

20. Water sampling

The objective of water sampling

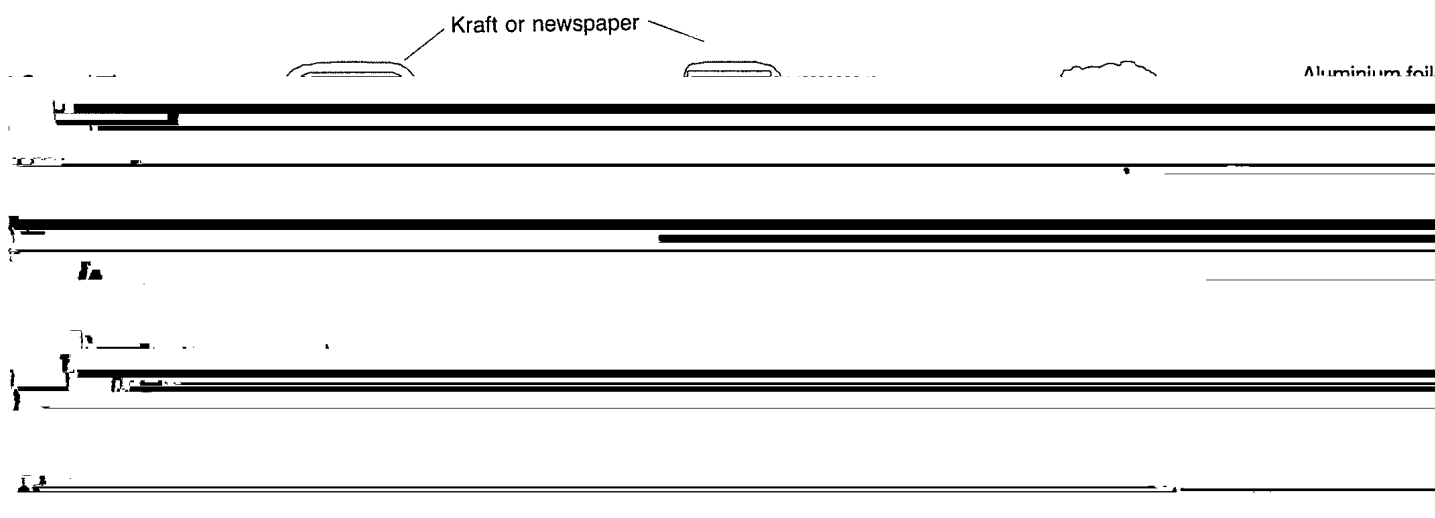
This Technical Brief describes the sampling procedures for bacteriological testing of water (see Technical Brief No.18, *Water testing*, for details of the analysis).

The objective of water sampling is to collect and deliver for analysis a sample of water representative of the bulk of water being examined. Sampling procedures are as important as the analysis. Care needs to be taken to ensure that there is no accidental contamination of the sample during sampling and transport.

Bacteriological analysis results are used to check the quality of treated drinking-water at taps and standposts on a distribution system. The other major use is to evaluate contamination by faecal bacteria of water sources, such as springs, boreholes, rivers and lakes.

Preparation and sterilization of sample bottles

- 1 Glass bottles of at least 200ml capacity with a ground-glass stopper or rubber-lined aluminium or plastic screw caps should be cleaned and washed thoroughly, then rinsed with distilled or de-ionized water.



Sterile bottles and protected tops

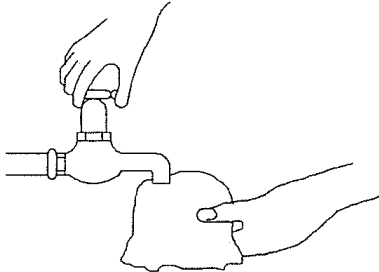
- 2 Add 0.25ml of 18% solution of sodium thiosulphate ($\text{Na}_2 \text{S}_2 \text{O}_3 \cdot 5\text{H}_2\text{O}$) per 250ml of bottle capacity to neutralize any residual chlorine.
- 3 Screw taps should only be loosely fastened prior to sterilization and then only tightened when cooled following sterilization. For ground-glass bottles only, a strip of paper should be placed in the neck of the bottle.
- 4 A piece of paper, preferably kraft paper or aluminium foil (although any thick paper, even newspaper, would do) should be fastened over the cap and neck of the bottle. This is tied with an open bow knot which can be released by a single pull.
- 5 The sample bottles are then sterilized in an autoclave at 122°C for 20 minutes or by heating in a dry oven at 170°C for one hour.
- 6 Allow bottles to cool and then tighten tops and store in a refrigerator until needed.

