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Department of Infectious and Tropical Diseases

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SUMMARY REPORT
MICROBIOLOGICAL TEST- NSF P248
PERFORMED FOR LIFESAVER SYSTEMS

Test Item

The 'Lifesaver bottle', 'Lifesaver jerrycan' and 'Lifesaver hydrocarry II' are manufactured by Lifesaver systems. Lifesaver systems delivered their units to the Laboratory new and unused in sealed packaging. User operating instructions were enclosed.

Before testing, each unit was examined for mechanical defects and leaks. An integrity check was carried out and the units were primed according to the manufacturer's instructions. An outlet hose was attached to the end of each unit for ease of testing and to reduce the chances of accidental contamination with unfiltered water during sampling procedures.

Test Protocols

The tests performed on the Lifesaver units were based upon the National Sanitation Foundation NSF P248 protocol - Emergency Military Operations Microbiological Water Purifiers, January 2006.

Test organisms

- *Escherichia coli* NCTC 10418 – concentrations as per Table 1
- *Poliovirus* Type 1 (Sabin vaccine strain) - concentrations as per Table 1

Test Results

Table 1 – Summary of Assay results of all samples.

As per the NSF P248 protocol the units were given a rest period of 48 hours between the passing of 100 litres and the final 50 litres.

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Bacteria after 50 litres

	CFU/ml into the unit (Log_{10})	CFU/ml from the unit (Log_{10})	% reduction (Log_{10} reduction)	Pass or failed (log reduction ≥6.00)
Unit 1	2.08×10^{7} (7.32)	$\leq1.67\times10^{-1}$ (-0.78)	≥99.99999920% (≥ 8.10)	Passed
Unit 2	2.08×10^{7} (7.32)	$\leq1.67\times10^{-1}$ (-0.78)	≥99.99999920% (≥ 8.10)	Passed

Bacteria after 100 litres

	CFU/ml into the unit (Log_{10})	CFU/ml from the unit (Log_{10})	Log_{10} reduction	Pass or failed (log reduction ≥6.00)
Unit 1	1.25×10^{8} (8.10)	$\leq1.67\times10^{-1}$ (-0.78)	≥99.99999987% (≥ 8.88)	Passed
Unit 2	2.58×10^{8} (8.41)	$\leq1.67\times10^{-1}$ (-0.78)	99.999999935% (≥ 9.19)	Passed

Bacteria after 150 litres

	CFU/ml into the unit (Log_{10})	CFU/ml from the unit (Log_{10})	Log_{10} reduction	Pass or failed (log reduction ≥6.00)
Unit 1	3.33×10^{7} (7.52)	$\leq1.67\times10^{-1}$ (-0.78)	≥99.9999995% (≥ 8.30)	Passed
Unit 2	1.25×10^{7} (7.10)	$\leq1.67\times10^{-1}$ (-0.78)	≥99.9999987% (≥ 7.87)	Passed

Virus after 50, 100 and 150 Litres

	PFU/ml into the unit (Log_{10})	PFU/ml from the unit (Log_{10})	% reduction (Log_{10} reduction)	Pass or failed (log reduction ≥4.00)
Unit 1 (after 150litres)	1.00×10^{7} (7.00)	≤1.25 (≤0.10)	≥99.999988% (≥ 6.90)	Passed
Unit 2 (after 50litres)	1.00×10^{7} (7.00)	3.75 (0.57)	99.999963% (6.43)	Passed
Unit 2 (after 100litres)	1.48×10^{5} (5.17)	≤1.25 (≤0.10)	≥99.99915% (≥5.07)	Passed
Unit 2 (after 150litres)	1.48×10^{5} (5.17)	≤1.25 (≤0.10)	≥99.99915% (≥5.07)	Passed

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Beads - Cryptosporidium Parvum Oocysts substitute

	beads/ml into the unit (Log_{10})	beads/ml from the unit (Log_{10})	% reduction (Log_{10} reduction)	Pass or failed (log reduction ≥3.00)
Unit 1 (after 150litres)	177.24 (2.95)	≤0.02 (≤-1.70)	≥99.987% (≥ 3.95)	Passed
Unit 2 (after 150litres)	177.24 (2.95)	≤0.02 (≤-1.70)	≥99.987% (≥ 3.95)	Passed

Turbidity

	EPA water	EPA + dust	output unit 2	output unit 4
	4.25	43.2	0.26	0.64
	4.09	44.2	0.22	0.49
	4.13	43.6	0.23	0.50
average NTU	4.16	43.67	0.24	0.54

Total dissolved solids

	EPA water	Unit 2	Unit 4
	1639	1635	1656
	1654	1532	1536
	1656	1525	1605
Average	1650	1564	1599

Summary

The 'Lifesaver units' were tested and exceeded the requirements as set out by National Sanitation Foundation Protocol NSF P248.

These requirements for bacteria are a 6 log reduction (99.9999% removal) and for viruses a 4 log reduction (99.99%) and for a 3 log reduction (99.9%) in Cryptosporidium parvum oocysts to be achieved over a volume of 150 litres and over a time period of 10 days. We can safely assume based upon size that fungi will also be removed. These reduction requirements are also shown in the NSF P231 protocol and the WHO guidelines for safe drinking water and are the basis for current UK and European legislation on drinking water standards.

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Regulatory Compliances

The LIFESAVER units meet and exceed the following:

UK compliance	Water Supply (Water Quality) Regulations 2000.
EU compliance	European Drinking Water Directive Council Directive 98/83/EC
US compliance	National Sanitation Foundation, NSF P231 & NSF P248 Environmental Protection Agency - EPA's Microbiological Reduction Requirements as shown in the US National Primary Drinking Water Regulations (http://epa.gov/safewater/mcl.html) under the Safe Drinking Water Act.
WHO compliance	World Health Organisation - Guidelines for Drinking-water Quality First Addendum 3rd Edition

Conclusions
Under the conditions of testing in our laboratory as shown in this report, our results show that the 'Lifesaver units' removed all bacteria and viruses from a contaminated water source in excess of legal requirements and as such, complies with the National Sanitation Foundation's NSF P231 & NSF P248 protocols as well as all British, US and European Drinking Water Regulations for Microbiological Reduction.

Signed on 15th September 2011

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All data will be held at LSHTM for a minimum of 10 years. During that time it shall remain available solely at the request of M. Pritchard or other nominated executive of Lifesaver Systems, and under no circumstances released to a third party.

This report is designed for internal developmental use, product registration or as evidence of full independent efficacy testing in defence of any official regulatory or legal enquiry. It must not be used for advertising purposes. In no way does any comment made in this report constitute an endorsement of any product by LSHTM, and no such claims, directly or by inference, made by any company or individual will be permitted to this effect.