

# Water Water Everywhere!

By Andy Blake

**Now it's time to throw some words around that you may not use on an everyday basis. Words like turbidity, potability, solar disinfection, filtration, sterilisation and purification.**

So, turbidity is the cloudiness of a liquid caused by a large numbers of particles. Depending on the type and size will determine whether these quickly sink to the bottom or remain suspended. Potability is water that is deemed safe for humans to drink without causing any problems.

Filtration is the physical process of separating liquids from solids. Depending on the type and nature of a filter will determine the outcome. A sock can be used to filter muddy water but it won't filter out the bacteria, viruses and other microscopic nasties. They require a finer filter, like the filter you may have on your kitchen tap. Fancy portable water filters and straws are now available and take the risk out of having a drink from an unknown water source. If caught out in the bush or coast, you may not have your filter so an improvised filter can easily be made which should remove the cloudiness.

Sterilization is the elimination of microbes and can be achieved with one or more of heat, chemicals, irradiation, high pressure, and sophisticated filtration. We benefit from this process every day when we drink pasteurised milk.

Purification is the process of removing undesirable chemicals, biological

contaminants, suspended solids and gases from unsafe water. This can be achieved by filtration, sedimentation, distillation; using biologically active carbon; chemical processes such as chlorination and the use of electromagnetic radiation such as ultraviolet light.

## **CHEMICAL WATER TREATMENT**

When I was in the NZ Army, we were supplied with water purification tablets that we used whilst in the field, to kill microorganisms found in streams etc. We used one tablet per water bottle and waited about an hour before we drank the water. It did add a strange taste to the water but definitely better than the alternative - diarrhoea and vomiting!

The tablets were small and great for peace of mind. Many different brands are available from your pharmacist and relatively inexpensive, a good thing to have in your survival kit.

Four drops of household bleach or iodine per litre of water works just as well. Remember to wait about an hour before consumption of the water

Water borne disease's include cholera, typhoid and dysentery.

## **SOLAR WATER DISINFECTION**

It turns out that one of the simplest ways to disinfect water is by using the sun. Sunlight — more accurately, ultraviolet radiation between the wavelengths of 320 and 400 nanometres, or UVA — destroys most pathogens. Solar Water Disinfection or SODIS for short is ideal to treat small quantities of water. Contaminated water is filled into transparent plastic bottles and exposed to full sunlight for six hours.

Sunlight is treating the contaminated water through two mechanisms: Radiation in the spectrum of UV-A and increased water temperature. If the water temperature rises above 50°C, the disinfection process can be up to three times faster. There are obvious limitations to this method such as you need plenty of sunshine (ideally between latitude 35°N and 35°S), the water must be of reasonable quality to start with and you need some clear plastic bottles - luckily these are usually found in abundance above the high tide mark. Also it will not have an effect on the chemical content

of the water. As the turbidity should be quite low, filter the water first. How much sunlight is required? This varies from about 6 hours under bright sunlight or up to 50% cloudy sky or two consecutive days with 100% cloudy skies.

Boiling water is probably the best method for purifying running water you gather from natural sources. It doesn't require any chemicals, or expensive equipment - all you need is a large pot and a good fire or similar heat source.



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Most experts feel that if the water reaches a rolling boil it is safe whereas others believe 5 or 10 minutes, plus an extra minute for every 300m of elevation is required. The heat sensitivity of micro-organisms varies, at 70 °C (158 °F), Giardia species (causes Giardiasis) can take ten minutes for complete inactivation, most intestine affecting microbes and E. coli (gastroenteritis) take less than a minute; at boiling point, Vibrio cholerae (cholera) takes ten seconds and hepatitis A virus (causes the symptom of jaundice), one minute. Boiling does not ensure the elimination of all micro-organisms; the bacterial spores Clostridium can survive at 100 °C (212 °F) but are not water-borne or intestine affecting. Boiling water does not affect its taste although it may taste a little "flat". This can be improved by pouring the water from one container to another to increase the oxygen

content of the water.

### IMPROVISED FIELD FILTRATION

An effective water filter can easily be made by filling a plastic bottle with alternating layers of charcoal and sand. Firstly remove the bottom of a plastic bottle and plug the narrow end with a clean piece of cloth or a toetoe flower head. Remember you may have a wettex cloth tablet in your survival kit that can be moistened and used. Invert the bottle and add a generous layer (4-5 cm) of sand or fine gravel. Now add a similar thickness layer of crushed charcoal from your fireplace. Only use the black charcoal and not the white coloured ash. Continue to repeat this alternate layering process until you fill the container. Now securely suspend this filter vertically and pour the questionable water into the top. Use another clean container to collect the water as it comes out the bottom. The water will filter down through the layers and you will be amazed at how clear the cloudy water becomes. It is wise to now purify this water with either boiling, SODIS or



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### **BOILING WITHOUT POTS**

Water can be brought up to the boil in a number of ways. There is applying heat to the bottom of a water carrying device (like a metal pot) or by applying heat to the water directly. Often if you are caught out in the bush you will not have the luxury of pots and pans and other such equipment, it is now you will have to use your improvisation to overcome this.

Rocks can be heated up over the fire and then placed into a container of water. The heat from the stone will quickly heat up the water. Several changes of rocks may be required to get the liquid hot enough. I have made a 40° bath in the middle of Fiordland, in the middle of winter on the shores of Lake Hauroko using this technique. I had been in the bush for a couple of weeks and the smell was getting a bit much, even for me, and the Lake was freezing! Many plastics can withstand very high temperatures, glass even higher. If these aren't available then maybe a receptacle made out of canvas, small depression in a rock (rock pool), carved out wooden bowl or even the base of the nikau palm frond. Use your knife and a sturdy short stick to cut around the bottom of the fronds base to form a large "pot". Large paua shells could be used - try heating from below also. Also a waterproof tarp could be placed in a small depression for water collection or for boiling water using hot rocks.

### **WATER STORAGE**

Water can be stored in containers made of shells, large leaves folded into a cone (ie whau and rangiora) the base of nikau palm fronds, condom



from your survival kit contained in a sock (don't puncture it), plastic containers and aluminium cans found in the inter tidal zone, plastic bags or a waterproof garment lining a small depression in the ground. If you are lucky enough to have a kayak, then water can be stored in an watertight hatch or a small amount can be stored in an upside down hatch lid. It is vital to continually think outside the square.

I cannot overstate how important water is to us and even though New Zealanders all live on an "Island" surrounded by about 15,000 kms of coastline and are blessed with numerous lakes, rivers and estuaries everywhere we still often are not properly hydrated. Honestly there are no excuses - off you go - go and have a glass of clear pure New Zealand water!

### **SALT WATER**

It must be noted - no amount of filtration will de-salinate sea water. This requires an osmotic membrane that operates under high pressure.