

# Making water safe for drinking and cooking

Water can carry tiny creatures called germs, viruses and parasites. These are disease organisms can make you and your family sick. Although it is better to protect and use a source of safe water (eg. a protected spring or well-kept well), many people collect the water they use to drink from a contaminated source such as a river or water hole. In this case, it needs to be treated before use. This Action Sheet is about ways to treat water to make it safe for drinking and cooking.

## Are there other situations when water need to be treated?

River water always needs to be treated. Water from pipes, tanks and wells needs to be treated if:

- There is any possibility that has been contaminated
- People refuse to drink it because of the colour or taste
- It has been transported and stored in the home

The methods shown in this Action Sheet do not make water safe from toxic chemicals. Water with toxic chemicals is never safe for drinking, bathing or washing clothes. It may lead to cancer, skin rashes, miscarriages, or other health problems.

## How to choose which water treatment method to use?

The methods you choose to treat water will depend on how much water you need, what it is contaminated with, how you will store it, and what resources are available. No matter how it is treated it is best to either let the water settle and pour it into another container, or filter the water, before disinfecting it.

## How do you make water safe from germs?

To make water safe from germs – the tiny living things that carry diseases – follow these steps

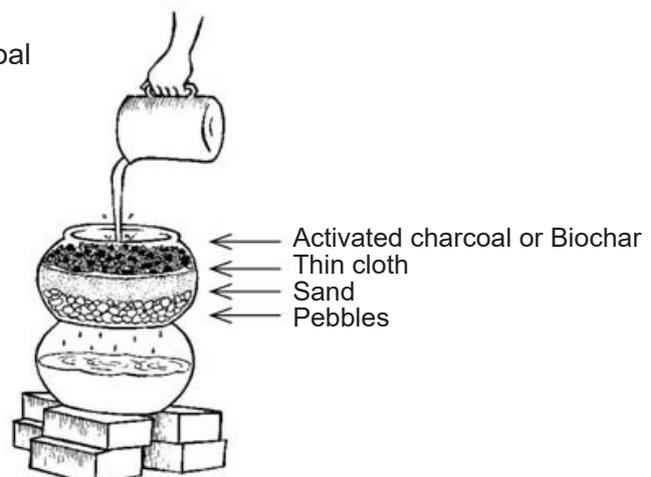
Let the water settle for a few hours and pour it into a clean container

OR filter it, using

A cloth filter,



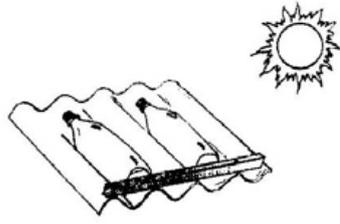
or an activated charcoal or biochar filter



Then disinfect the water using 1 of these methods:  
(These basic methods for treating water need little or no equipment).



Boiling



Solar disinfection



Adding chlorine



Adding lime or  
lemon juice

### How does settling water get rid of germs?

When water settles, mud, other solids, and germs and worms that cause illnesses fall to the bottom. Storing water for 5 to 6 days will reduce the number of germs in the water. But some germs, like giardia, will not be killed by any length of storage. For this reason it is best to use another method after letting the water settle, such as filtering, chlorinating, or solar disinfection. The following methods are ways to settle water that take more time but make it safe from most germs.

### Three pot method

The three pot method settles water so germs and solid matter fall to the bottom. This method is safer than settling water in one pot, but it does not make the water completely free of germs. The three pot method should be followed by disinfection (see page 5 of this action sheet).

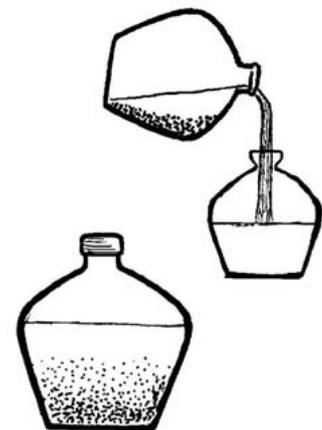
**Morning, Day 1:** Fill pot 1 with water. Cover the top and let it settle for 2 days.

