

A test reveals ‘secret’ hormones

‘E-Morph’ checks whether chemicals in the body have similar effects to oestrogen

BfR Communication No. 023/2020 of 20 May 2020

Hormones are the body’s own messenger substances that control many processes of life. Man-made or natural substances, which under certain circumstances can exert hormone-like effects on the organism, also occur in the environment. In unfavourable cases, they can for example impair fertility or promote diseases such as cancer. In the EU, chemicals and pesticides must therefore be tested to check whether they have harmful hormone-like effects. Such substances are known as ‘endocrine disruptors’ in specialist terminology.

Scientists at the German Federal Institute for Risk Assessment (BfR) have developed a test method which detects possible detrimental effects of chemical substances that mimic hormone activity. This test is based on a human cell line and specifically tracks substances which have similar or opposite effects to the female sex hormone oestrogen. A patent application for this test has now been filed.

The test, named ‘E-Morph’, is based on a simple principle. It checks whether and how the ‘glue’ between the cells changes under the influence of chemical substances. This is particularly important because oestrogen – or substances with similar effects to oestrogen – can loosen the bonds between mammary gland cells. If cancer cells are involved, this represents an acute danger. Because if cell adhesion is lost, the cancer cells can ‘break away’ and form daughter metastatic tumours elsewhere in the body. The body’s own oestrogen therefore does not only have positive effects, but can also trigger the formation of tumours under unfavourable circumstances. And if another substance has a similar effect to oestrogen, this can further accelerate the progression of cancer.

The cell ‘glue’ is the protein E-cadherin. This thread-like protein links the membranes of neighbouring cells like molecular ‘ropes’ and holds the cells together in this way. This is where the ‘E-Morph’ test comes in. When the cells are exposed to a substance that mimics oestrogen activity (or with an oestrogen-blocking substance), the distribution of the E-cadherin protein and the shape (morphology) of the cell-cell contact points are altered in a typical way. This change in the morphology of the E-cadherin contact points, which gave the ‘E-Morph’ test its name, can be reliably detected under the microscope. In this way, the ‘hidden’ hormonal potential of a chemical can be revealed.

In an automated robotic platform, ‘E-Morph’ facilitates the systematic screening of many substances within a short period of time. The research team of the German Centre for the Protection of Laboratory Animals at the BfR hopes that, in this way, the method can help to use chemicals more safely or even support the search for new cancer drugs. The tasks of the German Centre for the Protection of Laboratory Animals include the development of alternative test methods that are not based on animal experiments – such as the ‘E-Morph test’.

More information on the topic:

European patent application (EP 3517967 A1):

<https://data.epo.org/gpi/EP3517967A1>

International PCT patent application (WO 2019145517 A1):

<https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2019145517>

Background information on the patent application procedure and possible areas of application for the test:

<https://www.bfr.bund.de/cm/349/screening-method-for-estrogenic-and-anti-estrogenic-activity-background-information.pdf>

Contact:

9@bfr.bund.de

About the Bf3R

The German Centre for the Protection of Laboratory Animals (Bf3R) was founded in 2015 and is an integral part of the German Federal Institute for Risk Assessment (BfR). It coordinates all activities nationwide with the goals of restricting animal experiments to only those which are considered essential, and guaranteeing the best possible protection for laboratory animals. Moreover, it intends to stimulate research activities and encourage scientific dialogue.

About the BfR

The German Federal Institute for Risk Assessment (BfR) is a scientifically independent institution within the portfolio of the Federal Ministry of Food and Agriculture (BMEL) in Germany. It advises the German federal government and German federal states ("Laender") on questions of food, chemical and product safety. The BfR conducts its own research on topics that are closely linked to its assessment tasks.

This text version is a translation of the original German text which is the only legally binding version.