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**GROUPE TECHNOLOGIES DE SANTÉ**

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07 July 2006

**VERSTERGAARD FRANSEN**

**Subject:** Efficacy of LifeStraw systems **LF 64 bis**

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**Test details :**

The tests were performed with tap water (feed water) at a temperature of between 20-25° C.

The conductivity, total hardness and the turbidity of the feed water have been analyzed and are documented on this report.

The bacteria-elimination tests were performed with feed water with approximately 100 000 ufc per 2 liters of each research bacterium (challenge water).

The following bacteria were tested:

- Escherichia coli
- Enterococcus faecalis

The bacterial counts were performed according to these norms:

- NF EN ISO 9308-1 for Escherichia coli
- NF EN ISO 7899-2 for Enterococcus faecalis

The Straw was connected to the feed water source in such a manner that the water flow passed from the side of the water intake site to the suction mouthpiece (the operators were careful not to contaminate the mouthpiece of the straw during the experiment).

The flow/outflow of feed water and challenge water through the straw was fixed at a rate of 150 ml/minute.



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## Protocol for 700 Liters

### Day 1 (14/06/06)

Pass approximately 10 liters of feed water through the straw ( $\approx$  1 hr)  
Stop the water flow for 10 hrs (during the night)  
Analyze the feed water

### Day 2-3 (15-16/06/06)

Pass 2 liters of challenge water through the straw  
Analyze the challenge water and purified water to determine the levels of bacteria present  
Pass 100 liters of feed water ( $\approx$  11 hrs)  
Stop the water flow for 10 hrs (during the night)

### Day 4-5 (17-18/06/06)

Pause the experiment (weekend and preparation of challenge water)

### Day 6-10 (19-23/06/06)

Pass 2 liters of challenge water through the straw  
Analyze the challenge water and purified water to determine the levels of bacteria present  
Pass 100 liters of feed water ( $\approx$  11 hrs)  
Stop the water flow for 10 hrs (during the night)

### Day 11-12 (24-25/06/06)

Pause the experiment (weekend)

### Day 13 (26/06/06)

Pass 2 liters of challenge water through the straw  
Analyze the challenge water and purified water to determine the levels of bacteria present



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## Preparation of the challenge water

We use strains specified by the Lille Pasteur Institute ([www.pasteur-lille.fr](http://www.pasteur-lille.fr))

- *Escherichia coli* collection CIP 106 878
- *Enterococcus faecalis* collection CIP 106 877

### Stage 1: Preparation of the contaminate master solutions

*Escherichia coli* solution:

- 2 specified tablets in 100 ml of Tryptone salt
- Incubation of the solution at  $36^{\circ}\text{C} \pm 1^{\circ}\text{C}$  for 24 hrs

*Enterococcus faecalis* solution:

- 2 specified tablets in 100 ml of Tryptone salt
- Incubation of the solution at  $36^{\circ}\text{C} \pm 1^{\circ}\text{C}$  for 48 hrs

### Stage 2: Evaluation of the contaminate master solutions

The evaluation of the contaminated master solution was performed according to the following norms:

- NF EN ISO 9308-1 for *Escherichia coli*
- NF EN ISO 7899-2 for *Enterococcus faecalis*

And counted by Malassez's cell.

The master solutions were stocked at  $5^{\circ}\text{C} \pm 3^{\circ}\text{C}$  for *Escherichia coli* and *Enterococcus faecalis*.

### Stage 3: Preparation of the challenge water (one solution per day)

According to the results obtained, x ml of the master solutions of *Escherichia coli* and *Enterococcus faecalis* were added to 2 liters of feed water.

We thus obtained a solution containing approximately 100 000 ufc/2 liters of each bacterium.



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## Feed Water Specifications

Feed water: Sorgues city water (84)

Specified Parameters	Results
Temperature	20°C
Stability	18.5 °F
Conductivity	575 µS/cm <sup>2</sup> à 25°C
Turbidity	< 0.1 NFU

Control feed water

Specified Bacteria	Results
<i>Escherichia coli</i>	0 ufc/ml
<i>Enterococcus faecalis</i>	0 ufc/ml

Laboratoire agréé par le  
ministère de la santé pour la  
réalisation des prélèvements et  
des analyses des paramètres du  
contrôle sanitaire des eaux –  
Portée détaillée de l'agrément  
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**Product Tested : Lifestraw LF 64 bis**

*Escherichia coli*

Dates	Water Volume (L)	Nb Residual Bacteria (CFU/2L)	Bacterial Elimination (CFU/2L)	% Bacterial Elimination
15/06/2006	12	2200	297800	99,33
16/06/2006	114	0	>300000	100
17/06/2006	pause			
18/06/2006	pause			
19/06/2006	216	0	22200	100
20/06/2006	318	0	>300000	100
21/06/2006	420	0	86200	100
22/06/2006	522	0	>300000	100
23/06/2006	624	2000	20200	90,99
24/06/2006	pause			
25/06/2006	pause			
26/06/2006	726	10200	235800	95,85

