ALBERTA INNOVATES

Waste not, water not: flushing our resources down the drain

Nicholas Ashbolt, Alberta Innovates' Translational Health Chair in Water, suggests we're flushing valuable resources down the drain when we do things like go to the toilet, do laundry, or water the lawn. The obvious is the drinking water we flush down our pipes. The not-so obvious is what goes down the drain with it.

"There's no such thing as waste. Everything is a resource, the biggest of which is the energy embedded in what we flush down the toilet," says Ashbolt. "We can extract the energy embedded in what we're flushing down the drain using fairly simple biotechnology to turn it into useful products like methane and fertilizer."

MAKING WASTE WORK

Ashbolt and his colleagues are working with long-time collaborators at Wageningen University in the Netherlands to build off the pioneering work done by a company called Ostara who were able to create fertilizer out of sewage.

"Our Dutch colleagues are assisting in the design and operation of a full-scale blackwater energy and nutrient recovery process for a community of up to 2,000 people, to which we will also demonstrate Alberta innovations in wastewater treatment."

MAINTAINING WATER SAFETY

Talk of wastewater and drinking water in the same breath naturally gives rise to questions about water safety, an area that Ashbolt addresses with what's called quantitative microbial risk assessment. This assessment specifically focuses on pathogens that might be floating in our drinking water—and most certainly in our sewage—not on other indicators that might be misleading.

"The norm is to use something called faecal indicators," he says. "But these imply a very low risk if they're coming from seagulls or other wildlife of low human health risk. If it's coming from sewage, though, there is a very high risk because of viruses, parasitic protozoa and pathogenic bacteria. So, source does matter and quantitative microbial risk assessment helps to quantify that."

Pathogens can also exist in biofilms. This is the slimy goo you see on rocks by rivers and on the solid surface inside pipes, taps and shower heads. Some pathogens from sewage get stuck and accumulate within these biofilms, later releasing at a higher dose. To understand how these biofilms work and how pathogens interact and inhabit them, Ashbolt has built a plumbing lab at the University of Alberta campus.

"The lab helps us to understand how these organisms are coexisting with the more beneficial water-pipe microbes, much as research in other areas has shown with our gut microbiome," he says. "It also helps us properly manage pathogens, especially how to minimize unintended consequences as

we move to resource recovery water services like the one being pioneered at the Alberta Innovates-supported Resource Recovery Centre in St. Albert."

CLEANING UP AN AILING WATER SUPPLY

Detergents, fertilizer runoff or sewage leaking into an aquatic system can lead to increased phosphate levels and the rapid growth of algae and other plant life. When the plant life dies and is broken down by bacteria, oxygen is consumed. Too much oxygen consumption can cause aquatic animals to die. We hear about this in reports of algae blooms and beach closures in our provincial lakes.

Ashbolt, and his colleagues—among them private citizens Ken Pacholok and Jim Hole—are going to use the Resource Recovery Centre, which will soon be under construction, to find ways to stop this before it begins in St. Albert's Sturgeon River.

"We're proposing that we turn remaining greywater (having beneficially dealt with the separately-collected blackwater from toilets and kitchen sinks) into safe environmental flows for the Sturgeon River in St. Albert," says Ashbolt. "The water in this river is being over-withdrawn, and it's gone stagnant and eutrophied because of lack of environmental flow. The plan is to treat the greywater through a series of wetlands to give esthetic value to this development resulting in high-quality water flow in the river."

The Resource Recovery Centre is well underway to becoming a reality with construction expected to begin in June 2017.

MEET THE RESEARCHER

Dr. Nicholas Ashbolt was recruited to Alberta in late 2013 from the U.S. where he worked for the Environmental Protection Agency (EPA). Originally from Hobart, Tasmania, Dr. Ashbolt received his undergraduate and graduate degrees in microbial ecology from the University of Tasmania.

Prior to coming to North America, Dr. Ashbolt was a professor and Deputy Director of the Centre for Water and Waste Technology, the Education Coordinator for the Cooperative Research Center for Waste Management and Pollution Control at the University of New South Wales in Sydney. He also served as the Head of its School of Civil and Environmental Engineering. Dr. Ashbolt was also the principal wastewater scientist for what is now called Sydney Water Corporation, the entity supplying drinking and wastewater services for the city of Sydney, Australia.