pet cages in the kitchen sink.
- Use gloves and paper towels to clean up animal faeces and flush pet faeces down the toilet or place in a plastic bag, secured and place in the waste bin.

- Pet spills such as faeces and vomit should be cleaned up immediately and surfaces cleaned and disinfected.

- Hygienically clean floors used by pets regularly, by cleaning followed by disinfection, or using disinfectant/cleaner.

ANIMALS IN RURAL AREAS

- Rodents can transmit diseases and should be controlled by proper disposal of refuse.

- Chickens are known to carry food poisoning organisms.

- Domestic animals such as cattle, sheep, goats, pigs, cats and also rats and other rodents carry micro-organisms in urine which can then contaminate water or food.

- Cattle and goats carry diseases which can occur in rural homes, where people live in close proximity with cattle and goats.

- Humans can get infected from bites of flees which feed on the blood of an infected rat.

- Infections can be passed from animals to humans in several ways:

    - Some infections are carried on the fur of animals.

    - Infections can be transferred by touching and stroking animals and not washing hands.

    - Other germs are excreted in the faeces of animals and they can remain in the environment, especially in moist areas.

- Survival and transfer into food and water occurs in the same way as it does for human pathogens.

- Meat can become contaminated when animals are slaughtered and prepared for eating.

- As far as possible animal sheds should be separated and detached from the home.

- Animals should be kept clean and there should be adequate arrangements for disposal of urine and faeces.

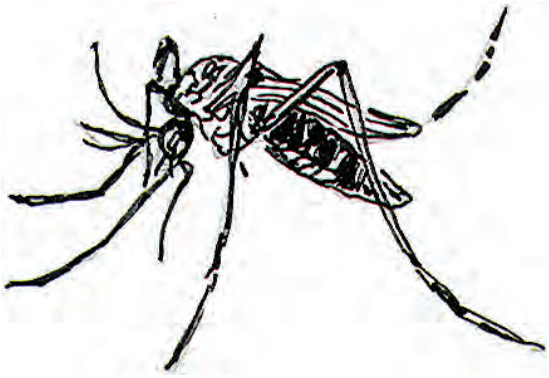
- Bio-gas stoves in rural homes could solve the problem of animal waste/human waste disposal, but these are not applicable in all communities.

- Always wash hands after handling domestic animals.

THE ROLE OF INSECTS IN THE SPREAD OF GERMS

- **Mosquitoes**

- *Anopheles* mosquitoes carry and transmit malaria and viral infections such as encephalitis.
- The *Culex* mosquito is responsible for spread of filariasis (elephantiasis) and encephalitis.
- *Anopheles* and *Culex* mosquitoes breed in dirty water sources such as septic tanks, blocked gutters, pools of wastewater, dirty ponds, etc.
- Dengue fever and other viral fevers are spread by *Aedes* mosquito which breeds in small sources of water such as overhead cisterns, small tanks, flower-pots, air-conditioner units and potable water in earthenware jars.



- **Houseflies**

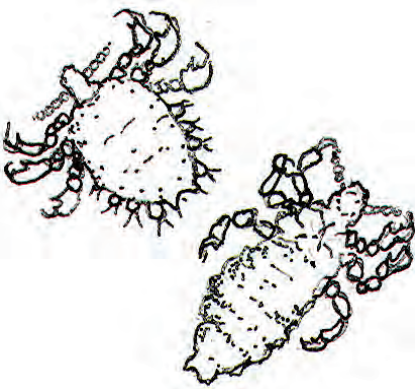
- The common housefly carries germs from human faeces and wastes to food. In this way it can spread infective diarrhoea, dysentery, cholera, amoebiasis, hepatitis, polio, etc.
- Eggs are laid in decaying organic matter, such as vegetable or fruit debris, animal and human excreta, refuse, etc.

- **Sandflies**

- Sandflies spread diseases such as sandfly fever, kala-azar and oriental sores (cutaneous leishmaniasis).
- Eggs are laid on moist soil, in cracks and crevices in the ground or walls, or in heaps of rubble. Flies feed on decaying organic matter.

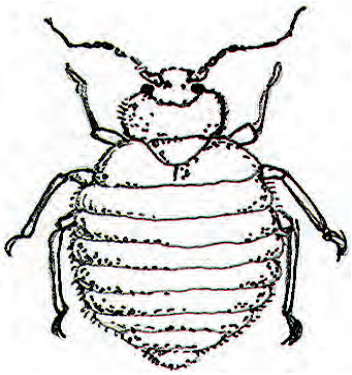
- **Lice**

- Lice live on the human body, either on the head (head louse) or pubic region (pubic louse).
- The infestation, known as pediculosis, is common among people with low standards of personal cleanliness.
- Lice can also transmit typhus and relapsing fever.



