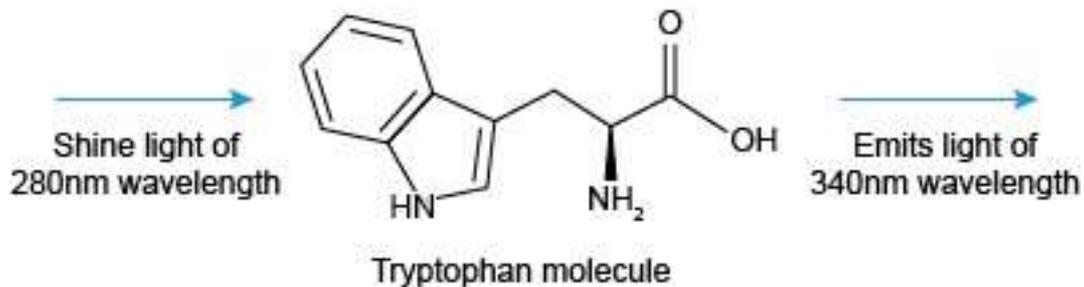


Water quality indicator: Tryptophan-like fluorescence

What is tryptophan?

Tryptophan is an amino acid that is present in many foods that are rich in proteins. Amino acids are organic molecules that are the building blocks of proteins.

Tryptophan fluoresces in the ultra-violet region of light. This means that when you shine a light of a particular wavelength on the molecule, it will emit light of a longer wavelength. For example, if you shine light of 280 nm wavelength on tryptophan it will emit light at 340 nm wavelength, and the intensity of this emitted light can be detected and measured by a suitable probe. 'nm' is short for nano-meter which is one billionth of a meter in length (1×10^{-9}).



Why do we measure tryptophan?

Some types of organic matter also fluoresce at the same wavelengths as tryptophan. 'Tryptophan-like' fluorescence in river water is associated with the presence of organic matter that can be easily degraded by microbes. This type of organic matter can arise in rivers from sewage inputs and from farm wastes such as cattle and pig slurry and silage. So the signal from a tryptophan probe can be used to identify the presence of these organic wastes in a river. This is quite a new technology, and the applications are still under development.

What are the natural controls on tryptophan?

Here are thousands of different types of organic matter molecules in a river made up of decomposing plants, animals and microbes. Because many types of organic matter fluoresce in the tryptophan region there will be temporal variations in the signal from a tryptophan probe, which provide a measure of the microbial activity that quite naturally occurs in the river.

Water quality indicator: Tryptophan-like fluorescence

How can human activity change tryptophan?

Because human sewage fluoresces at the same wavelengths as tryptophan, then we can measure accidental spillages of human waste into a river with a tryptophan probe. Such a probe might also help identify mis-connections with sewer pipes in urban river locations.

Farming activities can involve spraying organic fertilisers such as slurry onto field surfaces. Slurry has to be stored in containers under strict environmental regulations because it can be extremely harmful to the freshwater environment. An accidental release of slurry to a river can cause bacteria, which would use the slurry as a food source, to grow and rapidly multiply. These bacteria use up oxygen in the river water, causing dissolved oxygen levels to drop rapidly. This can lead to fish kills.