



Biological Consulting Services
of North Florida, Inc.

August 20, 2012

Dr. Fred Cooper
Ariix
563 West 500 South
Suite 340
Bountiful, Utah 84010

Dear Dr. Cooper:

We have conducted the requested filtration efficacy study on the provided Ariix filters (lot: F2943) received on July 10, 2012. The experimental set up and challenge of the water filter was designed to evaluate the filter's microbiological and chemical contaminant removal efficacy. It is intended to demonstrate its efficacy following initial use on the removal of viral, parasitic, and bacterial waterborne contaminants. In addition, the filters' efficacy on the removal of organic and inorganic chemical species including heavy metals and pesticides was tested. The contaminant species and testing parameters selected were based on the provided request. The testing was done according to methodology outlined in the NSF/EPA water purifier testing protocols. Chemical analysis of the filter influent and effluent samples was conducted by an independent NELAP accredited laboratory.

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

Sincerely,

George Lukasik, Ph.D.
Laboratory Director

Phil.Cooper@ariix.com

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FL DOH LABORATORY #E82924, EPA# FL01147

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File: Ariix filter cumulative contaminant removal efficacy study final 08 20 2012



Samples: Ariix Filters: Lot F2943
Analysis Parameter: MS-2 Bacteriophage, *Raoultella terrigena* and 3.0 µM Fluorescent Beads as *Cryptosporidium parvum* Oocyst Surrogate
Performed and Analyzed by: George Lukasik, Ph.D. and Alison Stargel, MPH

Water Sample	Percent Removal of Filter Challenge Species*		
	<i>Raoultella terrigena</i> ¹ Bacterial Contaminants % Removal	MS-2 Bacteriophage ² Viral Contaminants % Removal	3.0 Micron latex spheres <i>C. parvum</i> Surrogate ³ Parasitic Contaminants % Removal
Filter Influent Water*	2.8-5.6 x 10 ⁵	1.6-7.8 x 10 ⁵	1.3-1.8 x 10 ⁴
Ariix Filter #1 Effluent* BCS 1207081	>99.99994%	99.991%	>99.996%
Ariix Filter #2 Effluent* BCS 1207072	>99.99994%	99.99%	>99.996%
Ariix Filter #3 Effluent* BCS 1207084	>99.99994%	99.997%	99.99%
Cumulative Percent Removal	>99.99994%	99.993%	>99.994%

¹ *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.

² Bacteriophage MS-2 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 as a host using the double agar overlay assay as per EPA 1601.

³ Fluoresbrite Plain YG 3.0 Microspheres from Polysciences, Inc. were used as a surrogate for *Cryptosporidium parvum*.



*Procedure: A case (24 sealed filter units) of Ariix drinking water filters were received on July 10, 2012. Each was assigned a BCS identifier number. Three randomly selected filters were opened and one thousand milliliters of Class I ASTM water (pH 7.5±2 lab deionized water) was passed through each filter at a flow rate of 5-6 ml/ second. For challenge studies, Class I ASTM water (pH 7.5±2) was placed into a sterile beaker and seeded with *Raoultella terrigena*, 3.0 micron beads, and MS2 bacteriophage. This solution was agitated by an IKA paddle stirrer and 500 ml was passed through each filter connected to the pressure source (Pressure Control Station, Strategene USA). The solution was passed through the filter using steady 1.5 PSI pressure. Each filter's effluent was collected and 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 was determined in the filter influent and effluent water and the averages were calculated and are reported in the table as "Filter Influent Water" and "Filter Effluent Water". The pH of the filter effluent water was measure to be 7.5±2 and did not differ from the influent water pH. All analysis was conducted in duplicate for each volume tested.