**Morning, Day 2:** Fill pot 2 with water. Cover it and leave for 2 days. The dirt in pot 1 will begin to settle

**Morning, Day 3:** Pour the clear water from pot 1 into empty pot 3, making sure not to disturb the sediment at the bottom of pot 1. The water in pot 3 is now ready for drinking. The dirty water left in the bottom of pot 1 can be poured out. Wash pot 1 and refill it with water. Cover it and let it settle for 2 days.

**Morning, Day 4:** Pour the clear water from pot 2 into pot 3 for drinking. Wash pot 2 and refill it with water.

**Morning, Day 5:** Pour the clear water from pot 1 into pot 3 for drinking. Wash pot 1 and refill it with water.



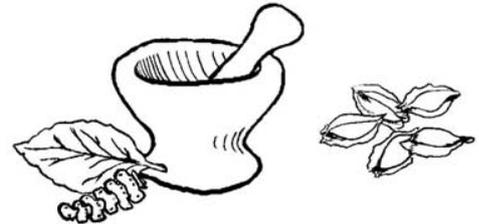
Every few days wash the clear water pot (pot 3) with boiling water. If you use a clean flexible pipe to siphon water from one pot to the next the sediment will be less disturbed than if you pour the water

## Using plants to clear and settle water

In many places people use plants to make water safer to drink. One plant used often is Moringa.

### Purifying water with Moringa seeds

- Allow the Moringa seed pods to dry naturally on the tree before harvesting
- Remove the seed husks, leaving a whitish kernel
- Crush the seed kernels to a powder with a stone or mortar
- Mix the powder with a small quantity of clean water in a small cup
- Pour the mixture through a tea strainer or sieve into a cup. It's best to cover the strainer with a piece of clean cloth
- Add the resulting milky fluid to the water you wish to treat in a clean vessel such as a pan or gourd
- Stir quickly for 30 seconds, then slowly and regularly for five to ten minutes. The faster it is stirred, the less time is needed.
- Cover the water and do not disturb it for at least an hour.
- The clear water may be siphoned or poured off the top of the container, or a vessel with a tap can be designed.
- The particles of dirt in the water will sink to the bottom. Most of the tiny creatures that make you sick will stick to these particles and sink to the bottom as well. However, not all of the dangerous disease organisms will be removed, so if you are able to, it is still safer to use a disinfection treatment as well.



### How much seed powder do you need?

Depending on how clear the water is, you will need between 50 and 150 milligrams (1/100 of a gram) of ground Moringa seed to treat one litre of water. A good, full seed will typically purify 5 litres of water that is not turbid (muddy); two seeds will purify between 2.5 and 5 litres of water that is slightly to moderately turbid; and three seeds will purify 2.5 litres of very turbid water.

You will need to experiment with the amount of seeds and stirring time to find what works in your area. Health-workers should be consulted about quantities and materials, and about how to combine this method with other ways to make drinking water safe.

Seed cake left over after extracting oil can still be used for water purification, if ground to a fine powder.

### Can this method be used on a larger scale?

Scientists have worked with water treatment works in Africa (Eritrea and Malawi) to show that powder from the seeds can replace expensive chemicals in water treatment works. If more water treatment works found out about this method, farmers might be able to sell Moringa seeds to water treatment works.

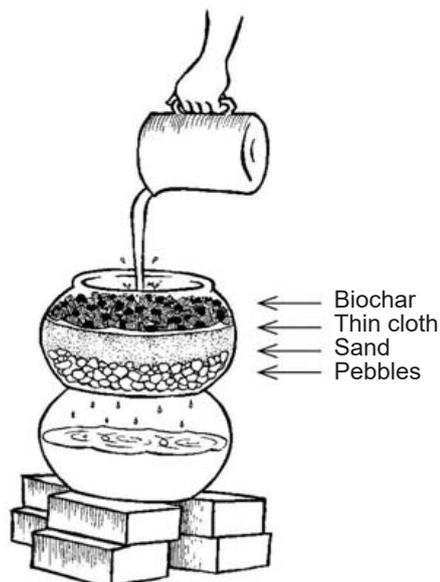
Action Sheet 52 tells you more about the many uses of the Moringa tree, and how to plant it. You mentioned charcoal and cloth filters above. Can you give more details?

