



# PathShield™ Antimicrobial Filter Media for Municipal Waste Water and Stormwater Treatment Applications

ASF Tech Report 13.1  
May 2013

A S Filtration™ is pleased to introduce PathShield™ Antimicrobial Filter Media for the reduction and control of coliform bacteria in municipal waste water and stormwater treatment applications. PathShield™ is registered with the U.S. Environmental Protection Agency (EPA) in accordance with Federal law for its intended antimicrobial uses.

PathShield™ effectively reduces coliform bacteria without releasing, discharging, or leaching any antimicrobial agents, chemicals, or heavy metals. PathShield™ kills coliform bacteria as the organisms physically move over the hostile surface of filter media granules (Figure 1). Efficacy is achieved at high filtration loading rates up to 20 gallons per minute per square foot (gpm/ft<sup>2</sup>). PathShield™ filter media is not consumed, requires no power source, has no moving parts, is non-corrosive, and is unaffected by seasonal temperature changes.



Figure 1. Bacteria is killed upon contact with hostile surface of PathShield™ media.

## Laboratory Testing

A number of independent efficacy tests were performed by a NELAP accredited laboratory

certified to perform *E. coli* plate counts. Various influent surface area loading rates and test cartridges simulated over 400,000 gallons of water passing through 24 cubic feet of PathShield™ media on an annual basis.

Table 1 summarizes the results of the laboratory simulations. *E. coli* concentrations ranged from 150 to 36,000 colony forming units per 100 milliliters (cfu/100 ml) while loading rates ranged from 9 to 118 gpm/ft<sup>2</sup>. Efficacies of >99.9%, or log three reductions, were achieved for these eight simulations.

Table 1. Summary of Laboratory Simulations

Influent <i>E. coli</i> (cfu/100 ml)	Loading Rate (gpm/ft <sup>2</sup> )	Efficacy (%)
150	19	>99.9
1,180	30	>99.9
2,120	9	>99.9
2,150	22.5	>99.9
3,000	10	>99.9
3,500	10	>99.9
4,300	18	>99.9
36,000	10	>99.9

Additional independent long term laboratory efficacy challenges against *E. coli* were performed using 15 separate quality control PathShield™ filter media samples. Table 2 summarizes testing results using an average target influent *E. coli* concentration of 16,500 cfu/100 ml and an influent surface area loading rate of 10 gpm/ft<sup>2</sup>. Over 99.99% removal efficiency, or greater than a log four reduction, was consistently achieved for the long term testing program.

**Table 2. Long Term Laboratory Efficacy Testing**

Influent <i>E. coli</i> (cfu/100 ml)	Effluent <i>E. coli</i> (cfu/100 ml)	Efficacy (%)
15,900	0.5	99.997
15,900	0.5	99.997
16,100	0.5	99.997
16,200	0.5	99.997
16,200	0.5	99.997
16,300	0.5	99.997
16,500	0.5	99.997
16,500	0.5	99.997
16,600	0.5	99.997
16,800	0.5	99.997
17,100	0.5	99.997
17,200	0.5	99.997
17,200	0.5	99.997
17,700	0.5	99.997
17,900	0.5	99.997

**Field Testing**

A series of independent field verification tests were performed by university researchers using PathShield™ filter media within a full scale commercially available stormwater catch basin insert at an ultra urban location in Los Angeles, California.

Table 3 summarizes the stormwater influent and effluent concentrations of *E. coli*, Enterococci and Total Coliform bacteria. An influent device loading rate of 19 gpm/ft<sup>2</sup> was measured for the testing events. Influent bacteria concentrations varied from under 2,000 cfu/100 ml to very high concentrations representative of stressed conditions. While all efficacies exceeded 92%, maximum efficacies of 99.9% were achieved resulting in a three log bacterial reduction.

**Toxicity Testing**

Comprehensive studies have been confirmed through the PathShield™ EPA registration that the media does not leach any antimicrobial agents, chemicals, or heavy metals and the effluent treated water is non-toxic.

**Table 3. Summary of Stormwater Field Testing**

Influent (cfu/100 ml)	Effluent (cfu/100 ml)	Efficacy (%)
<i>E. coli</i>		
1,800	<10	99.7
2,300	<10	99.8
7,000	120	98.3
10,000	770	92.3
Enterococci		
5,000	<10	99.9
16,000	230	98.6
77,000	50	99.9
170,000	170	99.9
Total Coliform		
1,700	<10	99.7
5,800	<10	99.9
9,900	<10	99.9
240,000	<10	99.9

**Conclusions and Benefits**

PathShield™ Antimicrobial Filter Media demonstrates superior performance for the removal of coliform bacteria in a variety of treatment applications including municipal waste water and stormwater runoff. EPA registration of PathShield™ confirms that coliform bacteria are physically killed as they pass through the media. Significant operational and environmental benefits can be realized through the use of PathShield™ filter media including:

- EPA registered antimicrobial filter media
- Media does not discharge, release or leach any antimicrobial agents
- Long term and high level of performance
- Does not rely on physical trapping
- No external power source or moving parts
- Media is non-corrosive and is not consumed
- Unaffected by seasonal temperature changes