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File: Ariix filter cumulative comtaminant removal efficacy study final 08 20 2012



Samples:
 Analysis Parameter:
 Performed by:
 Analyzed by:

Ariix Filters: Lot F2943
 Organophosphate and Chlorophosphate Pesticides
 George Lukasik, Ph.D. and Jason Rakofski
 Advanced Environmental Laboratories-Gainesville

Pesticide Species	Influent Concentration (ug/L)	Ariix Filter #1 Effluent BCS 1207083		Ariix Filter #2 effluent BCS 1207067		Ariix Filter #3 Effluent BCS 1207068		Cumulative Percent Reduction
		Concentration (ug/L)	% Reduction	Concentration (ug/L)	% Reduction	Concentration (ug/L)	% Reduction	
4,4-DDT	70	<0.018 undetectable	>99.974%	0.044	99.94%	0.14	99.8%	>99.9%
Aldrin	20	<0.016 undetectable	>99.92%	0.018	99.91%	0.031	99.8%	>99.9%
Dieldrin	7	0.057	99.2%	0.095	98.6%	0.15	97.9%	98.6%
Endosulfan Sulfate	1.8	<0.026 undetectable	>99.0%	<0.018 undetectable	>99.0%	<0.018 undetectable	>99.0%	>99.0%
Endrin	74	0.11	99.9%	0.11	99.9%	0.23	99.7%	99.8%
Heptachlor	15	0.029	99.8%	<0.019 undetectable	>99.9%	<0.019 undetectable	>99.9%	>99.9%
Lindane	44	0.88	98.0%	0.20	99.5%	0.61	98.6%	98.7%
Malathion	34	1.8	94.7%	0.54	98.4%	1.1	96.8%	96.6%

*Procedure: A case (24 sealed filter units) of Ariix drinking water filters were received on July 10, 2012. Each was assigned a BCS identifier number. Three randomly selected filters were opened and one thousand milliliters of City of Gainesville tap water (pH 7.7) was passed through each filter at a flow rate of 5-6 ml/ second. For challenge studies, 4 liters of tap water tap water was spiked with the indicated pesticides (Pesticide Matrix Spiking Solution, Ultra Scientific, RI) and 1000 ml was passed through each filter connected to the pressure source (Pressure Control Station, Strategene USA). The solution was passed through the filter using steady 1.5 PSI pressure. Each filter's effluent was collected in clean glass bottles provided by Advanced Environmental Laboratories (AEL, Gainesville, FL). The Influent and collected effluent samples were then delivered to AEL for analysis immediately following collection. AEL is NELAP accredited for the analysis of the above species in water (AEL Analysis: 89081A Pesticide, Preparation Method: SW-846 3510C, Laboratory Analytical Method: SW-846 8081A).



Samples:
 Analysis Parameter:
 Performed by:
 Analyzed by:

Ariix Filters: Lot F2943
 Inorganic Contaminants
 George Lukasik, Ph.D. and Alison Stargel, MPH
 Advanced Environmental Laboratories - Gainesville

Metal Species	Influent Concentration (mg/L)	Ariix Filter #1 Effluent BCS 1207071		Ariix Filter #2 Effluent BCS 1207075		Ariix Filter #3 Effluent BCS 1207076		Cumulative Percent Reduction
		Concentration (mg/L)	% Reduction	Concentration (ug/L)	% Reduction	Concentration (ug/L)	% Reduction	
Arsenic	0.048	Undetectable <0.0085	>82.3%	Undetectable <0.0085	>82.3%	Undetectable <0.0085	>82.3%	>82.3%
Chromium	0.027	0.0018	93.3%	0.0017	93.7%	0.018	93.3%	93.4%
Lead	0.13	Undetectable <0.0013	>99.0%	Undetectable <0.0013	>99.0%	Undetectable <0.0013	>99.0%	>99.0%
Uranium**	94**	Undetectable <0.2**	>99.8%	Undetectable <0.2**	>99.8%	Undetectable <0.2**	>99.8%	>99.8%
Mercury	0.20	0.00045	99.8%	0.0047	97.7%	0.0066	96.7%	98.1%

