Appendix 16. Preparation and use of 1% chlorine solution to disinfect water

Preparation of 1% chlorine stock solution[2]

To make 1 litre of the stock solution, mix the quantity shown of one of the following chemical sources with water and make up to 1 litre in a glass, plastic or wooden container

Product	1% chlorine stock solution	Notes
HTH at 70% active chlorine	15 grams in 1 litre of water or 1 level teaspoons in 1 litre of water	Loses about 2% of active chlorine per year The quantity of HTH (70% of active chlorine) necessary for all needs is approximately 100 to 110 g per patient per day
NaDCC at 1 g active chlorine per tablet	10 tablets in 1 liter of water	The most stable product
Chlorinated lime At 30% active chlorine	33 grams in 1 liter of water or 2 level teaspoons in 1 liter	Unstable and should be used within 3 months of manufacture(if stored in good conditions)
Sodium hypochlorite (bleach) at 5% active chlorine	250 ml of bleach in 1 litre of water or 1 glass in 1 litre of water	
Sodium hypochlorite concentrate at 15% active chlorine	70 ml of concentrate in 1 litre of water	

Notes:

- 1 tablespoon = 10 ml or 15 g; 1 glass = 250 ml
- A 1% solution contains 10 g of chlorine per litre = 10 000 mg/litre or 10 000 ppm (parts per million).
- Avoid skin contact with any of the chemical sources or the stock solution, and avoid inhaling chlorine fumes.
- Never prepare chlorine solutions in metallic containers (unless they are properly enamelled or painted) or use metallic spoons for measurement or stirring. The recommendation is to use plastic containers for preparation of chlorine solutions and wooden spoons for measurement and stirring.
- This stock solution should be made fresh every day and protected from heat and light.

Disinfecting water using a 1% chlorine stock solution3

To produce an initial chlorine concentration sufficient to leave a free residual chlorine (FRC) concentration: 0.2–0.5 mg/litre for water at point of use and 1 mg/litre for water at source.

1) **Prepare a 1% chlorine solution** as indicated above.
2) **Take four non-metallic water containers** (such as 20-litre plastic buckets) and put 10 litres of the water each one.
3) **Using a syringe, add progressively greater doses of 1% chlorine stock solution to the containers:**

— 1st container: 1 ml
— 2nd container: 1.5 ml
— 3rd container: 2 ml
— 4th container: 5 ml

4) **Stir the solution** in the containers and wait at least 30 minutes (wait 60 minutes below 10°C as soon as possible and then cover and store them in a refrigerator or icebox if pH is > 8).

5) **Measure the FRC** of each container using a comparator or test strip.

   Choose the container that shows an FRC between 0.2–0.5 mg/litre. This is the required concentration of chlorine for the disinfection of water at point of use. For chlorination of water at source, recommended FRC is 1 mg/litre.

6) **If no container has the right FRC**, repeat the exercise with different quantities in step 3 (that is, 2, 4, 8 and 16 ml).

7) **Calculate the amount** of 1% chlorine solution needed for the quantity of water to be treated. Test the chlorine levels of the containers regularly to ensure adequate levels of FRC.

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[2] United Nations Children's Fund. Chlorine Mixing, in Cholera Toolkit, 2013, Annex 8E(C), p. 217. New York: UNICEF; 2013 (https://www.unicef.org/cholera/Cholera-Toolkit-2013.pdf); and Médecins Sans Frontières. Preparation of chlorine solutions for cholera structures, in Cholera Guidelines 2004, p. 113. MSF; 2004 (https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/choleraguide.pdf).

[3] Source: Delmas, G., Courvallet, M. (1994). Public Health Engineering in Emergency Situation, WHO.