Science Current Events

Follow Us on Twitter

Top Science News

Earth Science

Space Science

Life Science

Medical News

Cancer News

Scientific Fields

Archive

RSS Feeds

Earth Science

Space Science

Life Science

Scientific Fields

Nanotechnology

Cancer

Science Textbooks

Anatomy

Scientists discover tiny microbes with potential to cleanse waterways

May 18, 2015

A seven-year scientific study has revealed that microbial communities in urban waterways has the potential to play an important role in cleansing Singapore's waterways and also act as raw water quality indicators.

The study found that canals designed to channel rainwater host microbial communities that could remove and neutralise organic pollutants in raw water. These organic pollutants are currently at trace levels in raw water - well below the United States-Environmental Protection Agency (US-EPA) drinking water standards - which is removed during water treatment processes.

Researchers from the NUS Environmental Research Institute (NERI) and the Singapore Centre for Environmental Life Sciences Engineering (SCELSE) at Nanyang Technological University (NTU) have discovered that the untapped natural ability of microbial communities could be harnessed to treat raw water even before undergoing treatment.

This process is known as 'bioremediation', a treatment that uses naturally occurring organisms to break down organic pollutants.

The study, which was published in the scientific journal Environmental Science & Technology, was conducted around the Ulu Pandan catchment area in collaboration with the Singapore's national water agency, PUB.

Microbes - Nature's "garbage cleaners"

The increased demand for water in urban centres, coupled with the elevated pressures placed on the environment by high-density living, has created a demand for efficient, environmentally sustainable solutions to manage urban watersheds. Harnessing the cleansing power of microbes provides a solution to the pressing need.

The breakthrough came about after the joint research team identified members of the entire microbial community and their functions from the aquatic ecosystem at the Ulu Pandan catchment area by extracting their DNA and RNA, the genetic blueprint of life.

Apart from the discovery that the microbes could remove and neutralise organic pollutants, the researchers also found out that the presence of aluminium, copper and potassium were critical to the community's ability to perform its ecological "cleansing" properties.

The discovery of these chemical elements' influence on the microbial community's functions paves the way for researchers to better understand their "cleansing" performance through further monitoring and study.

The project's lead scientist, Associate Professor Sanjay Swarup, Deputy Director of NERI and a Research Director at SCELSE said, "This study demonstrates the power of combining an in-depth analysis of microbial community ecology with physical and chemical characteristics.

"More importantly, with the support of government administrators, environmental sustainability could be achieved naturally through science, creating a better living environment for both man and nature."

The study also examined the differences of microbial communities in residential and industrial watershed systems. It was discovered that these two microbial communities perform different functions, which shows how various land use could influence the types of microbes and the functions they are capable of performing.

Dr Gourvendu Saxena, Research Fellow at NERI and SCELSE said, "Knowing what the microbes are doing provides information on what they are responding to. These marker-based microbial functions provide a higher resolving power than chemical markers that are currently in use.

"This study has enabled us to identify the key drivers of microbial communities and their functions at a watershed-scale. The findings can be used to understand microbial activity responsible for removing and neutralizing organic pollutants, which is critical to developing ecologically friendly waterways in rapidly urbanizing environments," said Dr Saxena who is the lead author of the study.

The study also found that the Ulu Pandan catchment area was not only well-managed but is an efficient drainage system, with pollutants below the baseline safety limits.

Professor Staffan Kjelleberg, Centre Director for SCELSE at NTU said, "For decades scientists have pursued research projects that seek to understand microbes' ability to chew-up stubborn pollutants.

"This breakthrough proves that it may be possible to push the boundaries in securing the availability of clean water through natural means and hence, maintain a more sustainable environment for Singapore and other societies."

Next phase of research

The research framework laid out in this study could be easily adopted by other cities around the world in studying their own waterways, and is being adopted by the international World Harbour Project, to which SCELSE is a party of.

The World Harbour Project is a coordinated network of researchers and managers, to bring the best practices in understanding and managing urban waterways to the world.

Biology

Chemistry

Engineering

Geophysics

Nanotechnology

Philosophy

Physics

Telescopes

Refractor Telescopes

Reflector Telescopes

Science Gifts

Moving forward, the team will continue to investigate the microbial communities' ability to self-cleanse the waterways. This is done by understanding the response to manipulating key metals, identifying the most efficient microbial community composition and establishing the conditions needed for optimal bioremediation.

Plans are in place to study the effects of plants on microbial communities and explore various waterways structure designs to determine optimal settings and parameters.

###

This joint study was conducted with key investigators from NERI and SCELSE, involving 17 researchers from institutions in Singapore, Sydney, Australia, Oklahoma, and Berkeley in the USA, and Beijing, China.

Nanyang Technological University

Related Microbial Communities Current Events and Microbial Communities News Articles

Study reveals intestinal bacteria succession during recovery from cholera in Bangladesh
A new study delineates a sequential pattern of changes in the intestinal microbial population of patients recovering from cholera in Bangladesh, findings that may point to ways of speeding recovery from the dangerous diarrheal disease.

Bacterial communities of female genital tract have impact on inflammation, HIV risk
A team led by researchers from Massachusetts General Hospital (MGH) and the Ragon Institute of MGH, MIT and Harvard has found that the most common bacterial community in the genital tract among healthy South Africa women not only is significantly different from that of women in developed countries but also leads to elevated levels of inflammatory proteins.

Revealing the ocean's hidden fertilizer
Phosphorus is one of the most common substances on Earth. An essential nutrient for every living organism--humans require approximately 700 milligrams per day--we are rarely concerned about consuming enough of it because it is present in most of the foods we eat.

Revealing the ocean's hidden fertilizer
Phosphorus is one of the most common substances on Earth. An essential nutrient for every living organism--humans require approximately 700 milligrams per day--we're rarely concerned about consuming enough because it is in most of the foods we eat.

Further assessment needed of dispersants used in response to oil spills
New commentary in Nature Reviews Microbiology by Samantha Joye of the University of Georgia and her colleagues argues for further in-depth assessments of the impacts of dispersants on microorganisms to guide their use in response to future oil spills.

The infant gut microbiome: New studies on its origins and how it's knocked out of balance
A fecal sample analysis of 98 Swedish infants over the first year of life found a connection between the development of a child's gut microbiome and the way he or she is delivered.

Using microbial communities to assess environmental contamination
First there were canaries in coal mines, now there are microbes at nuclear waste sites, oil spills and other contaminated environments.

Researchers find evidence of groundwater in Antarctica's Dry Valleys
Using a novel, helicopter-borne sensor to penetrate below the surface of large swathes of terrain, a team of researchers supported by the National Science Foundation, or NSF, has gathered compelling evidence that beneath the Antarctica ice-free McMurdo Dry Valleys lies a salty aquifer that may support previously unknown microbial ecosystems and retain evidence of ancient climate change.

UT research uncovers lakes, signs of life under Antarctica's dry valleys
Many view Antarctica as a frozen wasteland. Turns out there are hidden interconnected lakes underneath its dry valleys that could sustain life and shed light on ancient climate change.

Researchers produce first atlas of airborne microbes across United States
A University of Colorado Boulder and North Carolina State University-led team has produced the first atlas of airborne microbes across the continental U.S., a feat that has implications for better understanding health and disease in humans, animals and crops.

More **Microbial Communities Current Events and Microbial Communities News Articles**