



Public health Impact of Exposure to antibiotic Resistance in recreational waters

What is the PIER project and what will it tell us?

PIER - Public health Impact of Exposure to antibiotic Resistance in recreational waters - is a 4 year Environmental Protection Agency (EPA) funded research project led by Professor Dearbháile Morris at NUI Galway. The PIER Project will run from 2019-2023 and also involves researchers in the HSE West Department of Public Health amongst others.

There is potential for antibiotics and antibiotic resistant bacteria to get into our environment in human and animal waste, which may ultimately end up in recreational waters. **The PIER project will help us to understand if people who regularly swim, surf or do other in-water activities in Irish rivers, lakes and coastal seas are more likely to pick up and carry antibiotic resistant (AR) bacteria in their gut than those who don't regularly get in the water.**

What is antibiotic resistance?

The spread of antibiotic resistance (AR) means that it is getting harder and harder to treat simple infections and we may soon run out of antibiotics that work. AR occurs when antibiotics no longer kill bacteria, because the bacteria have changed somehow and have become resistant.

AR bugs are harder to kill than other common bugs. There are many different kinds of AR bugs. Some of them are very common and are found naturally in the ground, in water, or can live harmlessly on our skin or in our bowels. As long as a bug stays on the skin or in the bowel, it usually does not cause a problem. However, if an AR bug gets into a wound, into the bladder or into the blood, it can cause an infection that can be difficult to treat. This mostly happens in sick or vulnerable people with weaker immune systems, such as those in intensive care, the very old or the very young, and special antibiotics are then required for treatment, as ordinary antibiotics do not work.

Antibiotic resistance (AR) is now recognised as a global crisis and one of the most important threats to human health. Life-threatening superbug infections are still rare, contributing to around 700,000 deaths a year worldwide (cancer currently claims 8.2 million deaths a year). However, if AR continues to spread at its current pace and no new antibiotics are developed, it is estimated that by 2050 AR will cause around 10 million deaths a year. Without effective antibiotics, even a simple infection could be potentially life threatening. Common medical procedures such as open surgery or cancer chemotherapy would be very dangerous because of the risk of infection.

What is a superbug?

Some AR bugs known as 'superbugs' (or multi-drug resistant bacteria) are resistant to many different antibiotics. Famous examples include MRSA, ESBLs and CPE. Some very difficult to treat superbugs, such as CPE, are still rare, except in people who have spent a lot of time in hospital. Other less difficult to treat superbugs, e.g. ESBLs, are now very common in the environment. If a superbug like CPE circulates between hospital patients, it may be possible



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to control via infection prevention and control measures like hand hygiene and use of personal protective equipment. However, if it escapes to become widespread in the environment, like ESBLs, it becomes impossible to control.

Why is this research important?

We know there is potential for antibiotics and AR bacteria to get into our environment in human and animal waste, which may ultimately end up in recreational waters. **We want to find out if people who use natural waters for recreation are more likely to pick up (become colonised with) AR bacteria.** Although this is unlikely to cause serious illness in them, it could contribute to the spread of resistant bacteria to others, including vulnerable people in their homes, workplaces and community. **Understanding how antibiotic resistant bacteria enter human populations is essential for controlling their spread.**

The PIER project will identify the impact of AR in recreational waters on human health and wellbeing. Studies have shown that access to natural waters (seas, lakes and rivers) for recreation and relaxation is important for our mental and physical health, wellbeing and quality of life. PIER's results will be reported to governments and policy makers to support the development of monitoring strategies, regulatory activities and policy to limit antibiotic use in humans and animals and control the release of antibiotics and AR bacteria to the environment in sewage, manure and wastewater effluent. **We hope this will contribute to safer, cleaner waters for everyone to enjoy.**

Who can participate in PIER?

We are looking for **150** participants in each of the following two groups:

- 1. Water user group:** Adults who live on the island of Ireland who regularly (*on average at least 3 times per month*) use natural recreational waters (seas, lakes or rivers) for swimming, surfing or any other in-water activity where you are likely to swallow some water (e.g. body boarding, diving).
- 2. Non-water user group:** Adults who live on the island of Ireland who don't regularly use natural recreational waters (*on average less than once a month*), and therefore are not likely to have swallowed water. This group is equally as important, without them we will not be able to prove or disprove any association between recreational water use and carrying antibiotic resistant bacteria in your gut.

Why should I participate in PIER, what's in it for me?

- Your participation will contribute to protecting our natural recreational waters and improving water quality!
- You will contribute to cleaner, safer recreational waters for current and future generations to enjoy!
- You will contribute to improving policy regarding environmental AR monitoring and the release of waste containing AR bugs to recreational waters!