Water sampling

Sampling from a tap, standpost or pump outlet

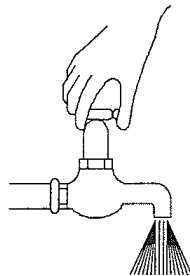
A. Clean the tap

Remove any attachments from the tap that may cause splashing and, using a clean cloth, wipe the outlet in order to remove any dirt. If the tap leaks, it must be repaired before sampling. WASH YOUR HANDS.



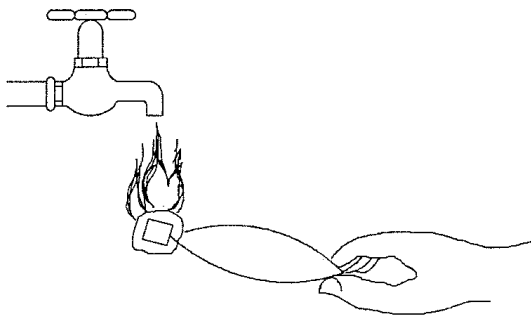
B. Open the tap

Turn on the tap at maximum flow rate and let the water flow for 1-5 minutes to clear the service line.



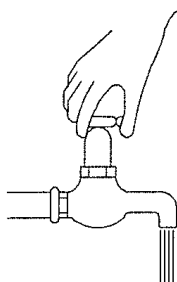
C. Sterilize the tap

Sterilize the tap for a minute with a flame from an ignited cotton wool swab soaked in alcohol; alternatively, a gas burner or cigarette-lighter may be used. If the tap is plastic, do not use a flame, a solution of hypochlorite will suffice. In some books tap sterilization is not considered important. However, if in doubt, sterilize the tap.



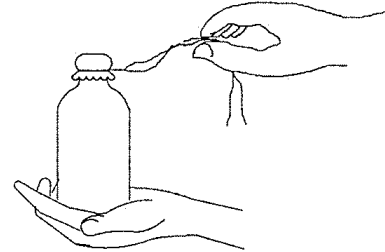
D. Open the tap prior to sampling

Carefully turn on the tap and allow the water to flow for 1-2 minutes at normal flow rate.



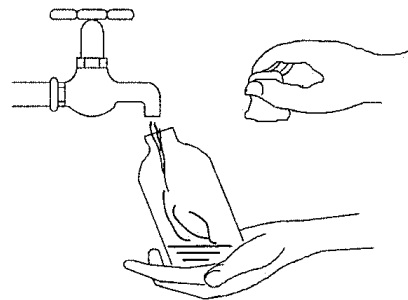
E. Open a sterilized bottle

Untie the string fixing the protective paper cover and pull out or unscrew the stopper, keeping your fingers on the paper.



F. Fill the bottle

While holding the cap and protective cover face downwards (so as to prevent entry of dust that might carry micro organisms), immediately hold the bottle under the water jet and fill to the shoulder of the bottle only.



G. Stopper or cap the bottle

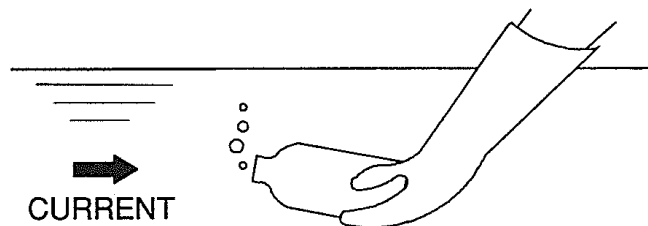
Place the stopper in the bottle or screw on the cap and fix the paper or foil covered cap in place with the string. Turn off the tap. Thank the consumer for the use of the tap.

Place a label on the bottle. Label with location (house no., road etc.), time of sampling, date and sampler's name. Place it in a transport box and return it to the laboratory within 24 hours if stored in melting ice.



