World Health Organization

WHO International Scheme to Evaluate Household Water Treatment Technologies

Oasis® Water Purification Tablets

Product evaluation report

WHO performance classification	Targeted protection (bacteria and viruses only) One-star (★)
Manufacturer	Hydrachem Ltd Gillmans Industrial Estate Billingshurst West Sussex RH14 9EZ United Kingdom www.hydrachem.co.uk
Evaluation procedure	Abbreviated laboratory testing
WHO report issue date	Round II, 2019
WHO reference number	01/06/2016-R2-35

Summary of evaluation

This report summarizes the evaluation results of chlorine disinfectant known by the tradename 'Oasis Water Purification Tablets' under Round II of the World Health Organization (WHO) International Scheme to Evaluate Household Water Treatment Technologies (the Scheme). Evaluation followed the requirements of the WHO protocol for chlorine disinfection technologies and comprised bacterial inactivation testing, review of existing data on viral inactivation and measurement of chlorine dose delivered, and posttreatment concentrations of free available chlorine. Based on the evaluation results, Oasis® Water Purification Tablets meet WHO performance criteria and are classified as providing *Targeted protection* (★) against bacteria and viruses only.

Background

Evaluation under the Scheme is based on performance criteria set out in *Evaluating Household Water Treatment Options: Health-based targets and microbiological performance specifications* (WHO, 2011). The criteria were determined by applying quantitative microbial risk assessment (QMRA) methods outlined in the *Guidelines for Drinking-water Quality* (WHO, 2017) and set $\log_{10}$ reduction targets against bacteria, viruses and protozoa, as shown in Table 1.

Table 1. WHO performance criteria for household water treatment technologies

Performance classification	Bacteria ($\log_{10}$ reduction required)	Viruses ($\log_{10}$ reduction required)	Protozoa ($\log_{10}$ reduction required)	Interpretation (with correct and consistent use)
★★★	≥ 4	≥ 5	≥ 4	Comprehensive protection
★★	≥ 2	≥ 3	≥ 2	
★	Meets at least 2-star (★★) criteria for two classes of pathogens			Targeted protection
—	Fails to meet criteria for 1-star (★)			Little or no protection

Product description

Oasis® Water Purification Tablets are effervescent chlorine tablets with sodium dichloroisocyanurate (NaDCC) as the active ingredient. The tablets are available in foil-wrapped strips of different strengths, according to the volume of water to be treated, from 1 to 200 L. The full product description, illustrations and use instructions can be found at www.hydrachem.co.uk.

Evaluation approach

Product-specific test plan: A product-specific test plan was developed based on the manufacturer's instructions for use; the WHO Scheme Harmonized Testing Protocol: Technology Non-Specific V 1.0 (WHO, 2018a); and the Chemical Disinfection Technology Protocol V 2.1 (WHO, 2018b). Testing was conducted at a WHO-designated laboratory, NSF International, in the United States of America.

Test organisms: Laboratory testing of Oasis® Water Purification Tablets investigated their performance in inactivating bacteria. *Escherichia coli* (*E.coli*) was the test organism. Evaluation of performance against viruses was based on a review of existing data. The available evidence on chlorine indicates that it is generally not effective against protozoa and therefore testing against this microbial group was not conducted.

Test waters: The product was tested in two simulated natural waters: General Test Water (GTW), simulating high quality groundwater, and Challenge Test Water (CTW), simulating surface water. Details on the physicochemical characteristics of the test waters are available in the Chlorine Disinfection Technology Protocol V 2.1.

Test set up: Samples from two production lots were provided for the test. The product was applied according to the manufacturer's use instructions. Pretreatment and posttreatment water grab samples were analysed using methods described in the product-specific test plan. Three replicates / sample tablets from each production lot were tested in CTW and GTW, resulting in 12 sample points per test organism (i.e. 2 lots × 3 replicates × 2 test waters).

Concentrations of free residual and total chlorine delivered in deionized, demand-free water were measured as a general indication of product quality[1]. Posttreatment free residual and total chlorine samples were collected

