A TOOLKIT FOR MONITORING AND EVALUATING HOUSEHOLD WATER TREATMENT AND SAFE STORAGE PROGRAMMES

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A toolkit for monitoring and evaluating household water treatment and safe storage programmes.

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ANNEX A: SUMMARY OF HWTS METHODS[1]

METHOD	REMOVAL PERFORMANCE (LOG REMOVAL)[a]	ADVANTAGES	LIMITATIONS
Filtration (ceramic)	Bacteria: 2–6 Protozoa: 4–6 Viruses: 1–4	• Simple to use • Visual improvement in treated water • Possibility of local production benefits economy • One-time capital cost	• Lack of residual protection presents potential for recontamination (although products increasingly address this through attached safe storage containers) • Variability in quality of locally produced filters • Filter breakage requires reliable supply chain • Need to regularly clean filters and receptacles • Low flow rate of 1–3 litres per hour (slower in turbid waters) • Potential user taste objections
Filtration (slow sand filtration, i.e. biosand)	Bacteria: 1–3 Protozoa: 2–4 Viruses: 0.5–2	• High flow rate (~20 litres per hour) • Simple to use • Visual improvement in treated water • Production from locally available materials • Longer life • One-time capital cost	• Lack of residual protection presents potential for recontamination • Difficulty in producing and transporting heavy concrete and plastic (45–160 kg) filter housing and sand • Need for periodic cleaning and difficulty in assessing when cleaning is needed
Filtration (microfiltration [MF], ultrafiltration [UF], nanofiltration [NF], reverse osmosis [RO])	Bacteria: 2 MF; 3 UF, NF or RO – 4 MF; 6 UF, NF or RO Protozoa: 2 MF; 3 UF, NF or RO – 6 MF, UF, NF or RO Viruses: 0 MF; 3 UF, NF or RO – 4 MF; 6 UF, NF or RO	• Visual improvement in treated water • Potential longer life if spare parts are accessible • One-time capital cost	• Lack of residual protection presents potential for recontamination (although methods increasingly address this through attached safe storage containers) • Need for multiple steps to use the product, requires additional user support • Requires reliable supply chain for spare parts
Combined flocculant/ disinfectant powders	Bacteria: 7–9 Protozoa: 3–5 Viruses: 4.5–6	• Reduction of some heavy metals (e.g. arsenic) and pesticides • Residual protection against recontamination • Visual improvement in treated water • Small sachets are easily transported due to size, non-hazardous classification, long shelf life	• Need for multiple steps to use the product, requires additional user support • Requires reliable supply chain • Most appropriate in areas with high turbidity • Higher relative cost per litre treated

[1] Adapted from Lantagne & Clasen (2009); WHO (2011c).

METHOD	REMOVAL PERFORMANCE (LOG REMOVAL)[a]	ADVANTAGES	LIMITATIONS
Thermal (boiling and pasteurization)	Bacteria: 6–9+ Protozoa: 6–9+ Viruses: 6–9+	• Existing presence in many households of materials needed to boil water • Sociocultural acceptance of boiling for water treatment in many cultures	• Lack of residual protection presents potential for recontamination • Potential for burn injuries and increased risk of respiratory infections from indoor stoves or fires • Potentially high cost of carbon-based fuel source (with concurrent deforestation risk) and the opportunity cost of collecting fuel • Potential user taste objections
Solar disinfection (solar disinfection + thermal effect)	Bacteria: 3–5+ Protozoa: 2–4+ Viruses: 2–4+	• Simple to use • No cost to the user after obtaining the plastic bottles • Minimal change in taste of the water • Minimal likelihood of recontamination because of safe storage	• Need for pretreatment (filtration or flocculation) of waters of higher turbidity • Volume to treat dependent on availability of clean, intact plastic bottles • Lack of visual improvement in water aesthetics to reinforce benefits of treatment • Relatively longer time to treat water and variability depending on sun intensity (12–48 hours)
Chlorination	Bacteria: 3–6 Protozoa: 3–5 (non-*Cryptosporidium*) Protozoa: 0–1 (*Cryptosporidium*) Viruses: 3–6	• Residual protection against recontamination • Simple to use • Possibility of local production benefits economy • Low cost	• Lower removals in turbid waters • Potential user taste and odour objections • Requires reliable supply chain • Necessity of ensuring quality control of product • Misunderstanding about the effects of chlorination by-products

[a] The range of removals represents baseline (i.e. in the field by a relatively unskilled operator) to maximum documented removals. Removal may also be expressed in terms of per cent reduction: 90% = 1 log, 99% = 2 log, 99.9% = 3 log, 99.99% = 4 log, 99.999% = 5 log, 99.9999% = 6 log, etc.