

Acclimatize: Technology to keep our coastal waters clean



Acclimatize, co-ordinated by UCD One Health researcher Professor Wim Meijer, is sniffing out sources of pollution in Dublin's coastal waters in order to improve human and animal health.

Picture this: you plan a day out at the beach, but when you get there, a large sign warns you that the waters are not safe for swimming. Or, even worse, you get there before microbial contamination has been detected and you end up with a nasty tummy bug as a souvenir of your day out.

It's in everyone's interest to pick up on problems with coastal water in good time, and a new project involving researchers at UCD is taking a One Health approach, figuring out how and where the pollution happens so that it can be better tackled.

Coastal waters under threat

"Coastal waters are under threat from chemical and faecal pollution," explains Professor Wim Meijer, Professor of Microbiology at UCD School of Biomolecular and Biomedical Science. It doesn't sound pleasant, but this means that

disease-causing bacteria or viruses or protozoa may be present in the water, and that can result in illness in humans that swim in the water, or use it for recreation, or who consume foods such as shellfish that have been grown in aquaculture."

These disease-causing organisms, or pathogens, can come from a variety of sources: for example, sewage or agricultural waste that is leaking into a stream that eventually empties



Professor Wim Meijer, Professor of Microbiology, UCD School of Biomolecular & Biomedical Sciences

into the sea, or seagulls and dogs may be depositing their waste on the beach, which gets washed into the water.

Local authorities currently sample coastal water at designated bathing spots to monitor quality. If the levels of particular bacteria are high, beach-goers are warned about the potential hazards of bathing. But a new project, Acclimatize, wants to track back and find the sources of pollution so they can be better tackled.

The aim of the Acclimatize project is to look at water quality and contrast rural and urban bathing waters,” explains Professor Meijer, who co-ordinates the project alongside Professor David Kay at the University of Aberystwyth in Wales. The project is partially funded by the European Regional Development Fund through the Ireland Wales Cooperation programme.

The Irish component of the INTERREG Ireland Wales project is looking at three designated bathing areas in Dublin Bay – Dollymount Strand, Sandymount Strand and Merrion Strand – and working closely with local authorities who are sampling the bathing waters there.

“The way to determine the quality of the water is to look for the presence of bacteria in the water that are often resident in intestines of humans and animals, such as E. coli,” explains Professor Meijer. “The more of these ‘faecal indicator’ bacteria there are in the water, the bigger the chance you will get diarrhoea if you are in contact with the water.”

But while the current method of analysing



water samples can tell you there is a problem, it doesn't tell you exactly where that problem started, he adds. “You don't know where these bacteria came from – were they from humans, dogs, chickens, gulls or cows? And how did they travel into the coastal waters?”

Sniff out the sources

Acclimatize, which in Ireland is working with Dublin City Council, Dún Laoghaire – Rathdown County Council, Fingal County Council, the Environmental Protection Agency and Irish Water, is on a mission to find out. By monitoring coastal waters and the rivers and streams that feed them, the team can sniff out sources of pollution, much like a bloodhound following a trail of scent, explains Professor Meijer.

“We developed real-time monitoring tools in a previous INTERREG project along the river Dargle into Bray,” he says. “We can now use them to monitor markers of microbial contamination along rivers and streams feeding Dublin Bay and measure where the levels of these markers spike. That can lead us to, say a leaking sewage pipe or septic tank, or runoff from the land. Even small streams can look very innocent but sometimes they are highly polluted with levels of faeces approaching what you might see in a wastewater plant.”

Building up this 'heatmap' of pollution sources in Acclimatize requires different types of expertise and collaborators include Dr John O'Sullivan at UCD School of Civil Engineering, Professor Gregory O'Hare at UCD School of Computer Science and Dr Bartholomew Masterson, Adjunct Professor at the School of Biomolecular and Biomedical Science. "We not only need the microbial know-how but we also need to ensure we can capture and analyse and model the data to tell us how dangerous the contamination is, and this is where the engineering and computer expertise comes in," explains Professor Meijer.

Future-proof protection

Ultimately the 6.7 million Euro Acclimatize project, will allow authorities in the sampling areas in Dublin and Wales to get specific, real-time information about where pollution originates, to take immediate measures in order to stem the flow of contaminants into coastal waters and even to plan for the future.

"We want to analyse the data in the context of climate change," explains Professor Meijer. "If we expect to have drier summers and wetter winters, are the sources of contamination likely to become worse or to have less of an impact over time, if we can predict this then we invest the resources smartly to future-proof the protection of coastal waters."

What Professor Meijer particularly likes about working on the project is how water quality can link and improve health and wellbeing in humans and other species of animal.

"This kind of project connects and has impacts for us all," he says. "You have a family out on the beach in the summer, people are swimming kids are playing in sand and puddles and they are exposed to wildlife and agriculture and pets such as dogs. Or you have humans who eat shellfish grown just offshore in aquaculture. Water is the medium in the environment that connects us all and we want to make sure that the water is safe."



Professor Wim Meijer working in the lab in UCD Science with his Acclimatize research group project