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Customer name: Basic Water Needs India  
Pvt. Ltd.,  
Research start: 5/07/08  
Research complete: 1/10/08  
Lab ID: 219

## Bactericidal effect of silver leached from ceramic filters

### 1. Purpose of research

Secondary bacterial contamination of treated water in storage vessels happens frequently due to contact of the water with a dirty storage vessel, unclean hands, insects, dust particles etc.

WHO and Unicef are trying to prevent this by advising the use of special costly water storage vessels.

Ceramic filters from Basic Water Needs India Pvt. Ltd. show very good removal rate of bacteria due to pore size of the filters and silver impregnation applying on the filters.

During the filtration process some silver leaching was detected from the ceramic filter. The extent of this leaching and the bactericidal property of silver containing filtered water was task of this study.

### 2. Test setup

Tap water has been passed through the filters in a continuous way, at a rate from 3 to 5 liters per hour.

Totally 7000 liters of water was passed through each filter. At intervals the concentration of silver was measured in the filtered water and some ceramic material was removed by scrubbing the filter surface.

A few times diluted sewage was added into 10 liters of silver containing filtered water and into 10 liters of tap water without silver. The modeling range of E. coli added was between 500 – 2000 N/100 ml.

After three hours and in one case after one and two hours, the amount of surviving bacteria was measured. In the test on 2/09 effluent from both filters was mixed and diluted with pure tap water to make a concentration of 50 % and 12.5 %. It was interesting to see the minimum silver concentration being able to deactivate bacteria in silver containing water.

Two filters were used for testing purpose with 0.08 % w/w silver impregnation (filter N1-0.08% and filter N2-0.08%).

### 3. Silver leaching from filters during passage of 7000 liters.

Date	Liters of water passed	Filtrate Silver, ug/l	Flow l/h	Diameter filter in mm.
18/07	30	0.08 – 4.9 0.08 – 4.9	5.0 5.0	59
23/07	600	0.08 – 3.6 0.08 – x	5.0 5.0	59
7/08	2 150	0.08 – 3.0 0.08 – 6.5	4.0 4.0	58
18/08	3 150	0.08 – x 0.08 – 3.5	5.0 5.0	57
27/08	4 100	0.08 – 4.0 0.08 – 3.5	5.0 5.0	57
2/09	4 700	0.08 mix of both filters – 5.6	4.0 3.0	56.8
11/09	5 700	0.08 – 4.0 0.08 – 3.2	5.0 4.0	56
1/10	7 000	0.08 – 3.1 0.08 – 2.5	5.5 4.5	51

#### 4. Bacteria removal tests

Tests 27/08 after filtering 4100 liters of water.

	Coliform bacteria CFU/100 ml	E. coli CFU/100 ml
Initial contamination	100	400

<b>Three hours after adding bacteria</b>	Coliform bacteria CFU/100 ml	%	E. coli CFU/100 ml	%
Surviving bacteria in tap water	20		40	
Effluent water from filter N 1- 0.08%	0	100	0	100
Effluent water from filter N 2- 0.08%	0	100	0	100

Tests 2/09 after filtering 4700 liters of water. Effluent from 2 filters was mixed.

	Coliform bacteria CFU/100 ml	E. coli
Initial contamination	1100	1600

<b>Three hours after adding bacteria</b>	Coliform bacteria CFU/100 ml	%	E. coli CFU/100 ml	%
Surviving bacteria in tap water	330		1350	
10 liters effluent water from filters	0	100	0	100
5 liter effluent water and 5 liters tap water added	30	91	50	96
1,25 liters effluent water and 8,75 liters tap water added	160	51	560	58

Tests 11/09 after filtering 5700 liters of water.

	Coliform bacteria CFU/100 ml	E. coli CFU/100 ml
Initial contamination	500	770

<b>One hour after adding bacteria</b>	Coliform bacteria CFU/100 ml	%	E. coli CFU/100 ml	%
Surviving bacteria in tap water	350		620	
Effluent water from filter N 1- 0.08%	0	100	10	98.7
Effluent water from filter N 2- 0.08%	0	100	0	100

<b>Two hours after adding bacteria</b>	Coliform bacteria CFU/100 ml	%	E. coli CFU/100 ml	%
Surviving bacteria in tap water	300		600	
Effluent water from filter N 1- 0.08%	0	100	0	100
Effluent water from filter N 2- 0.08%	0	100	0	100

<b>Three hours after adding bacteria</b>	Coliform bacteria CFU/100 ml	%	E. coli CFU/100 ml	%
Surviving bacteria in tap water	280		350	
Effluent water from filter N 1- 0.08%	0	100	10	98.7
Effluent water from filter N 2- 0.08%	0	100	0	100

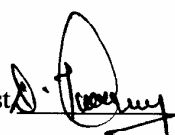
Tests 1-10-08 after filtering 7000 liters of water

Initial bacterial concentration has not been measured.

<b>Three hours</b> after adding bacteria	Coliform bacteria CFU/100 ml	%	E. coli CFU/100 ml	%
Surviving bacteria in tap water	500		540	
Effluent water from filter N 1- 0.08%	4	99.2	0	100
Effluent water from filter N 2- 0.08%	2	99.6	0	100

## 5. Conclusions

1. Water passing ceramic filters from Basic Water Needs India Pvt. Ltd. obtains bactericidal property due to the silver leaching from the filters.
2. The amount of leaching silver has range of concentration from 2.5 – 6.5 ppb, much less than permissible level of silver in drinking water. (USA 100 ppb and European countries 10 ppb).
2. Coliform bacteria and E. coli particular can be deactivated within 3 h contact time.

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