



Your guide to...

PATHOGEN TESTING

View the full toolkit at kit.riveractionuk.com

This short guide will provide useful resources and guidance on why it's important to test for pathogens, and what methods are available to you.

WHAT ARE PATHOGENS AND WHY TEST FOR THEM?

Pathogens in river water refer to microorganisms, such as bacteria and viruses, that have the potential to cause disease in humans and other living animals. Rivers typically host various pathogens, but increased instances of pollution have driven up pathogen concentrations to hazardous levels, posing significant health risks to river users.

By testing waterways for pathogens it helps identify the sources of pollution and mitigate the health risks, safeguarding our rivers and those who depend upon them. Testing will indicate whether harmful sewage is flowing into your river and how often. It also informs studies and may well be picked up in the media. Testing for these bacteria is also a key part of the process of meeting bathing water quality standards. If this is something you're interested in, Surfers Against Sewage provide a great [guide to gaining water bathing status](#).

E. COLI AND INTESTINAL ENTEROCOCCI

When testing water quality, we focus on looking for bacteria that indicate water contamination. The most common indicators are E. coli or intestinal enterococci (IEC), which do not naturally occur in the environment and are found in untreated sewage and agricultural waste.

E. coli and intestinal enterococci are bacteria that live in your body... but can cause problems when they, er, leave your body! Many are harmless, but some strains of E. coli can cause stomach upsets and nasty gastrointestinal illness. IEC causes similar symptoms, with worse implications if it gets into a cut or wound.

THE TESTING PROCESS

Testing methods involve cultivating the bacteria in an incubator until growth stagnates. This gives us a number of 'colony forming units' CFUs from which we can determine how safe the water is for bathing. Testing positively for these bacteria tells us that faeces may be present in the water.



A group on the River Grom in Kent have taken E.coli samples.

These images clearly show the different amount of CFUs in each sample.

Most commonly, water quality is tested in labs. All water companies will test their drinking water for E.coli. One of the most common methods used to detect E. coli in water is the 'Colilert' test. This is a quick test that helps identify both E. coli and coliform bacteria. In this test, a water sample is mixed with special nutrients in a small vial, which is then kept warm for 18 to 24 hours. If E. coli is present, the liquid in the vial turns yellow. Additionally, the vial can glow under UV light, providing further confirmation of E. coli.

When testing using the colilert method, a 100ml sample is split into 51 different wells on a 'Quanti Tray'. The wells that turn liquid are then counted. Lab technicians will then compare the counted wells to the most probable number of E.coli that this indicates.



BATHING WATER STANDARDS

The Environmental Agency themselves tests for E. coli across England's designated bathing waters between 3 and 20 times between May and October. You can find the EA's guidelines on E. Coli levels [here](#).

Inland Bathing Waters

Excellent	EC: ≤ 500 cfu/100ml ; IE: ≤ 200 cfu/100ml (95th percentile)
Good	EC: ≤ 1000 cfu/100ml ; IE: ≤ 400 cfu/100ml (95th percentile)
Sufficient	EC: ≤ 900 cfu/100ml ; IE: ≤ 330 cfu/100ml (90th percentile)
Poor	means that the values are worse than the sufficient

UNDERSTANDING BATHING WATER STANDARDS FURTHER

The difference between Good and Sufficient looks confusing, because Defra classifies Good as <1000cf, but sufficient <900. However, what is important to recognise here that Good is in the 95th percentile and Sufficient is the 90th percentile. See below.

Good - EC: ≤ 1000 cfu/100ml ; IE: ≤ 400 cfu/100ml (95th percentile)

Sufficient - EC: ≤ 900 cfu/100ml ; IE: ≤ 330 cfu/100ml (90th percentile)

Percentiles are a way of understanding how one set of data may compare to another; it's ensuring that we keep the range of results in mind when creating a comparison. In this context, percentiles are used to evaluate water quality over a period of time by looking at a range of test results.

Let's start with Good:

- Good says the standard is 95th percentile - that means 95% of results need to fall below that of the specified limit.
- So it is indicating that only 5% of samples can be above the limit, which in the case for Good is 1000cfu.
- So if you take 20 tests and 19 are below 1000cfu and one is above 1000cfu, it is still deemed as Good.

Now let's look at Sufficient:

- For sufficient the standard is the 90th percentile - so 90% of results needs to fall below that of the specified limit.
- So it indicates that 10% of samples can be above the limit, which is in this case above 900cfu.
- So if you take 20 tests and 18 are below 900cfu and two are above 900cfu, it is still deemed as Sufficient.

So, the 95th percentile is stricter because it allows less room for higher values compared to the 90th percentile.

These percentiles help regulators understand the overall distribution of bacteria levels in the water over time, providing a more comprehensive picture of water quality rather than just looking at individual samples.

WHAT DIFFERENT TESTING METHODS ARE THERE?

Fluidion Alert One Testing Unit

We recommend the [Alert One test unit by Fluidion](#) for citizen scientists interested in regular, long-term testing. This handheld lab quantifies E. coli in situ, meaning you don't need to send samples to a lab, and it is designed for use by individuals with minimal training. You can find detailed step-by-step instructions on how to use the kit [here](#).

The unit itself costs £2,785, with each test priced at £15. Fluidion also suggests purchasing a portable charger, available for £45, or you can find compatible chargers online for around £25. This highly professional kit has been used to assess the health of Paris' River Seine in preparation for the 2024 Olympics.

Lab Testing

Lab tests follow strict protocols and use specialised equipment to ensure accurate and consistent results. Each lab will have its own requirements for testing before sending the water sample, usually by courier, to the lab.

[Latis Scientific Lab](#) is a market leading provider of laboratory services, with labs across the UK. Each sample costs around £30 to be analysed, and the courier service price can vary depending on distance to your closest lab. Universities may also have suitable laboratory services, which can analyse your samples for a lower price.

Resources and Guidance

The Ilkley Clean River Group offers a [wealth of resources and materials](#) to assist you with water testing. You will find valuable guidance and links to resources including the protocol they have developed on testing for sewage pollution which has been approved by the Environmental Agency.