BCN RESEARCH LABORATORIES, INC.

Microbiological Testing
of the UZima Filter model UZ01

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PREPARED FOR

UZima Filters, Inc.

PREPARED BY

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INTRODUCTION

The UZima Water Filter UZ01 was tested for its ability to remove pathogens from water contaminated with common pathogens known to cause diarrheal diseases.

FILTER DESCRIPTION

The UZima UZ01 Filter is stated to be a 0.1 um filter thus classified under Microfiltration. According to the US Centers for Disease Control and Prevention, Microfiltration Filtration has these qualities:

- A microfiltration filter has a pore size of approximately 0.1 micron (pore size ranges vary by filter from 0.05 micron to 5 micron)
- Microfiltration has a very high effectiveness in removing protozoa (for example, *Cryptosporidium*, *Giardia*)
- Microfiltration has a moderate effectiveness in removing bacteria (for example, *Campylobacter*, *Salmonella*, *Shigella*, *E. coli*)
- Microfiltration is not effective in removing viruses (for example, Enteric, Hepatitis A, Norovirus, Rotavirus)
- Microfiltration is not effective in removing chemicals

METHODOLOGY

Three pathogens were used to test the filter: *Klebsiella pneumonia*e and *Enterobacter* sp. (commonly called fecal coliforms), and *E. coli*.

The pathogens tested have estimated sizes of:

Klebsiella pneumoniae - approximately 0.5 μm in width by 2 μm in length
***Enterobacter sp*.** - approximately 0.6 to 1.0 μm in width by 1.2 to 3 μm in length
E. coli - approximately 0.5 μm in width by 2 μm in length

Three different dilutions of the inoculum were made with each pathogen to create a High Concentration (average of 5,166,666 organisms per ml), a Medium Concentration (average of 21,666 organisms per ml), and a Low Concentration (average of 31 organisms per ml) dilution inoculum. Each sample was passed through the Uzima UZ01 filter by gravity feed and the filtrate collected. The filtrate was divided into two 300 ml samples and each was filtered through a 45 micron membrane filter. One membrane was transferred to M-FC broth (fecal coliforms) and the second was transferred to M-Coli Blue broth (*E. coli*). All plates were incubated at 35 C for 24 hours and then each plate was tested for bacterial growth. All tests were done in triplicate.

Analysis Standards:

US Environmental Protection Agency (EPA) goals for a microbiological reduction were used to assess filtration success. The EPA recommends a 6-log reduction for filters such as a Hollow Fiber Membrane filters. A 6-log reduction means lowering the number of microorganisms by 1,000,000-fold, that is, if the water to be filtered has 1,000,000 pathogenic microbes in it, a 6-log reduction would reduce the number of microorganisms to one.

RESULTS

Numerical results from tests are shown in Table 1. The UZ01 successfully reduced the presence of *E. coli* to undetectable levels in all samples. The UZ01 also successfully reduce the presence of fecal coliforms to undetectable levels in all samples except for one high concentration sample. In the high concentration sample with detectable levels of fecal coliforms, bacterial levels were successfully reduced by 99.9999%.

Table 1 Results

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	Inoculum count per ml	Inoculum count per 300 ml	Fecal Coliform count per 300 ml	*E. coli* count per 300 ml	Effective Percentage of Fecal coliform and E. coli colonies removal	Overall Effective Percentage of Fecal coliform and E. coli colonies removal for all tests
Low inoculum 1	32	9,600	<1	<1	99.9999 log4	
Low inoculum 2	34	10,200	<1	<1	99.9999 log4	
Low inoculum 3	29	8,700	<1	<1	99.9999 log4	
Mid inoculum 1	25,000	7,500,000	<1	<1	99.999999 log6	
Mid inoculum 2	20,000	6,000,000	<1	<1	99.999999 log6	> 99.999999 log6
Mid inoculum 3	20,000	6,000,000	<1	<1	99.999999 log6	
High inoculum 1	3,500,000	1,050,000,000	<1	<1	>99.9999999 log7	
High inoculum 2	6,000,000	1,800,000,000	<1	<1	>99.9999999 log7	
High inoculum 3	6,000,000	1,800,000,000	1	<1	>99.9999999 log7	

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