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TO: Florence Cassassuce
Niparaja' A.C.
Fc.I. Madero #389
La Paz, Col. Centro 23000
Baja California Sur
Mexico
(52) 612 122 1171

FROM: Jim Truscott
Project Manager

SUBJECT: Challenge of UV Bucket System. BioVir Project # 080402

Please find below the results from the microbiological challenge of the UV Bucket system.

Introduction:

BioVir tested a UV system to evaluate its anti-microbial performance with regard to bacteria and viruses. The system consisted of an upper reservoir, a middle chamber containing a UV lamp and a maze of weirs, and a lower collection chamber equipped with a spigot for dispensing the treated water.

For a claim to be made that a device is a "microbiological water purifier", the USEPA Guide Standard and Protocol for Testing Microbiological Purifiers requires that the unit demonstrate a 6 log reduction for bacteria and a 4 log reduction for viruses. In this test the challenge bacterium was *E. coli* ATCC # 11229 and the challenge virus was MS-2 Bacteriophage.

Procedure:

1. Ten liters of General Test Water (GTW) 1 was prepared in a carboy with the following water quality parameters:

Test Water Measurements						
Water Type	Temp (°C)	pH	Total Chlorine (mg/L)	Turbidity (NTU)	TOC (mg/L)	TDS (mg/L)
GTW 1	19.0	7.16	Non Detect	0.08	-	277

2. GTW 1 was spiked with 0.4 mL of an *E. coli* suspension (1.8×10^{10} CFU/mL) and 0.4 mL of a 1:10 dilution of MS-2 phage suspension (2.0×10^{11} PFU/mL). The test water was stirred to mix the organisms.
3. An influent (pre-treatment) sample was collected from the carboy.

4. The spiked GTW 1 was added to the upper reservoir. After about 1.5 L of seeded test water was added to the top reservoir, it was noted that the UV lamp was not turned on. This volume of water was drained from the bucket. The bucket was wiped down with a bleach solution, followed by a wipe with sodium thiosulfate, and finally, the unit was rinsed with deionized water. The UV lamp was turned on, and the remaining 8.5 L of seeded GTW 1 was passed through the test unit. The water was allowed to flow into the lower chamber with the UV lamp turned on.
5. Two 500 mL effluent (post-treatment) samples were collected. The first sample was collected at the beginning of flow from the spigot. Once the first sample was collected, the spigot was closed and water was allowed to collect in the lower chamber until it was above the level of the spigot. The spigot was then opened and a second 500 mL sample was collected.
6. *E. coli* analysis was conducted using the membrane filtration method (Standard Method 9222D) utilizing mFC agar. Cultures were incubated at 44.5°C for 24 hours. Bacteriophage analysis was conducted using the double layer phage assay. Cultures were incubated at 35°C for 18-24 hours.

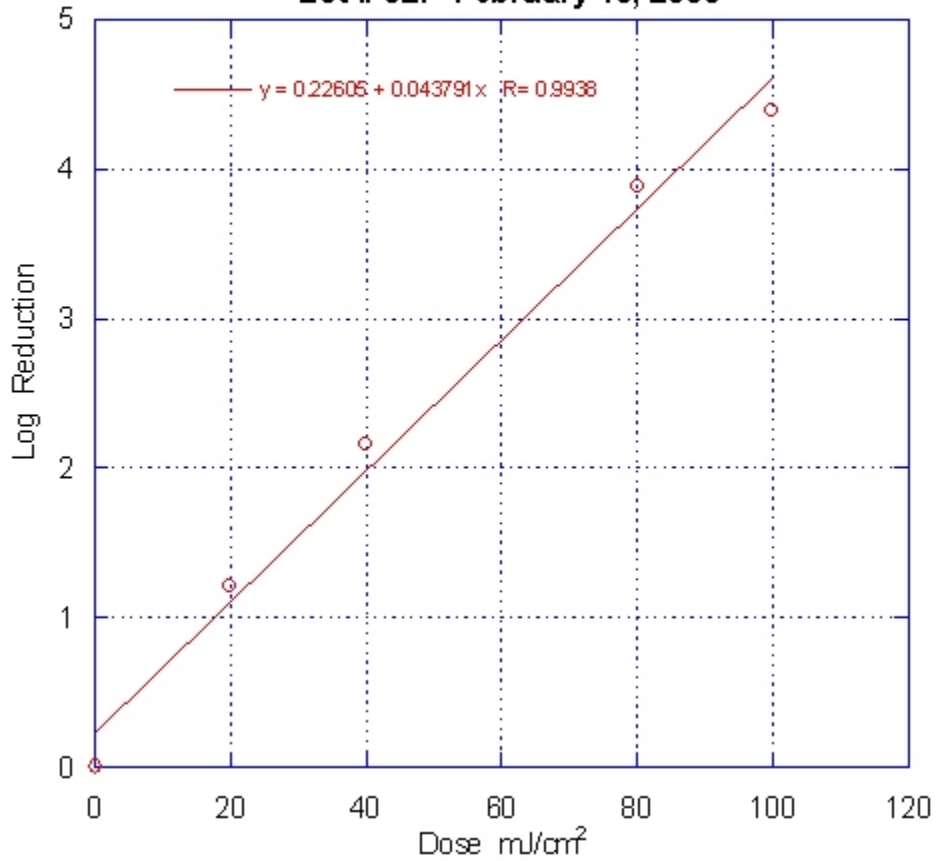
Results:

The challenge results are presented in Table 1. The goal for a water purification device is to reduce at least 6 logs of the influent bacteria and 4 logs of the influent virus. The system was able to achieve greater than the required 6 log reduction for bacteria at both sample points. For virus, the system achieved 3.6 log reduction at the beginning of flow, and near the end of flow, it achieved 3.9 log reduction.

Table 1. Challenge Results				
Sample	<i>E. coli</i> (CFU/100 mL)	<i>E. coli</i> Log Reduction	Phage (CFU/L)	Phage Log Reduction
Influent	3.3 x10 ⁷		1.5 x10 ⁹	
Effluent Begin	1	7.5	3.4 x10 ⁵	3.6
Effluent End	<1	>7.5	2.1 x10 ⁵	3.9

The collimated beam results are attached on the following page. Based on the log reduction observed, the UV dose during this test was approximately 75 to 85 mJ/cm².

Collimated Beam UV 254 MS2 Dose Response
Lot #527 February 13, 2008



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