There are many ways to filter water to make it safer from germs. Some very effective filters, like slow sand and ceramic filters (See Action Sheet 24), require special equipment to make, but can filter large amounts of water. Other filters, like charcoal and cloth filters described below, require no special equipment and are easy to use to filter smaller amounts of water before disinfecting.

### Biochar filter

This filter is easy to make and works well for removing most germs from small amounts of water. Because the germs that are filtered out will grow on the biochar, it is important to remove and clean the charcoal often if the filter is used daily, or anytime the filter has been unused for a few days.

1. Punch holes in the bottom of a container with a sharp instrument.
2. Grind biochar to a fine powder and rinse with clean water. Activated charcoal can be substituted for biochar, ordinary charcoal will not work as well. **NEVER USE CHARCOAL BRIQUETTES! THEY ARE POISON!**
3. Place layers of stones, gravel, and sand in the container. Put in a thin cloth and a layer of charcoal on top.
4. Pour water into the filter and collect drinking water from the bottom vessel.



### Cloth filters

In Bangladesh and India a filter made of sari cloth, a finely woven cloth, is used to reduce the amount of cholera germs in drinking water. Because the cholera germ often attaches to a tiny animal that lives in water, filtering out these animals also filters out most cholera germs. This method also filters out guinea worms.

You can make a cloth filter out of handkerchiefs, linen, or other fabric. Old cloth is more effective than new cloth because worn fibers make the pores smaller and better for filtering.

1. Let water settle in a container so that solids sink to the bottom.
2. Fold the cloth 4 times and stretch or tie it over the mouth of a water jar.
3. Pour water slowly into the jar through the cloth.



Always use the same side of the cloth, or germs may get into the water. After using the cloth, wash it and leave it in the sun to dry. This kills any germs that may be left in the cloth. In the rainy season, disinfect the cloth with bleach.

### Once the water is clear, why do you need to disinfect it?

The methods of settling or filtering water described above make it clean and pleasant to drink, but some germs can still survive.

Disinfecting water kills germs. If done correctly, disinfection makes water completely safe to drink. The most effective methods are boiling, solar disinfection, or using chlorine.

## Boiling water

Boiling water for 1 minute makes it safe from germs. Bring water to a rapid, rolling boil. Once it starts boiling, let it boil for 1 full minute before taking the pot off to cool. Water needs to boil for 3 minutes to kill germs in high mountain areas because water boils at a lower temperature high in the mountains.

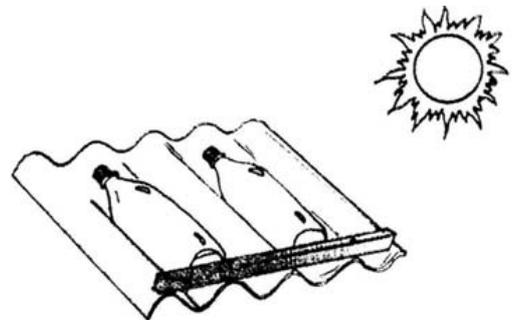
Boiling changes the taste of the water and boiled water takes a long time to cool, so it cannot be used right away. After boiled water cools pour it into a bottle and shake it strongly. This will add air to the water and improve the taste.



## Solar disinfection (SODIS)

Solar disinfection is a very effective way to treat water with only sunlight and a bottle. Filtering or settling the water first will make it clearer so it will disinfect more quickly. Solar disinfection works best in countries close to the equator, because the sun is strongest there. The farther north or south you are, the more time is needed for disinfection to work. (For more information about SODIS, see the Contacts List at the end of this sheet.)

