WHO International Scheme to Evaluate Household Water Treatment Technologies

Summary results of Round I

Background

Globally, an estimated 663 million people lack access to improved drinking-water sources[1], and even where improved sources are available, the water supply is not necessarily safe. At least 1.9 billion rely on either unimproved sources or improved sources that are faecally-contaminated[2]. It is in these settings that household water treatment (HWT) and safe storage can serve as an important interim measure to make drinking-water safer. Health gains from HWT and safe storage can only be achieved when treatment products are **effective** in removing pathogens from drinking-water, and are used correctly and consistently. A variety of HWT products – with performance ranging from little to considerable pathogen removal – are available. However, many countries have neither the resources nor the capacity to evaluate HWT performance according to WHO criteria.To fill this need, WHO established the International Scheme to Evaluate Household Water Treatment Technologies. WHO works with an Independent Advisory Committee (IAC) of experts and designated testing laboratories to consistently and independently evaluate the performance of HWT products, and in so doing, guide Member States and procuring agencies in product selection.

Overview

In 2014, WHO issued the first call to HWT manufacturers to submit expressions of interest for products to be evaluated in Round I of the Scheme. Ten products representing filtration, solar, ultraviolet (UV) and chemical disinfection methods were evaluated. The evaluation consisted of laboratory testing and review of existing testing data.

[1] WHO/UNICEF (2015). Progress on sanitation and drinking-water: 2015 update and MDG assessment. Geneva (http://www.who.int/water_sanitation_health/publications/jmp-2015-update/en/)
[2] WHO (2014). Preventing diarrhoea through better water, sanitation and hygiene: Exposures and impacts in low- and middle-income countries. Geneva: World Health Organization; (http://www.who.int/water_sanitation_health/gbd_poor_water/en/)

Review of product dossier by WHO and IAC, including existing testing data and product information on safety, performance and field testing

Testing of products at WHO designated testing laboratories according to WHO harmonized testing protocols

Review of results by WHO and IAC review test results and performance classification. Summary results are listed on WHO webpage

Figure 1: The Scheme evaluation at a glance[3]

The performance of HWT products is classified as 3-star (★★★); 2-star (★★); and 1-star (★), denoting descending order of performance, based on $\log_{10}$ reductions of bacteria, viruses and protozoa from drinking-water. Performance that does not meet the minimum target is given no stars. The microbiological reductions required for the three categories of performance are shown below:

Table 1: WHO microbiological performance criteria for HWT technologies

Performance target	**Bacteria** ($\log_{10}$ reduction required)	**Viruses** ($\log_{10}$ reduction required)	**Protozoa** ($\log_{10}$ reduction required)	**Performance classification** (assuming correct and consistent use)
★★★	**≥ 4**	**≥ 5**	**≥ 4**	Comprehensive protection: very high pathogen removal
★★	**≥ 2**	**≥ 3**	**≥ 2**	Comprehensive protection: high pathogen removal
★	Meets at least 2-star (★★) criteria for two classes of pathogens			Targeted protection
–	Fails to meet WHO performance criteria			Little or no protection

In addition to the performance evaluation, a rapid assessment was conducted to determine HWT products that are currently on the market and the regulatory environment in the regions of Africa and Asia. The key facts from the (i) performance evaluation; (ii) review of existing testing data and product information; and (iii) market assessment are summarized as follows:

[3] The evaluation procedure and protocols can be found at: http://www.who.int/household_water/scheme/applicant/en/

1. A VARIETY OF HWT PRODUCTS ARE AVAILABLE THAT WERE FOUND TO MEET WHO PERFORMANCE TARGETS.

Eight out of the HWT ten products evaluated in Round I meet at least 1-star (★) performance targets. These products represent membrane ultrafiltration, UV, solar and chlorine disinfection technologies.

Technology	Product	Manufacturer	Performance	Performance classification (assuming correct and consistent use)
Membrane ultrafiltration	LifeStraw Family 1.0	LifeStraw SA	★★★	Comprehensive protection: *very high removal of bacteria, viruses and protozoa*
Membrane ultrafiltration	LifeStraw Community	LifeStraw SA	★★★	
Membrane ultrafiltration	LifeStraw Family 2.0	LifeStraw SA	★★	Comprehensive protection: *high removal of bacteria, viruses and protozoa*
Flocculation-disinfection	P&G Purifier of Water	The Procter & Gamble Company	★★	
UV disinfection	Waterlogic Hybrid / Edge Purifier	Qingdao Waterlogic Manufacturing Company	★★	
Chemical disinfection	Aquatabs	Medentech Limited	★	Targeted protection: *removal of bacteria and viruses only*
Chemical disinfection	H2gO Purifier	Aqua Research LLC	★	
Solar disinfection	WADI	Helioz GmbH	★	Targeted protection: *removal of bacteria and protozoa only*