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- You will contribute to the global fight against AR and helping to keep antibiotics working for this and future generations!

What does participation in PIER involve?

You will be asked to collect a pea-sized faecal (poo) sample at home, to answer a short questionnaire and to return them to us by post in a prepaid envelope. Here's how it works in 3 easy steps:

Step 1: Register online – www.nuigalway.ie/pier We will collect your name, address and phone number and ask you a few questions about your use of the water to see if you are eligible to participate. If you are eligible, we will call you to confirm that you are happy to participate and answer any questions that you have about the study and send you a PIER study kit.

Step 2: Collect your sample and fill out a short survey - Your PIER study kit sent to your home contains everything you need to hygienically collect a pea-sized sample of poo when you use the toilet. We will use this sample to collect the bacteria that live in your gut and test them for resistance to antibiotics. You will also get a survey about your use of natural recreational waters.

Step 3: Return your sample and survey to us by free post. Once you have signed the consent form, filled in the short survey and taken your sample – put it in the FREE POST envelope provided and post it back to us. We will analyse the bugs in your sample for antibiotic resistance.

We will also invite you to participate in a longitudinal study (PIER Persistence Study) which aims to see how long antibiotic resistant bacteria **persist** in water user and non-water users' guts. If you choose to participate we will ask you to provide one sample every 3 months for 2 years, using the same convenient method. **This part of the study is completely optional and you can choose not to participate in this.** You will have additional time to consider taking part in this longer study before you commit.

How do I collect the faecal sample?

You collect a pea-sized piece of poo using a plastic scoop that we provide, either from used toilet paper, or directly from your poo on a bed of toilet paper in the toilet bowl. The scoop screws into a collection tube, which is then placed in a leak proof postal pack and sent to us in a free post envelope with your completed questionnaire and consent form.

How long will it take?

It should take **less than 15 minutes** to collect the sample and complete the questionnaire.



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Are there any risks?

Risks and discomfort associated with participation in this study are minor. There is no risk of injury from sample collection. The main risk is illness from exposure to biological pathogens in your faecal sample, which is extremely rare but possible, so proper hand hygiene during collection is important.

What if I have medical concerns?

If you do experience illness, or are concerned about your health following participation in this study, you should contact your GP.

Can I change my mind and withdraw from the project?

You may withdraw from the project at any time by emailing us at pier@nuigalway.ie

What information will be collected?

We will identify whether or not you have antibiotic resistant bacteria in your gut. We may examine the bacterial DNA in the sample, to analyse what types of bacteria and resistance genes are present. **We will not collect information on any other health conditions** (e.g. colorectal cancer, IBS). The questionnaires will collect information on risk factors that may be associated with AR bacteria living in your gut (e.g. exposure to animal waste), as well as some personal information, such as age and sex. **All data collected will be anonymised.**

What will the information be used for?

Findings of the project will be published in a report to the EPA, which will include recommendations for their implementation and uptake by government and regulatory bodies tasked with protecting the environment and public health, and combatting the spread of antibiotic resistance. Such authorities include the EPA, HSE, Local Authorities, Irish Water, relevant government ministers and departments and the EU Commission. Participants can download the report for free from the EPA Research Reports website (www.epa.ie/pubs/reports/research/) once the study has concluded.

How will my information be stored?

The data collected will be anonymous and will be securely stored so that only researchers involved in this project at the School of Medicine, NUI Galway will be able to access it. Data will be retained in secure storage for 5 years after the end of this project.



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Can I find out the results of my sample?

We will not be informing individual participants whether AR bacteria have been found in their faecal samples. This is because in most cases, gut colonisation by AR bacteria clears by itself after a short time, and usually does not cause any health problems in healthy individuals. There is currently no recommended treatment to eliminate AR bacteria that are not causing illness. The proportion of colonised people in the water user and comparison groups will be recorded in the report which will be freely available to download from the EPA website upon project completion (www.epa.ie/pubs/reports/research/). However, results of individuals will not be identifiable. If you have any concerns about your health, we recommend that you seek advice from your GP.

What if I have any questions?

If you have any questions now or in the future, please email pier@nuigalway.ie or contact a member of the research team directly:

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Does this study have ethical approval?

This project has been reviewed and approved by the National University of Ireland Galway Research Ethics Committee; Ref no. 19-Dec-02.

If you have any concerns about this study and wish to contact someone independent in confidence, please contact the Chairperson of the NUI Galway Research Ethics Committee, c/o Office of the Vice President for Research, NUI Galway at ethics@nuigalway.ie

How can I sign up?

Please visit www.nuigalway.ie/pier to register by completing the online registration form!