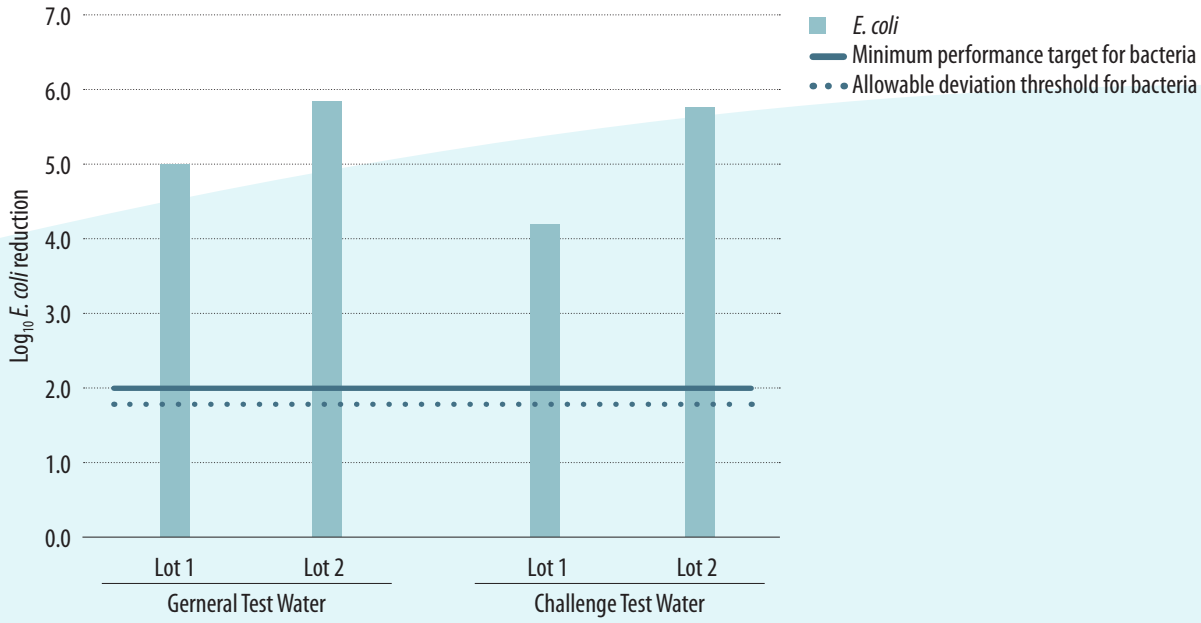
[1] Most commercially available chlorine products are generally designed to deliver a dose of 2 mg/L in clear, nonturbid water.

and analysed. Per the *Guidelines for Drinking-water Quality* (WHO, 2017), a minimum of 0.2–0.5 mg/L of residual chlorine should be maintained at the point of delivery to ensure sufficient disinfection. However, the concentration of total chlorine should not exceed the health-based guideline value of 5 mg/L.

Results

Fig. 1 presents the results of the bacterial testing for the two lots in GTW and CTW. All test water characteristics were within specifications.

Fig. 1 Bacterial reduction across test lots[1]



Oasis® Water Purification Tablets achieved mean *E. coli* reductions of 5.4 and 5.0 $\log_{10}$ in GTW and CTW, respectively, with an overall mean reduction of 5.2 $\log_{10}$.

The mean concentrations of free residual and total chlorine in deionized, demand-free water were 2.8 and 3.0 mg/L, respectively. Posttreatment mean concentrations of free residual and total chlorine were 0.60 and 0.80 mg/L in GTW and 1.3 and 1.5 mg/L in CTW, respectively.

Interpretation and application of results

As shown in Table 1, performance is classified in three ascending tiers: ★ (one-star); ★★ (two-star); and ★★★ (three-star). Both three- and two-star products provide *Comprehensive protection* against all three microbial groups. One-star products meet performance targets for only two of the three microbial groups, providing *Targeted protection*.

Each production unit should consistently meet or exceed the performance target for each microbial group, and in both test waters (GTW and CTW). A maximum deviation of 0.2 $\log_{10}$ is acceptable for 25% of sample

[1] The maximum microbial reduction that can be demonstrated is limited by the pretreatment challenge concentration delivered. For each organism tested, the pretreatment concentration must be sufficient to allow for the demonstration of the performance targets in the table showing the performance criteria. Due to the complexity of using viable organisms, there may be variation in these pretreatment concentrations above what is sufficient, which may lead to demonstrated reductions reported that far exceed the performance targets. However, the emphasis is on whether the performance target has been met and not the extent by which the target was exceeded.

points at the two-star performance tier, and 0.4 $\log_{10}$ at the three-star performance tier[1]. This means that for classification as a two-star product, up to three of the twelve sample points can achieve a reduction of 1.8 $\log_{10}$ for bacteria or protozoan cysts (instead of 2 $\log_{10}$), or 2.8 $\log_{10}$ for viruses (instead of 3 $\log_{10}$). Each phage is treated separately for evaluating acceptable allowance; the overall reduction for viruses is based on the lower-performing phage.

Performance classification

Oasis® Water Purification Tablets met the minimum performance target of 2 $\log_{10}$ for bacteria. The review of existing data on viral inactivation by chlorine and measured concentrations of free residual chlorine in the posttreatment samples suggest that the product would likely meet the minimum performance target for viruses. As such, Oasis® Water Purification Tablets are classified as providing Targeted protection (★) against bacteria and viruses only.

Considerations for product selection

Microbial conditions	Use where contaminants of concern are known to be bacterial / viral microbes
Physico-chemical water characteristics	Use in nonturbid source water, or as a secondary treatment for water that has been pretreated through e.g. filtration to reduce turbidity and organic demand Regularly measure chlorine demand and free chlorine residual to ensure sufficient disinfection
Product information and labelling	Check that the device is appropriately labelled and has clear instructions for use

[1] These cut-off values were determined using QMRA modelling and selecting ranges that still resulted in appreciable health gains within a specific performance tier.

References

WHO (2011). Evaluating household water treatment options: health-based targets and microbiological performance specifications. Geneva: World Health Organization (http://www.who.int/water_sanitation_health/publications/household_water/en/).

WHO (2017). Guidelines for drinking-water quality, fourth edition. Incorporating the first addendum. Geneva: World Health Organization (http://www.who.int/water_sanitation_health/publications/drinking-water-quality-guidelines-4-including-1st-addendum/en/).

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