★★★: removes at least 4 $\log_{10}$ of bacteria, at least 5 $\log_{10}$ of viruses and at least 4 $\log_{10}$ of protozoa

★★*:* removes at least 2 $\log_{10}$ of bacteria, at least 3 $\log_{10}$ of viruses and at least 2 $\log_{10}$ of protozoa

★*:* meets the performance targets for at least 2-star (★★) for *only two* classes of pathogens

2. SOME PRODUCTS FAIL TO MEET THE SCHEME'S MINIMUM RECOMMENDATIONS FOR HEALTH PROTECTION.

Two of the products evaluated do not meet the Scheme's minimum microbiological performance criteria. Identifying such products is crucial to inform appropriate HWT product selection and procurement and to promote use of better performing alternatives.

3. **AWARENESS OF THE KEY CONSIDERATIONS IN HWT PERFORMANCE EVALUATION IS LIMITED.**

Three main findings arising from the review of existing testing data and discussing with HWT stakeholders are that:

- **Performance is often overlooked in selecting products.** While WHO recognizes that performance is certainly not the only factor, there are no health benefits in distributing products that do not meet minimum health standards and doing so may mislead users, especially those most in need of safe water solutions.
- **Testing conducted outside the Scheme is undertaken with varying methods and often under "ideal" conditions** such as using non-turbid water, high doses and long contact times, and only against a limited set of parameters. This results in data which only reflect "part of" HWT performance, rather than comprehensive data under all conditions, thus rendering interpretation of tests difficult and comparability between tests even more so.
- **Product information, including use instructions and labelling can be unclear**, and deciphering information that is pertinent to product performance is difficult. Without sufficient product information, the ability of users to correctly and consistently use HWT and ultimately achieve health gains is compromised.

4. **THERE IS A STRONG GROWTH IN FILTER MARKETS IN PARTS OF ASIA.**

Findings from India, Viet Nam, China and South Korea highlight that the growth in the filter markets is likely attributed to growing consumer awareness of a number of factors, including the quality of supplied water, the potential health gains from using HWT, the wide availability of HWT products and also the ability of middle-income households to pay.

5. **SUSTAINED USE OF HWT REMAINS RELATIVELY LOW IN THE AFRICAN REGION.**

The vast majority of those without improved water sources live in sub-Saharan Africa, and an estimated 53 % of the population in the region are exposed to water that is faecally-contaminated[4]. Yet, reported HWT use in the region remains relatively low (20 %, on average). Implementation of HWT is largely project-based and is often focused on emergency relief efforts or cholera outbreaks, highlighting the need for approaches that promote more sustained, ongoing use and develop the mechanisms and systems to ensure availability, user support and effective supply chains

[4] Preventing diarrhoea through better water, sanitation and hygiene: Exposures and impacts in low- and middle-income countries. Geneva: World Health Organization; (http://www.who.int/water_sanitation_health/gbd_poor_water/en/, accessed 16 February 2015).

6. **REGULATION OF HWT IS WEAK AND FRAGMENTED.**

Findings from Ethiopia, Ghana and Viet Nam highlight that regulatory frameworks for HWT products are weak, and often fragmented. Overall, few countries regulate HWT products based on their microbiological performance, and among those that do, such regulation is often limited to chemical disinfectants and not all three classes of microbial pathogens (i.e. viruses, bacteria and protozoa).

7. **STRENGTHENING THE REGULATORY CAPACITY OF NATIONAL GOVERNMENTS IS IMPORTANT.**

The findings from the review of existing data and market assessment underscore the need to increase awareness of the WHO HWT performance criteria. They also highlight the importance of strengthening the capacity of national regulatory institutions to consider performance in regulating HWT, including evaluating product efficacy data and certifications, conducting complimentary evaluations of local HWT products and informing the public and users of performance.

8. **STRENGTHENING IMPLEMENTATION OF HWT** is critical to ensure that effective HWT products reach, and are used correctly and consistently by those most at risk of water-borne disease. This requires market development, understanding of consumer preferences, behavioural interventions and monitoring and evaluating on-going use. Through the WHO/UNICEF International Network on Household Water Treatment and Safe Storage, WHO is working with other stakeholders to better understand and address these additional factors to support smarter HWT implementation and better health impact.