EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN

Public Relations Department

Dr. Karl Guido Rijkhoek
Director

Antje Karbe
Press Officer

Phone +49 7071 29-76788
+49 7071 29-76789
Fax +49 7071 29-5566
karl.rijkhoek[at]uni-tuebingen.de
antje.karbe[at]uni-tuebingen.de

www.uni-tuebingen.de/aktuell

Press Release

Environmental researchers are developing new biosensors for testing water

Biologists from the University of Tübingen have helped develop biosensors which can detect drugs in water more quickly and in smaller amounts.

Tübingen, 09.03.2017

Biologists from the University of Tübingen are part of an interdisciplinary team which has developed novel biosensors that enable pharmaceutical products to be detected more effectively in water. These sensors can measure two types of pharmaceutical substances – beta-blockers and non-steroidal anti-inflammatory drugs (NSAIDs) – in real-time and in low concentrations. The research was recently published in *Water Research*.

As a consequence of demographic change, the consumption of medicines is increasing in industrial nations. Large amounts of pharmaceutical agents are already deposited at waste treatment facilities through waste water. As these substances usually cannot be removed effectively, surface water organisms are subjected to a cocktail of drugs. Just a few micrograms per liter are enough to cause harmful side effects in fish.

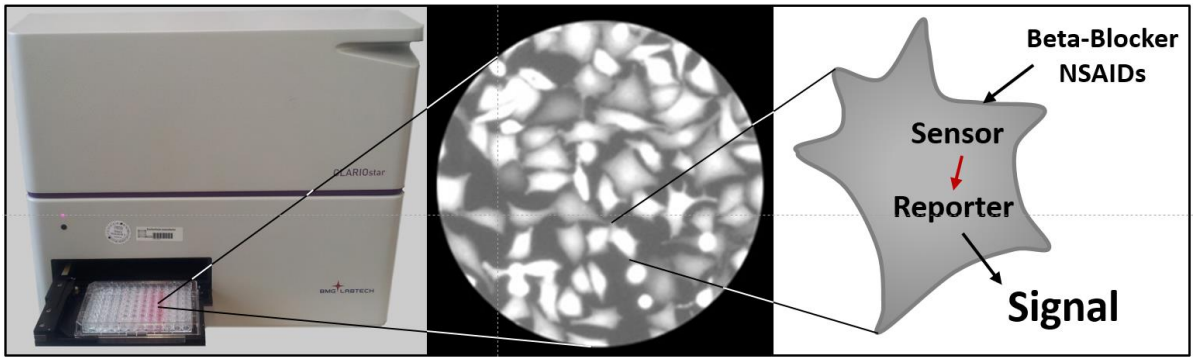
In the joint project “EffPharm” biologists, biochemists and analytical chemists are working to find a solution to the problem. The project is funded by the German Environment Agency (UBA) and coordinated by ecotoxicologist Professor Rita Triebskorn. In this context, the working group headed by Dr. Manfred Frey from the Steinbeis Innovation Center for Cell Culture Technology at the Mannheim University of Applied Sciences has succeeded in developing cell-based biosensors for two classes of drugs. These biosensors can detect the binding of such substances to their target molecules (receptors) in treated waste water in real time.

At the University of Tübingen, Professor Rita Triebskorn and Professor Heinz Köhler from the Animal Physiological Ecology working group have demonstrated these biosensors to be able to detect very low concentrations of the drugs at levels which are harmful to water organisms. Dr. Marco Scheurer from the Water Technology Center in Karlsruhe showed that the new biosensors capture a large proportion of

the compounds that had previously been detected by complex and time-intensive chemical analysis.

The newly developed biosensors have many more advantages in contrast to previous approaches. After the biosensor cell lines are exposed to drugs in water samples, a fluorescence signal appears within seconds. In contrast to conventional reporter gene assays, the biosensors detect the effect of chemicals in the cell in real-time and avoid misleading information which may occur in reporter gene assays that take several hours to generate a signal. Thanks to their mechanism of action, the biosensors can detect future beta-blockers or NSAIDS without knowing their exact chemical structure.

"It would be desirable for the technology developed here to be used in monitoring programs to determine the water quality and the cleaning performance of sewage treatment plants," says Professor Rita Triebskorn. "This would close an important gap in the plausibility chain between the detection of pharmaceutical substances in water and the health effects of the organisms concerned."



The principle behind the new biosensors: The receptor binding of the drugs immediately generates a fluorescence signal in the exposed cells which measures its intensity. Photo: M. Frey

Publication:

Kevin Bernhard, Cordula Stahl, Regina Martens, Heinz-R. Köhler, Rita Triebskorn, Marco Scheurer, Manfred Frey (2017): Two novel real time cell-based assays quantify beta-blocker and NSAID specific effects in effluents of municipal wastewater treatment plants. Water Research 115, 74-83. *http://dx.doi.org/10.1016/j.watres.2017.02.036*

Contact:

Prof. Dr. Rita Triebskorn
University of Tübingen
Institute of Evolution and Ecology
Animal Physiological Ecology
Phone: +49 7071 29-78892
rita.triebskorn[at]uni-tuebingen.de