*Enterococcus faecalis*

Dates	Water Volume (L)	Nb Residual Bacteria (CFU/2L)	Bacterial Elimination (CFU/2L)	% Bacterial Elimination
15/06/2006	12	0	10400	100
16/06/2006	114	0	8000	100
17/06/2006	pause			
18/06/2006	pause			
19/06/2006	216	0	8800	100
20/06/2006	318	0	10000	100
21/06/2006	420	0	6000	100
22/06/2006	522	0	1000	100
23/06/2006	624	2600	20400	88,7
24/06/2006	pause			
25/06/2006	pause			
26/06/2006	726	8800	265600	96,79



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Chart showing stops

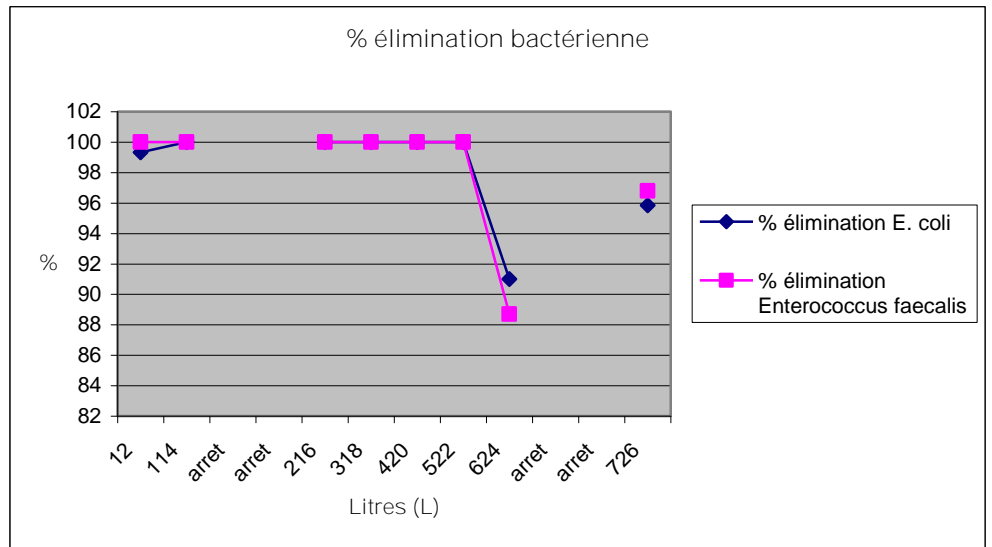
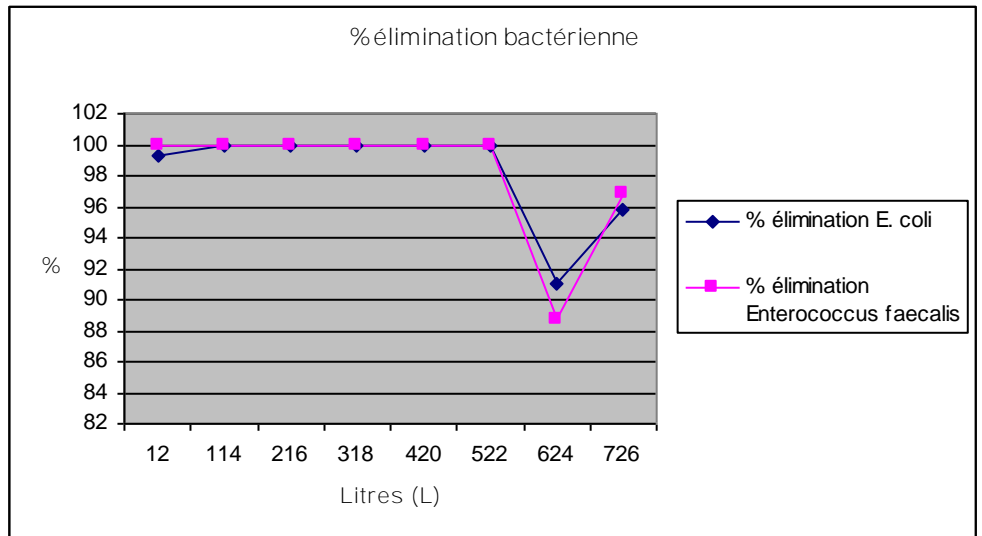


Chart without the stops



Laboratoire agréé par le ministère de la santé pour la réalisation des prélèvements et des analyses des paramètres du contrôle sanitaire des eaux – Portée détaillée de l'agrément disponible sur demande.