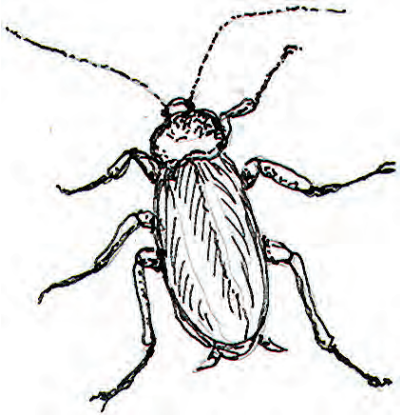
- **Bedbugs**

- Bedbugs are wingless insects feeding on human blood.
- So far they have not been shown to spread any diseases.
- They live in cracks and crevices of beds and lower portions of the walls, hidden between layers in the mattresses and seams of clothing, furniture such as chairs, etc.



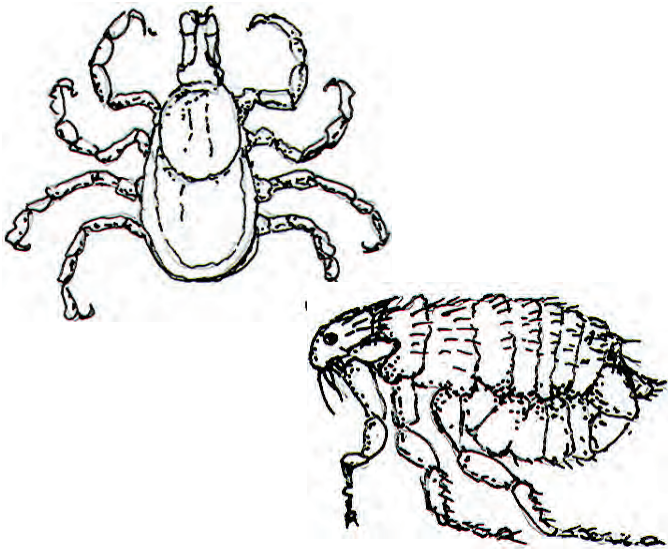
- **Cockroaches**

- Cockroaches breed in humid and dark places with poor ventilation, such as cupboards in the kitchen and stores, refrigerators, underground drains.
- They are generally active during night, feeding on food residues and other eatables.
- They have potential to spread diseases as houseflies do, but there is no conclusive proof yet to that effect.



- **Ticks, mites and fleas**

- Fleas are responsible for transmission of plague from rats to humans.
- Biologically, ticks and mytes are not insects, but arthropods.
- Ticks are ecto-parasites of both domestic and wild animals.
- They attack man and transmit diseases such as Kyasananur forest disease, typhus, relapsing fever, only under exceptional conditions.
- Scabies is caused by a particular type of adult mite.



PROTECTIVE MEASUREMENTS

- In the evenings wear clothes covering as much of the body as possible.
- Sleeping under mosquito-nets (note: sandfly nets are finer than mosquito nets), and making the house mosquito proof. Mosquito-net impregnated with contact insecticide is now available and, if not washed, retains its effect for about six months.
- Cover water-tanks (including ends of overflow pipes) of houses and buildings with wire mesh to prevent mosquitoes entering the tanks and breeding in them.
- Wastewater should not be allowed to stagnate around the house.
- Disposing of faeces, keeping toilets and latrines covered and covering septic tanks (and ventilation pipes) with wire mesh.
- Collecting household refuse in a closed bag or a dustbin with a fitting cover.
- Using insecticides and insecticide-aerosol sprays.
- Using mosquito repellent in the room or on the exposed skin.
- Control of lice is basically through personal cleanliness and care of hair. Infestation can be treated by benzyl benzoate or gamma-benzene hexachloride lotion or anti-lice preparations applied to the hair for a few hours. Frequent hair-washing and combing with fine toothed comb helps remove dead insects.
- Laundering clothes regularly to eliminate lice.
- Controlling rats in and around the home to control fleas. Eliminate rat burrows and breeding places, etc.
- Better design of food storage cupboard.
- Do not leave food residues for insects to feed on.
- Cover openings of drains in bathrooms to prevent insects entering the home from underground drains.
- Domestic animals like cattle, dog, etc. should be kept clean and free from ticks and mites by regular vigilance and periodic treatment with insecticides.