*Procedure: A case (24 sealed filter units) of Ariix drinking water filters were received on July 10, 2012. Each was assigned a BCS identifier number. Three randomly selected filters were opened and one thousand milliliters of City of Gainesville tap water (pH 7.5) was passed through each filter at a flow rate of 5-6 ml/ second. For challenge studies, 4 liters of tap water tap water was spiked with the indicated species and 1000 ml was passed through each filter connected to the pressure source (Pressure Control Station, Strategene USA). The solution was passed through the filter using steady 1.5 PSI pressure. Each filter's effluent was collected in containers provided by Advanced Environmental Laboratories (AEL, Gainesville, FL). The Influent and collected effluent samples were then delivered to AEL for analysis immediately following collection. AEL is NELAP accredited for the analysis of the above species in water.

** Results are in ug/L



Samples:
Analysis Parameter:
Performed by:
Analyzed by:

Ariix Filters: Lot F2943
Chlorine (Total Residual)
George Lukasik, Ph.D. and Alison Stargel, MPH
Advanced Environmental Laboratories - Gainesville

Metal Species	Influent Concentration (mg/L)	Ariix Filter #1 Effluent BCS 1207079		Ariix Filter #2 Effluent BCS 1207082		Ariix Filter #3 Effluent BCS 1207089		Cumulative Percent Reduction
		Concentration (mg/L)	% Reduction	Concentration (mg/L)	% Reduction	Concentration (mg/L)	% Reduction	
Chlorine	2.28	0.10	95.6%	0.04	98.2%	0.04	96.7%	98.2%

*Procedure: A case (24 sealed filter units) of Ariix drinking water filters were received on July 10, 2012. Each was assigned a BCS identifier number. Three randomly selected filters were opened and one thousand milliliters of City of Gainesville tap water (pH 7.5) was passed through each filter at a flow rate of 5-6 ml/ second. For challenge studies, 4 liters of tap water tap water was adjusted to approximately 2.5 ppm total chlorine using house hold bleach. One thousand milliliters was passed through each filter connected to the pressure source (Pressure Control Station, Strategene USA). The solution was passed through the filter using steady 1.5 PSI pressure. Each filter's effluent was collected in containers provided by Advanced Environmental Laboratories (AEL, Gainesville, FL). The Influent and collected effluent samples were then delivered to AEL for analysis immediately following collection. AEL is NELAP accredited for the analysis of the above species in water.



Samples:
Analysis Parameter:
Performed by:
Analyzed by:

Ariix Filters: Lot F2943
VOC
George Lukasik, Ph.D. and Alison Stargel, MPH
Advanced Environmental Laboratories - Gainesville

Metal Species	Influent Concentration (ug/L)	Ariix Filter #1 Effluent BCS 1207079		Ariix Filter #2 Effluent BCS 1207082		Ariix Filter #3 Effluent BCS 1207089		Cumulative Percent Reduction
		Concentration (ug/L)	% Reduction	Concentration (ug/L)	% Reduction	Concentration (ug/L)	% Reduction	
Chloroform	290	16	94.5%	26	91.0%	20	93.1%	92.88%
Benzene	380	3.5	99.1%	11	97.1%	4.2	98.9%	98.37%

*Procedure: A case (24 sealed filter units) of Ariix drinking water filters were received on July 10, 2012. Each was assigned a BCS identifier number. Three randomly selected filters were opened and one thousand milliliters of City of Gainesville tap water was passed through each filter at a flow rate of 5-6 ml/ second. For challenge studies, 4 liters of tap water tap water was spiked with the indicated species and 1000 ml was passed through each filter connected to the pressure source (Pressure Control Station, Strategene USA). The solution was passed through the filter using steady 1.5 PSI pressure. Each filter's effluent was collected in containers provided by Advanced Environmental Laboratories (AEL, Gainesville, FL). The Influent and collected effluent samples were then delivered to AEL for analysis immediately following collection. AEL is NELAP accredited for the analysis of the above species in water.



Samples:

Ariix Filters: Lot F2943

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.



August 20, 2012

Signature of Laboratory Director/Authorized Rep. _____ Date: _____

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