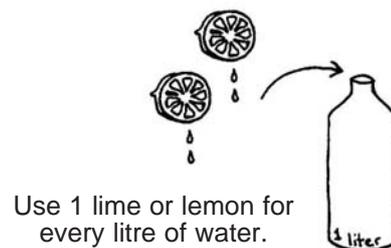
1. Clean a clear plastic or glass bottle or plastic bag.
2. Fill the bottle  $\frac{3}{4}$  full, and shake it for 20 seconds. This will add air bubbles to the water. Then fill the bottle or bag to the top. The air bubbles will help to disinfect the water faster.
3. Place the bottle in an open place where there is no shade and where people and animals will not disturb it, like the roof of a house. Leave the bottle in the sun for at least 6 hours in full sun, or 2 days if it is cloudy.
4. Drink directly from the bottle. This will prevent the possibility of contamination from hands or other vessels.



## Lime or lemon juice

Adding the juice of a lime or lemon to 1 litre of drinking water will kill most cholera and other germs as well. This does not make water completely safe, but may be better than no treatment in areas where cholera is a threat.

Adding lime or lemon juice to water before using solar disinfection or the 3 pot method will improve the effectiveness.



Disinfecting water kills germs. If done correctly, disinfection makes water completely safe to drink. The most effective methods are boiling, solar disinfection, or using chlorine.

### What can I do about water hyacinth?

If water hyacinth has already arrived where you live, make the most of the situation by experimenting with ways to use this free source of biomass. Help to clear it if you can. If you are clearing water hyacinth by hand, make sure it's safe and wear gloves - water hyacinth can cause itching (as if it couldn't be any more troublesome). Remove whole plants from the water and take them away to dry out. Cut weeds left in the water will decompose and cause more problems.

If you haven't yet seen water hyacinth in your area, set up an early warning system. Know what to look out for, and check out which organisations could help if you find any.

Find out about other introduced species that have gone wild where you live. Join or set up a hacking group to remove alien vegetation that has got out of control. Plant indigenous plants and trees in your garden.



Image, FAO

### Acknowledgements

This Action Sheet was written by Nancy Gladstone, based on information from the following sources: Thinkquest Internet Challenge on Water Hyacinth by students at Greenfield Girl's Primary School and Jurie Hayes Primary, Vredenburg, South Africa. (<http://library.thinkquest.org/C0126023>); Judge, E., Hands On Energy, Infrastructure and Recycling, ITDG Publishing; Navarro, L.A. and Phiri G. (Editors) Water Hyacinth in Africa A Survey of Problems and Solutions ([web.idrc.ca/es/ev-9427-201-1-DO\\_TOPIC.html](http://web.idrc.ca/es/ev-9427-201-1-DO_TOPIC.html)); Advice received from Dr. Rob Reeder, Plant Pathologist at CABI Biosciences ([www.cabi.org/](http://www.cabi.org/)) and Thomas Moorhouse of Clean Lakes Inc. (<http://www.cleanlake.com/CLEANLAKES.htm>). Original cartoon by Alan Hesse.

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### For more information

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ITDG Technical Brief on Water Hyacinth Control and Possible Uses  
[www.itdg.org/docs/technical\\_information\\_service/water\\_hyacinth\\_control.pdf](http://www.itdg.org/docs/technical_information_service/water_hyacinth_control.pdf)

USE WATER HYACINTH! A Practical Handbook of Uses for the Water Hyacinth from Across the World, by K. Lindsey and H.-M. Hirt. 1999. 115 pp. Order from Anamed, Schafweide 77, 71364 Winnenden, Germany.

Wittenber R. & Cock M.J.W. 2001 (eds) Invasive Alien Species: A Toolkit for Best Prevention and Management Practices. Published by GISP Download at <http://www.gisp.org/downloadpubs/Toolkiteng.pdf>

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