Sampling from a watercourse or reservoir

Holding the bottle by the base, submerge it to a depth of about 30cm with the mouth facing slightly upwards. If there is a current, the bottle mouth should face towards the current. If there is no current, scoop the bottle away from your body. If the bottle is completely full, discard some water to provide some air space. The bottle should then be stoppered or capped.

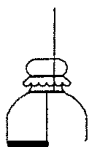


Sampling from wells, boreholes and water containers

For wells or boreholes equipped with a pump, the pump should be operated to clear any standing water in a water column (this pumping could be at least 20 – 30 minutes depending on the depth and diameter of the borehole) before the outlet pipe is sterilized using either a gas torch or alcohol flaming. Operate the pump for a further two minutes and take a sample in the flowing stream of water. For shallow open wells a weighted bottle or shallow sampling device may be used.

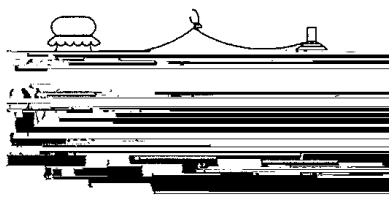
A. Prepare the bottle

With a piece of string, attach a stone of suitable size to the sampling bottle.



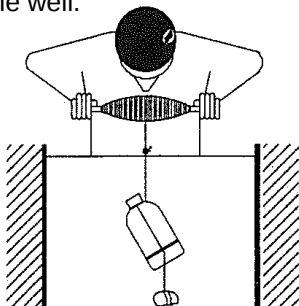
B. Attach bottle to string

Take a 20-metre length of clean string rolled around a stick and tie onto the bottle string. Open the bottle.



C. Lower the bottle

Lower the bottle, weighted down by the stone, into the well unwinding the string slowly. Do not allow the bottle to touch the side of the well.



D. Fill the bottle

Immerse the bottle completely in the water and lower it to the bottom of the well.



E. Raise the bottle

Once the bottle is filled, rewind the string round the stick to bring up the bottle. If the bottle is completely full, discard some water to provide some air space. Stopper the bottle.

A sample from the water carrier's pot or bucket may be more representative of what is actually being drunk so take a sample poured into the bottle from that as well. If the water is stored in the house then the household container would also need to be sampled. Positive results from the house only would indicate poor hygiene in the home rather than polluted groundwater.

Water sampling

General points

DO:

- Collect the bacteriological sample first at sampling point.
- Only collect in sterile bottles.
- Keep the bottle closed until the sample is ready to be collected.
- Hold the bottle around the base.
- Carry some spare sterile bottles.
- Wipe the outside of the bottle.
- Resample if there is a possibility of contamination.
- Transport the sample in a cooled (0 – 4°C melting ice) covered container within 24 hours.
- Label the bottle with a waterproof marker pen with location, time, date and sampler's name.
- Test for chlorine residual on site by using a DPD or starch-iodide method. (Hutton, 1983.)

DO NOT:

- Contaminate the sampling point.
- Allow the top or neck of the bottle to touch anything.
- Collect samples in dirty bottles.
- Rinse or completely fill the bottle.
- Put yourself at risk from bilharzia: wear waterproof gauntlets or waders.

Frequency of sampling

Ideal frequencies related to populations are described in WHO's *Guidelines for Drinking Water Quality* (1985) but few countries can afford or are able to meet these recommendations due to a lack of trained staff and resources. The general criteria should be, however:

1. To test as often as possible.
2. To test at as many points in the water network as practically feasible.
3. To keep the testing facilities fully employed until an acceptable frequency of sampling is obtained.

There should be a concentration of sampling at points where maximum benefit will be obtained. It is essential that treated water entering the distribution system is monitored daily. Other points to be sampled are shown below. The minimum WHO recommendation on frequency of sampling for piped supplies is 1 sample per month per 5,000 people served.



Typical sampling points. (Priority, 1-3)

For further information:

Hutton, L.G., *Field Testing of Water in Developing Countries*, WRC Medmenham UK, 1983.

Hutton, L.G., Technical Brief No. 18.

WHO, *Guidelines for Drinking Water Quality*, Vol 1 – 3, WHO, Geneva, 1985.