

A&L Laboratory Inc.

Testing of *HydroFLOW* S38 Using *Escherichia coli*, *Klebsiella*, and *Pseudomonas* As Test Organisms

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Introduction

The *HydorFLOW* S38 is a non-intrusive water-conditioning device for residential and small commercial applications.

Hydropath Holdings LTD (UK) manufactures the *HydorFLOW* units which are powered by the patented Hydropath technology. Their theory is that the unit induces an electric signal of harmless AM radio waves into the water pipe on which it is installed (metal or PVC), essentially making the water column a part of an electric circuit.

A bacterium or algae which pass through the water conditioner's ring of ferrites become charged by the Hydropath signal. This charge forms a hydration layer of pure water around the cell. Osmosis forces water into the bacteria and/or algae, creating an osmotic pressure which ruptures the cell membrane and causes the cell to die. In addition to eradication via osmosis, it is believed the electric signal, which is emitted by the *HydorFLOW* device, causes the bacteria and/or algae to die by affecting the cell's membrane, which causes it to perish.

Test Organism

Three test organisms were used in the experiment. *Escherichia coli* (ATCC 15597), *Klebsiella pneumoniae* (ATCC 9591), and *Pseudomonas aeruginosa* (ATCC 262).

Test Procedure

Samples of general test water (EPA Test Water #1) were prepared. The general test water was created from laboratory reagent water. The required physical and chemical characteristics are listed as follows:

Table #1. Required chemical and physical characteristics of test water per U.S.E.P.A.

Parameter	General Test Water
Chlorine Residual	<0.10 mg/L
pH	7.5
Total Organic Carbon (TOC)	<0.50 mg/L
Turbidity	<1 NTU
Temperature	21°C
Total Dissolved Solids	78 mg/L

A closed loop plumbing system was set up with an injection port to add the microorganisms. The rate of water flow through the system is 2.1 gpm

Known quantities of microorganisms were added to the system. The *HydorFLOW S38* was turned on and the samples were obtained to determine the log-reduction of the microorganisms.

Two scenarios were performed: (1) the water stationary in the pipes and (2) the water flowing at 2.1 gpm.

Test Results

**Table #1 Microorganisms Titer-logarithmic Reductions and Percent Kill
Stationary Water Flow [Duration time = 60 minutes]**

Organisms	Control	Result	Log Reduction	%Kill
<i>E.coli</i>	1.46E+07	6.06E+05	1.3831	95.8607 %
<i>Klebsiella</i>	9.64E+06	5.83E+05	1.2190	93.9611 %
<i>Pseudomonas</i>	1.06E+07	8.73E+05	1.1038	92.1261 %

**Table #1 Microorganisms Titer-logarithmic Reductions and Percent Kill
2.1gallons/minute Water Flow [Duration Time = 30 minutes].**

Organisms	Control	Result	Log Reduction	%Kill
<i>E.coli</i>	8.32E+06	4.13E+03	3.3042	99.9504 %
<i>Klebsiella</i>	9.14E+05	5.83E+04	2.1955	99.3624 %
<i>Pseudomonas</i>	1.03E+07	1.37E+04	2.8774	99.8674 %

Conclusion

- Hydropath Technology achieved a significant log reduction with stationary and flowing water.
- It is not clear how the *HydorFLOW* water-conditioning device kills bacterial cells. The significant log reduction of the stationary water demonstrates the bacteria do not require passing through the device in order to die. With this said, a greater log reduction can be achieved if the bacteria passes through the device.