

# Treatment of effluents from oyster hatcheries by membrane process

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## CONTEXT

Some hatcheries can produce exotic shellfish (like polyploid oysters) with the risk that gametes and larvae reach the environment, threatening the local biodiversity. Therefore, effluents from farms must be treated but conventional processes are efficiency limited due to the quality of the water (UV) or the production of by-products (oxidation). The objective of this work was to develop a new process to remove oyster gametes from shellfish hatchery effluents. The retention by ultrafiltration membrane was determined and the oyster gamete viability was evaluated after treatment.

## MATERIAL AND METHODS

**Membranes:** Aquasource hollow fibre PES membranes (0,02 µm), in-out configuration.

**Pilot:** Semi industrial unit, completely automated, able to treat 20 m<sup>3</sup>.d<sup>-1</sup>. 3 cleaning procedures to eliminate fouling: **classical backwash** (CB), **air-backwash** (AB) and chemical cleanings.

**Effluents:** Seawater + gametes produced by oyster *Crassostrea gigas*. Two types of effluents that could be produced by a shellfish hatchery were treated to simulate :

- **Accidental pollution:** highly concentrated effluents on a short period
- **Chronic pollution:** low concentrated effluent on a long period

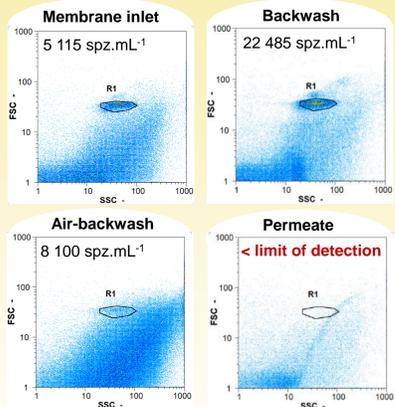
**Conditions of filtration:**  $J = 60 \text{ L.h}^{-1}.\text{m}^{-2}$  and  $t_{\text{filtration}} = 30 \text{ or } 60 \text{ min}$

→ close to industrial conditions, validated with previous tests of seawater filtration



