



WORLD HEALTH
ORGANIZATION



WATER,
SANITATION
AND
HEALTH

Household Water Treatment and Safe Storage Following Emergencies and Disasters SOUTH ASIA EARTHQUAKE AND TSUNAMI

Following an emergency, families frequently lack access to a safe source of drinking water. In this situation, it is critical to communicate to families that the need to make water safe by themselves, at home or in shelters, to protect themselves from disease.

Household water treatment is effective, simple, and inexpensive. It is especially applicable to populations recovering from a disaster situation who often lack facilities and resources. For example, if household bleach is available, a dilute chlorine solution can be made up and used to disinfect water. Water can also be safely treated by exposing it to sunlight. All that is required is a discarded clear plastic bottle. Another option to treat water at home is the use of simple ceramic pot filters moulded by local artisans. If available, commercially produced tablets containing chlorine, or sachets with combined flocculation and disinfection properties, can also effectively remove pathogens from water.

All the approaches described improve the microbial quality of water and significantly reduce episodes of diarrhoeal disease. The "best" option should be selected according to local requirements. What is most important is that households treat their water using a method or technology that is promptly available and which is most applicable and acceptable to the community in question. Households should continue treating water until their supply is tested and found to be safe, or advised by local authorities.

Chemical disinfection

Following emergencies, chlorine or iodine tablets may have been distributed. If this is the case, water should be treated using the directions that come with the tablets. Alternatively, water may be disinfected by the use of existing types of chlorine compounds. At doses of a few mg/litre and contact times of about 30 minutes, free chlorine generally inactivates >99.99% of enteric bacteria and viruses, provided water is clear. Trained personnel or community members should prepare a 1% chlorine stock solution from sodium hypochlorite (liquid bleach), calcium hypochlorite or high-test hypochlorite (powdered chlorine). The amount of chlorine needed depends mainly on the concentration of organic matter in the water and should ideally be determined for each situation. This solution should be added to water to leave a free residual chlorine concentration of 0.4 to 0.5 mg/l after 30 minutes, which can be determined using a special test kit. If this is not available, a slight smell of chlorine is a crude indicator.

For further information, see annex and
www.who.int/water_sanitation_health/hygiene/emergencies/em2002chap7.pdf;
www.cdc.gov/safewater/default.htm;

For further information visit www.who.int/water_sanitation_health/en
www.who.int/household_water

Solar disinfection

Solar disinfection is an effective water treatment method that is applicable to emergencies, especially when no chemical disinfectants are available. Ultra-violet rays from the sun are used to inactivate pathogens present in water. This technique involves exposing water in clear plastic bottles to sunlight for a day, for example on the roof of a house. In emergencies, empty bottles can be used that are left over from an initial shipment of drinking water. Bottles need to be cleaned, filled to three quarters full and shaken thoroughly 20 times, before being filled completely. The bottles are then exposed to sunlight for 6 hours (or for 2 days if the sun is obscured by clouds). The water should be consumed directly from the bottle or transferred in a clean glass for drinking. To be effective, solar disinfection must be applied to relatively clear water. For further information, see annex and www.sodis.ch and www.who.int/water_sanitation_health/dwq/wsh0207/en/.

Filtration

If filters are available, then water filtration is another option to purify water. Ceramic filters with small pores, often coated with silver for bacteriostasis, have been shown to be effective at removing microbes and other suspended solids. Filters need to be cleaned regularly. Monthly maintenance consists of scrubbing the ceramic filter element to unclog pores and washing the receptacle tank and spigot to prevent bacterial growth. If properly maintained, they have a long life. Ceramic filters can be mass-produced or manufactured locally. For further information, see annex and www.potpaz.org/ or www.purifier.com.np.

Combined flocculation/chlorination systems

Commercially available sachets can also dramatically improve the microbial quality of drinking water. These are formulated to coagulate and flocculate sediments in water followed by a timed release of chlorine. These typically treat 10 litres of water. The water is normally stirred for few minutes and then strained, and then allowed to stand for another half hour. Please follow the instructions on the packet. For further information, see annex.

Boiling

Following a disaster many families will lack the facilities and fuel to boil water. However, if practical, households can disinfect their drinking water by bringing it to a rolling boil, which will kill pathogens effectively except at high altitudes.

Safe storage

Regardless of whether household water is initially of acceptable microbiological quality, it often becomes contaminated with pathogens of fecal origin during transport and storage due to unhygienic storage and handling practices. Studies show that the use of containers with narrow openings for filling, and dispensing devices such as spouts or taps/spigots, protect the collected water during storage and household use. Improved containers protect stored household water from the introduction of microbial contaminants via contact with hands, dippers, other fecally contaminated vehicles or the intrusion of vectors.

