



**Biological Consulting Services**  
*of North Florida, Inc.*

May 23, 2013

Thomas Robbins

Re: Bacterial, viral, and protozoan parasite filtration efficacy testing of the provided water bottle filters: BCS ID 1305210, 1305212, 1305215, and 1305220. "Water-To-Go" filters.

Dear Mr. Robbins;

We have conducted the requested filtration efficacy study on the provided water bottle filters received on May 14, 2013. The experimental set up and challenge of the water filter was designed to evaluate the filter's initial microbiological contaminant removal efficacy. It is intended to demonstrate its efficacy following light use on the removal of bacterial, viral, and parasitic waterborne contaminants. The contaminant species and water condition parameters selected were based on NSF water purifier testing protocols.

Following, you will find our report on the results of the challenge study. Should you have any questions, please do not hesitate to contact me.

Sincerely,

George Lukasik, Ph.D.  
Laboratory Director

Page 1 of 3

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FL DOH LABORATORY #E82924, EPA# FL01147

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FILE:

WATER-TO- GO FILTERS MICROBIAL REMOVAL EFFICACY STUDY REPORT 05 15 2013.DOC



Samples: Provided Pleated "Water-To-Go" Filters  
 Test: Filtration Efficacy / Vacuum\*  
 Test Parameter: *Raoultella terrigena*, MS-2 Bacteriophage (virus), and 3.0 µM Fluorescent Microspheres as *Cryptosporidium parvum* Oocyst Surrogate  
 Performed and Analyzed by: George Lukasik, Ph.D. & Alison Stargel, MPH; May 15, 2013

Water Sample	Percent Removal of Challenge Species*		
	Three Micron Fluorescent microspheres <sup>1</sup> (Parasitic Contaminants Surrogate Percent Removal)	<i>Raoultella terrigena</i> <sup>2</sup> (Bacterial Contaminants Percent Removal)	MS-2 Bacteriophage <sup>3</sup> (Viral Contaminants Percent Removal)
Filter Influent Water**	1.4 x 10 <sup>4</sup> beads/ 0.1 ml	4.6 x 10 <sup>5</sup> cfu/ml	4.4 x 10 <sup>5</sup> pfu/ml
12 Pleat Filter #1 Effluent Water** BCS 1205212	>99.99%***	>99.9999%***	99.9998%
12 Pleat Filter #2 Effluent Water** BCS 1205220	>99.99%***	>99.9999%***	>99.9999%***
24 Pleat Filter #1 Effluent Water** BCS 1205210	>99.99%***	>99.9999%***	>99.9999%***
24 Pleat Filter #2 Effluent Water** BCS 1205215	>99.99%***	>99.9999%***	>99.9999%***

<sup>1</sup> Three micron green fluorescent latex microspheres (Fluoresbrite® YG Microspheres 3.00µm, PolySciences Inc. PA, USA) were used as surrogates for *Cryptosporidium* oocysts. It is used to determine filter's parasitic removal efficacy. The microspheres were enumerated by fixing onto SingleSpot Slides (IDEXX, USA) and viewing by UV fluorescence microscopy.

<sup>2</sup> *Raoultella terrigena* (ATCC 33257) was obtained from ATCC and propagated on Tryptic Soy Agar (TSA, Becton Dickinson, USA). It is used as a bacterial model to evaluate filters for bacterial removal efficacy. The bacteria were enumerated as colony forming units (cfu) following incubation at 36.5°C for 24 hours.

<sup>3</sup> Bacteriophage MS-2 (ATCC 15597-B1) was used as a model for human viruses. It is of similar shape and size to human enteroviruses and thus is used to determine filter's viral capture efficacy. It was enumerated using *E. coli* C3000 (ATCC 15597) as a host using the single layer plaque assay agar procedure as per EPA 1601.

\*\* Filter effluent samples were analyzed in duplicates following collection.

\*\*\* No species were detected in the filter effluent for the duplicate samples analyzed.

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\*Challenge Study Description: 1 liter of laboratory grade reagent water was passed through each filter using 3.6 inHg vacuum provided by a diaphragm pressure/vacuum pump (Schuco-Vac Pump). Reagent water was then seeded with *Raoultella terrigena*, bacteriophage MS-2, and latex microspheres. This solution was stirred till homogenous and 500 ml was aspirated through each filter using vacuum. The filter effluent was collected in a trap bottle. The flow rate was measured at 10ml/sec. The effluent was assayed for the respective species. A sample of the influent was removed prior to the beginning of the challenge study and at the end. The number of microorganisms and microspheres was determined and is reported as the "Filter Influent Water" and "Filter Effluent Water". The flow rate was calculated using a NIST traceable timer.

Study data are summarized in the provided table(s). The results presented pertain only to the study conducted on the test articles/samples provided by the client (or client representative). The study was authorized and commissioned by the client. The results presented pertain only to the samples analyzed and identifier number(s) indicated. The data provided is strictly representative of the study conducted using the material/samples/articles provided by the client (or client's representative) and its (their) condition at the time of test. The study and data are obtained under laboratory conditions and may not be representative or indicative of a real-life process and/or application. Positive, negative, and neutralization controls were performed as outlined in the method and as per Good Laboratory Practices. All analyses were performed in accordance to laboratory practices and procedures set-forth by our NELAP/TNI accreditation standards (ISO 17025) unless otherwise noted. BCS makes no claims with regards to the express or implied warranty regarding the ownership, merchantability, safety or fitness for a particular purpose of any such property or product.



Signature of Laboratory Director/Authorized Rep. \_\_\_\_\_ Date: May 23, 2013

Page 3 of 3

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