Schenk Lab

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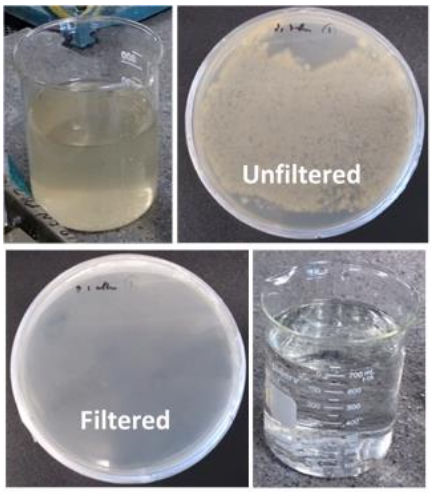
High Flow Rate Water Purification

With water resources containing a plethora of microbial and viral pathogens, efficient and cost effective purification technologies are required to produce clean water at a viable price. With water resources fast declining and the quality of reserves being affected by pollution and climate change the need for innovative new water purification technologies is stronger than ever.

Water treatment can generally be classified into two main categories: chemical treatment and filtration. Chemical treatment methods are employed to facilitate sterilization to kill potential pathogens and flocculation to facilitate removal of suspended particles. Chemical treatments require continual dosing commonly making them an expensive variable cost. Filtration can be used for both sterilisation and removal of particulate matter depending on the pore size of the selected filter. Whilst small pore size such as nanofiltration is highly effective, the energy required to achieve the required flow rates adds to the operating cost of water treatment facilities.



Bacterial and Fungal growth tests of Brisbane River water unfiltered or filtered using the hydrate membrane

Researchers at The University of Queensland (UQ) have developed a gel membrane, which can efficiently extract particulate matter and microorganisms, including viruses, from water under low pressure conditions with high flow rates.

Flow rate comparison (L/m2.h "LHM")			
Hydrate Membrane	Ultrafilters	Nanofilters	Reverse Osmosis
337*	30*	20*	15
On average the Hydrate Membrane flow rate is 17 x faster than current typical filters			

** Average industrially relevant flow rates at common operating pressures: ultrafilters (140psi), nanofilters (220-510 psi) and Reverse Osmosis (250 psi)*

Virus removal

Viruses are omnipresent and extraordinarily abundant in water. Viral pathogens in vomit and faeces of infected individuals contaminate the marine environment, fresh water and groundwater which contaminate drinking water sources. The unique chemistry of the hydrate membrane can putatively facilitate the removal of viruses such as:

- **Adenovirus**
- **Anterovirus**
- **Hepatitis A**
- Norovirus
- Rotavirus
- Astrovirus

Bacteria removal

A wide variety of bacterial and protozoan pathogens excreted in faeces are capable of initiating waterborne infections including:

- Bacterial Enteropathogens
- Putative bacterial pathogens in water supplies
- Helicobacter Pylori
- Pathogenic Protozoa

In order to ensure potable water supply these microorganisms need to be effectively killed and/or removed. The hydrate membrane may provide a low cost solution.

Potential products

The hydrate membrane has the flexibility to be incorporated into multiple formats:

- personal water bottle filtration systems
- home water filtration systems
- industrial water purification systems
- developing world small, medium and large deployable low cost water purification

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UQ Research into the Hydrate Membrane is mid stage –TRL 3-4. In order to progress further towards commercial application, the researchers seek commercial partners to collaborate with to test application of the membrane in numbers industrially and consumer relevant scenarios.

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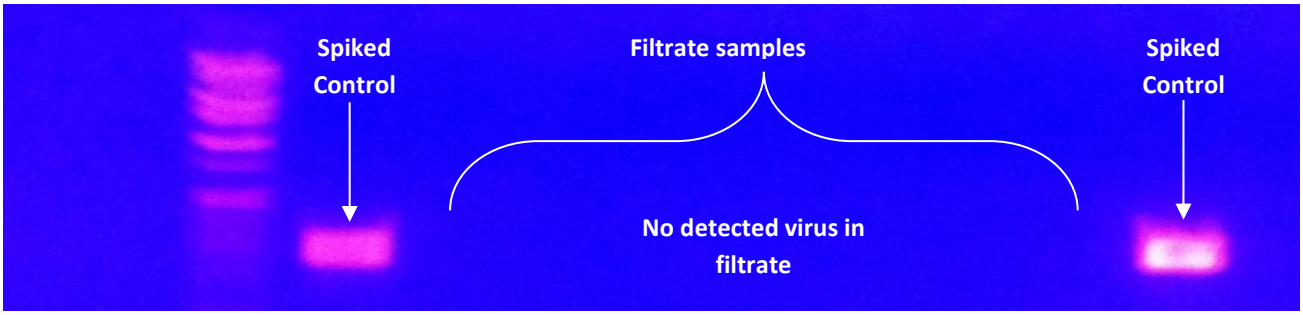
Multiple Applications

With the ability to separate based on both pore size and hydrophobicity the gel membrane has a number of applications which are being explore including:

- ✓ Oil extraction from water
- ✓ Food and nutraceutical applications
- ✓ Algae harvesting
- ✓ Aquaculture water management



Water samples spiked with a virus and then purified using the hydrate membrane show remove all virus as detected by high fidelity PCR.

A Flexible Solution

Due to the low cost and flexibility of the membrane material the technology may be tailored for high capital intensive, high infrastructure applications as well as low cost, no power, portable solutions which may be suitable for the consumer market or the developing world.

What are we looking for?

Commercial partners to collaborate and test specific water filtration applications and further develop the membrane technology into application specific filtration products for different markets.

Professor Peer Schenk is interested in finding solutions from Science and Technology that address Food and Energy Security (www.schenklab.com). He works at the School of Agriculture and Food Sciences at The University of Queensland, Australia and heads the Algae Biotechnology Laboratory (www.algaebiotech.org) and the Plant-Microbe Interactions Laboratory (www.plantsandmicrobes.com).

Peer is internationally recognised for his expertise in Biotechnology, including the development of new disease resistant plants and his R&D successes with industry. He commercialised technology from six patents and his published papers are cited by over 1,000 publications per year.