

Hydrochip Life+, Development of a molecular chip for rapid determination of the quality of surface water by using diatoms as indicator organisms

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A good quality of the surface water is essential for drinking water production, fishery, recreation and also has an important value in itself. The quality of the surface water is under a lot of pressure by for example the emission of heavy metals, fertilizers and pesticides. A current method to determine the quality of surface water is the use of the composition of diatom populations. Diatoms are present in surface waters and the presence or absence of certain types of diatoms gives an indication of the quality of water. Current ecological monitoring is based on the collection and analysis of numerous field samples by well-trained specialists and is labour, time and cost intensive. A less expensive and more objective approach for fast identification of biota in field samples would be a beneficial upgrade of currently applied methods. Because of these reasons STOWA, Vitens, TNO, Waternet and Hoogheemraadschap Hollands Noorderkwartier started a project to develop a new alternative rapid method to determine diatom populations, based on molecular techniques. This project started in 2012, is called Hydrochip Life+ and will take a period of 4 years.

The Hydrochip Life+ project demonstrates a new measuring device called Hydrochip, and provides the opportunity to monitor diatoms in an innovative way. The hydrochip is a microarray device which contains specific biomarkers based on the 18S rRNA gene of the different species of diatoms. 18S rRNA probes for the various diatom taxa on the chip were collected from available data and through a single-cell approach. By using these biomarkers it is easy to ascertain what kinds of diatoms are present in the water, and translate this to the ecological state of the water. In addition, the platform is fast, cost effective, flexible and can be adapted changing the biomarker composition. The result is obtained within 6 hours, while the results from the microscopic analysis can take up to 6 months.

The goal of the project is to demonstrate and validate the use of Hydrochip as a method to measure ecological water quality parameters to the same standard as the classical microscopic methods. In this research we further developed the Hydrochip and started analyzing surface water samples and comparing the results with the classic standard light microscopic analysis. The first tests show that the Hydrochip yields reliable results in part of the trophic spectrum. These results demonstrate that this tool could be added for the water boards and compared to the classic methods, with the benefit that we can more rapidly analyze samples.