International Network to Promote Household Water Treatment and Safe Storage

A number of the collaborating organizations in WHO's International Network to Promote Household Water Treatment and Safe Storage are responding in their individual capacities to the South Asia tsunami disaster. Members and their partners have reacted, for example, by donating flocculation/disinfection sachets, distributing bleach, and providing information on various household treatment technologies. More information can be found at www.who.int/household_water/en/.

Annex on household water treatment

Chlorination

Table 1: Preparation of 1% chlorine stock solution

To prepare the solution, add the quantity of one of the chemical sources shown below to water, mix, and make up to 1 litre in a glass, plastic or wooden container:

Chemical source	Percentage available chlorine	Quantity required	Approximate measures
Bleaching powder	35	30g	2 heaped tablespoons
Stabilized/tropical	25	40g	3 heaped tablespoons
High-test hypochlorite	70	14ml	1 tablespoon solution
Liquid laundry bleach	5	200ml	1 teacup or 6-oz milk tin
Liquid laundry bleach	7	145ml	10 tablespoons
Javelle water	1	Is itself a 1% stock solution	

A 1% solution contains 10 g of chlorine per litre = 10000mg/l or 10000ppm (parts per million).
1 tablespoon = 4 teaspoons

Avoid skin contact with any of the chemical sources or the stock solution, and avoid inhaling chlorine fumes.

This stock solution should be *fresh*, i.e. made every day, and protected from heat and light.

Table 2: Disinfecting water using a 1% stock solution

To produce an initial chlorine concentration sufficient to leave a free residual chlorine concentration of 0.4–0.5 mg/l after 30 minutes:

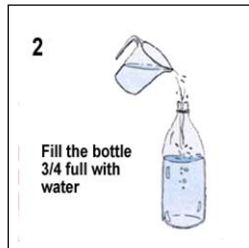
1. Prepare a 1% chlorine solution
2. Take 4 nonmetallic water containers (e.g. 20-litre plastic buckets) and put 10 litres of the water to be chlorinated in each one.
3. Using a syringe or another measure, add progressively greater doses of 1% chlorine solution to the containers:
 - 1st container: 1ml
 - 2nd container: 1.5 ml
 - 3rd container: 2ml
 - 4th container: 5ml
4. Wait for 30 minutes and then measure the residual free chlorine concentration, using a comparator or test strip.
5. Choose the sample with between 0.4–0.5 mg/l of free residual chlorine.
6. Calculate the amount of 1% chlorine solution needed for the quantity of water to be treated.



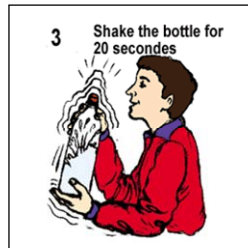
SODIS Application



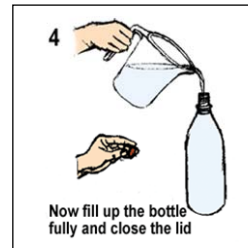
**Clean
PET Bottles**



**Fill Bottles
partly to 3/4**



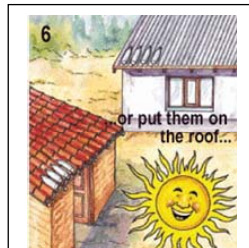
**Aerate the Water
through Shaking**



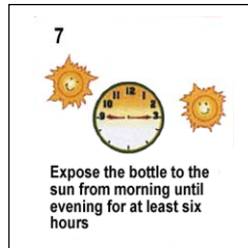
**Fill Bottles
completely**



**Expose Bottles
to Sunlight**



**Exposure on Roofs
are adequate**



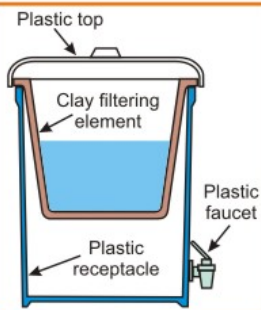
**Expose the Bottles
for 6 Hours**



**Drink the Water
from the Bottles**

Ceramic filtration

HOW TO USE YOUR FILTER



1. Washing the RECEPTACLE

Wash your hands with soap .
 Attach the spigot (faucet) to the plastic receptacle.
 Fill the receptacle one quarter full with water and add two tablespoons of chlorine bleach.
 Leave this for thirty minutes to disinfect the plastic receptacle.
 Use this water to wash the entire inside of the plastic receptacle and the lid with a brush or cloth.
 Drain the water out through the spigot to disinfect.
 If you do not have bleach, wash the receptacle and lid with soap and water as described above.
 You can use either filtered or boiled water to rinse.



2) Place the plastic receptacle in a location that is stable and out of the way of activity.

Using both hands on the edge of the clay filter, place it on the mouth of the receptacle.