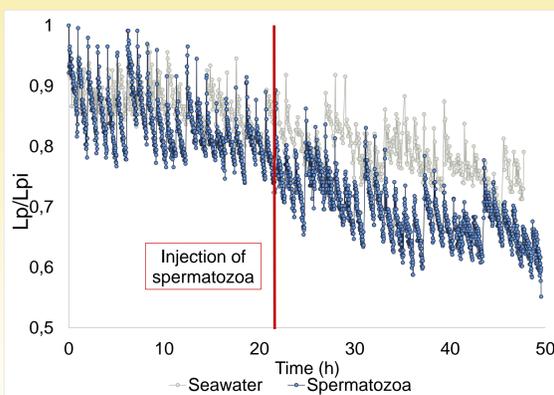
## ♂ CHRONIC POLLUTION

### Spermatozoa concentrations



Retention rate: 100 %  
LRV: 3-4 log

### Impact on membrane fouling

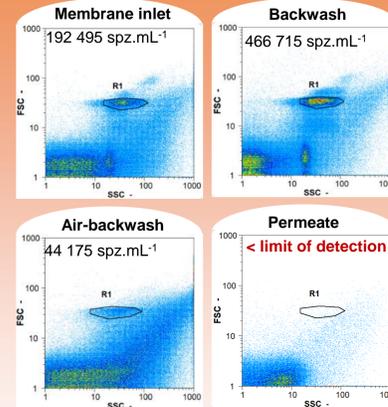


Moderate fouling generated by the injection of spermatozoa

✓ UF efficient to treat a chronic pollution of spermatozoa

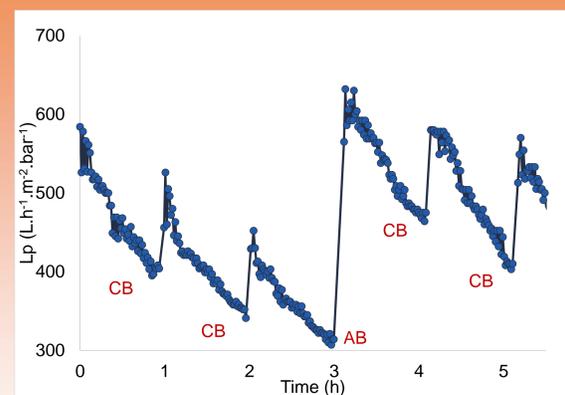
## ♂ ACCIDENTAL POLLUTION

### Spermatozoa concentrations



Retention rate: 100 %  
LRV: 4-5 log

### Impact on membrane fouling

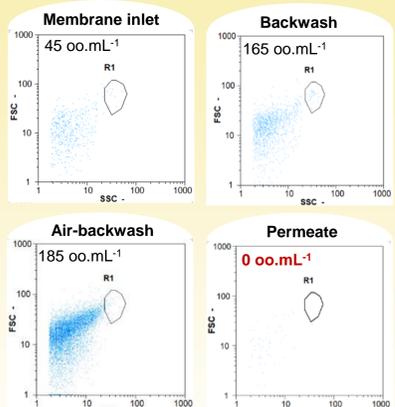


Fouling higher than for chronic pollution  
Fouling controlled by AB

✓ UF efficient to treat an accidental pollution of spermatozoa

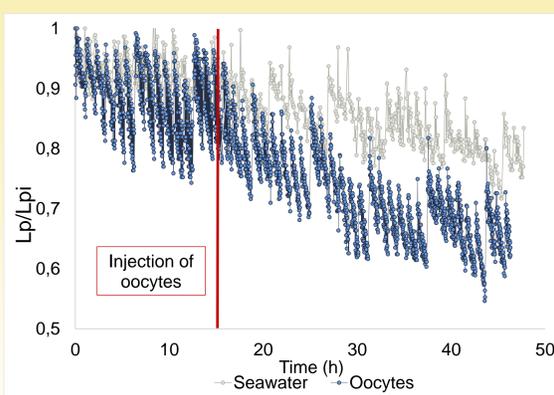
## ♀ CHRONIC POLLUTION

### Oocytes concentrations



Retention rate: 100 %  
LRV: 3-4 log

### Impact on membrane fouling

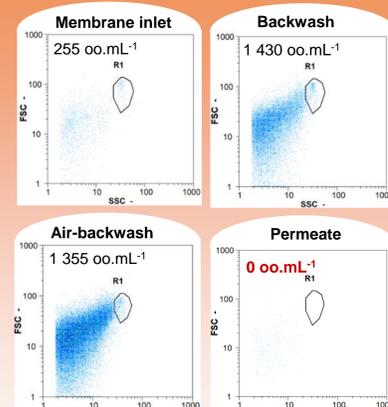


Moderate fouling generated by the injection of oocytes

✓ UF efficient to treat a chronic pollution of oocytes

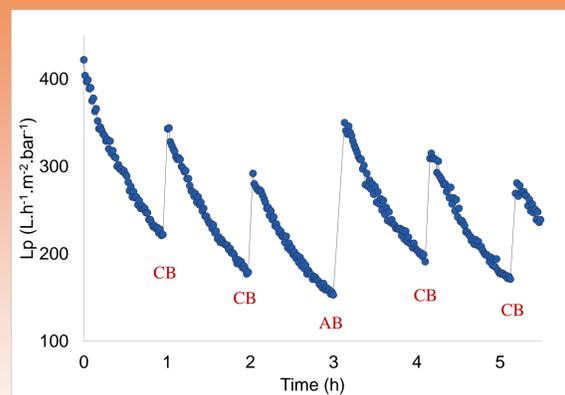
## ♀ ACCIDENTAL POLLUTION

### Oocytes concentrations



Retention rate: 100 %  
LRV: 4-5 log

### Impact on membrane fouling



Fouling higher than for chronic pollution  
Fouling controlled by AB

✓ UF efficient to treat an accidental pollution of oocytes

## CONCLUSION

The study showed the retention of oocytes and spermatozoa by ultrafiltration whatever the operating conditions of filtration and gametes concentrations. Moreover, a good regeneration of membrane was obtained during the period of the study (> 7 months) demonstrating the sustainability of the process facing this organic pollution. A protection of the marine environment biodiversity is obtained with membrane processes.