3) To get rid of the clay taste of the new filter, fill it with water and drain through the spigot. Repeat until all taste is gone.



4) If your water is turbid, strain it through a clean piece of fine cloth. Tie the cloth in place around the outside of the plastic receptacle.



5) Keep your filter filled and covered at all times.

The filter will flow more rapidly (one to two liters per hour) if it is kept full.

Remember: Before serving water wash your hands and cups with soap.

HOW TO CLEAN YOUR FILTER



Cleaning your CLAY FILTER

1) When the flow rate decreases, it is a signal that the pores of the clay filter are clogged.

To wash:

- Do not lift the clay filter when it is full of water. Wait until the clay filter is empty and there is filtered water in the plastic receptacle.
- Wash your hands with soap.
- Remove the clay filter from the plastic receptacle and put it on a plate that has been washed with filtered water.



- Pour a few inches of filtered water back into the filter.
- Scrub the filter with a stiff laundry brush on the inside and outside to remove any debris or particles.
- Do not worry if some of the clay comes off. It means you are scrubbing well.
- Rinse with filtered water until the water is clear.

Attention! Never use chlorinated water or soap to wash the clay filter.



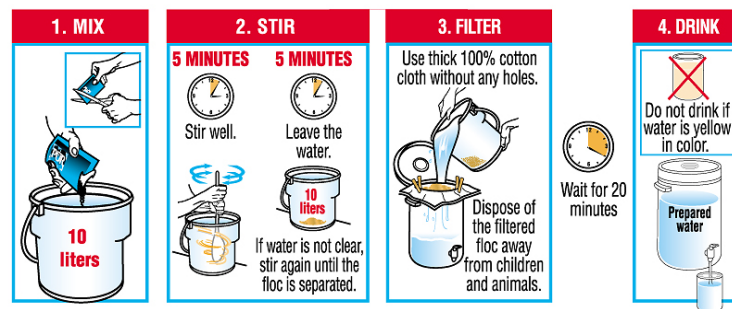
3) Washing the PLASTIC RECEPTACLE

Wash the plastic receptacle each month with chlorinated water or with soap as explained in part 1. Once you have finished washing, return the clay filter to the plastic receptacle to begin use.

Attention: The Filtron filter generally functions well for a year and a half or more. If you have problems, contact the organization that distributed your filter for advice on what to do.

Combined flocculation/chlorination systems

Inclusion of the directions for "PUR" in this annex – an example of a combined flocculation/ chlorination technology – does not imply WHO endorsement.



PUR Purifier of water Product Demonstration Guide

1. Open a sachet using a pair of scissors.
2. Add the contents of the sachet to a clean mixing vessel containing 10 liters of water.
3. Agitate the powder vigorously in the water for 5 minutes. Be sure a vortex is created when mixing. Then, let the water stand until it clarifies.
4. After adding the powder to the water, the water will become colored. The color indicates that the product is working. When the process is finished, the water will be crystal clear.
5. If you see the water is still colored, you can mix again and let it rest for another few minutes.
6. Once the water looks clear, and the floc is at the bottom of the bucket, filter the water through a clean cloth filter into a clean storage container and cover it with a lid.
7. The filter must be a cotton cloth that prevents the floc from passing through.
8. Wait **20 minutes** before drinking the water.
9. Do not drink water if it is colored or cloudy after treatment. If the floc accidentally gets into the treated water, use another cloth to filter the floc out of the treated water. The water is still good to drink.
10. The treated water should be preferably consumed within 24 hours after its preparation. Water that is left over should be used for cooking, washing, watering animals or otherwise discarded.
11. **ALWAYS** dispense the water from the storage container into another container, such as a cup or glass for drinking.
12. Discard the floc from the water treatment process in the latrine, or on the ground away from children and animals.

Do not ingest the powder; Do not ingest the powder. Maintain out of children's reach.

Contents: Fe₂(SO₄)₃: 352 mg Fe(III); Ca(OCl)₂

PUR Purificador de agua

Guía para la demostración del producto.

1. Abra el sobre con unas tijeras.
2. Añada el contenido del sobrecito a un recipiente limpio que contenga 10 litros de agua.
3. Agite el polvo vigorosamente en el agua por 5 minutos aproximadamente. Asegúrese de que cree un embudo al revolver el agua. Luego deje que el agua repose hasta que esté clara.
4. Luego de añadir el polvo en el agua, el agua se coloreará. El color indica que el producto está funcionando. Cuando el proceso termine, el agua estará cristalina.
5. Si nota que el agua aún tiene color, luego de revolver y reposar, puede revolver de nuevo y dejarla reposar por segunda vez.
6. Una vez que el agua se vea clara, y que los grumos estén en el fondo, cuele el agua a través de un filtro de tela limpio a una cubeta de almacenamiento limpia y cúbrala con una tapa.
7. El filtro debe ser una tela de algodón, sin agujeros, para evitar que pasen los grumos al agua.
8. Espere **20 minutos** antes de beber el agua.
9. No beba el agua si ésta tiene color o está turbia después de ser tratada/purificada. Si los grumos cayeran accidentalmente dentro del agua tratada/purificada, use otro filtro de tela para filtrar de nuevo los grumos del agua tratada. El agua todavía se puede utilizar.
10. El agua tratada/purificada debe consumirse preferiblemente dentro de las 24 horas siguientes a su preparación. El agua que quede, después de ese período, deber utilizarse para cocinar, lavar, darle de beber a los animales o descartarse.
11. **SIEMPRE** debe dispensar el agua de la cubeta de almacenamiento a un nuevo recipiente, como una taza o un vaso.
12. Deseche los grumos del agua tratada/purificada en la letrina, o en la tierra, lejos de los niños y de los animales.

PUR Purificateur d'eau Guide de démonstration du produit

1. Ouvrir le sachet du produit avec des ciseaux.
2. Ajouter le contenu du sachet dans un seau propre contenant 10 litres d'eau.
3. Mélanger vivement la poudre dans l'eau, durant environ 5 minutes. S'assurer de créer un tourbillon lors du mélange. Laisser ensuite reposer le mélange jusqu'à ce que l'eau se clarifie.
4. Une fois la poudre additionnée à l'eau, celle-ci se colore. Cette couleur est une indication du bon fonctionnement du produit. Lorsque le processus de purification de l'eau est terminé, l'eau devient limpide.
5. Si une fois cette procédure terminée, l'eau reste colorée, recommencer à mélanger et laisser l'eau se poser une nouvelle fois.
6. Une fois limpide et le floc accumulé au fond du seau, laisser l'eau se décarter à travers un filtre de coton, dans un récipient propre réservé au stockage de l'eau purifiée, et le couvrir.
7. Le filtre doit être en coton, sans trous, afin d'éviter que le floc ne passe au travers.
8. Attendre **20 minutes** avant de boire.
9. Ne pas boire l'eau si elle reste colorée ou trouble après purification et traitement. Si l'eau traitée contient du floc, la re-filtrer avec un autre filtre, afin d'éliminer le floc. Cette eau reste potable.
10. Une fois purifiée, l'eau doit être consommée dans les 24 heures suivant son traitement. Passé ce délai, le reste d'eau peut être utilisé en cuisine, pour le ménage, ou pour l'abreuvement des animaux.
11. **TOUJOURS** verser du récipient de stockage dans un autre récipient (tasse ou verre).
12. Jeter le floc restant suite au traitement de l'eau dans les latrines ou l'enfouir dans la terre, loin des enfants et des animaux.

PUR مطهر الماء طريقة الاستعمال

(Classic Arabic)

- 1- افتح الغشاء بمقص
- 2- افرغ محتوى الغشاء في دلو نظيف (10 لترت من الماء).
- 3- خلط المسحوق بالماء برشاقة لمدة 5 دقائق. تأكد من خلق زوبعة أثناء التخليط. اترك الخليط يرتاح حتى يصبح الماء صافياً.
- 4- خلال عملية الخلط، سيصبح الماء ملوناً. هذا اللون هو دليل على نجاح مفعول المسحوق. عند الانتهاء من عملية التطهير سيعود لون الماء صافياً.
- 5- إذا بقي الماء ملوناً، عاود عملية الخلط واترك الماء يرتاح مرة أخرى.
- 6- عندما يصبح الماء صافياً، ويتكوّن راسب إلى قعر الدلو، صف الماء عبر ثوب قطني نقي وبدون أي ثقب في سطل نظيف وغطيه.
- 7- يجب أن تكون المصفاة من ثوب قطني بدون أي ثقب حتى لا يمر الراسب عبر المصفاة.
- 8- انتظر **20 دقيقة** قبل شرب الماء.
- 9- لا تشرب الماء إذا كان ملوناً أو غير صافٍ بعد عملية التطهير. إذا كان الماء المطهر يحتوي على بعض الرواسب فيجب إعادة تصفية الماء بثوب آخر. سيظل هذا الماء صالحاً للشرب.
- 10- يجب استعمال الماء خلال اليوم الذي يلي عملية التطهير. أما بعد ذلك فيستحسن استعمال الماء لأغراض أخرى مثل المطبخ، التنظيف أو تروية الحيوانات.
- 11- يجب دائماً صب الماء من مكان التخزين إلى الكوب.
- 12- ارم الأوساخ الناتجة عن عملية التطهير في المراض أو ادفعها بعيداً عن متناول أيدي الأطفال والحيوانات.

For further information visit www.who.int/water_sanitation_health/en
www.who.int/household_water