Peter Behnisch

Peter Behnisch is Chief Commercial Officer of the Dutch company BioDetection Systems b.v. (BDS). This company specializes in bio-based screening technologies for safety, quality and bioactivity assessment.

BDS started developing bioassays in order to detect dioxin(like) compounds in food products, which are released during combustion processes. Thus, the Chemical Activated LUciferase gene eXpression (CALUX) bioassay was developed. Now, BDS offers multiple CALUX reporter assays in order to detect compounds, such as dioxin(like) compounds, endocrine disruptive compounds, genotoxicity, obesity and oxidative stress.

CALUX bioassay

The CALUX assay is based on specific pathways in mammalian cells and their natural responses, which vary per compound. Luciferase transcription is coupled to the natural response, resulting in measurable light after adding luciferin. Thus, the CALUX assay enables quantification of compounds by measuring luminescence emitted by luciferase.

High concentrations of certain compounds could be toxic and induce apoptosis or cell death. This results in a lower measured concentration, due to decreased light emittance. As a solution, a false positive control is incorporated, which always produces background luminescence. If the background luminescence drops, that means the cell died and the measured concentration is incorrect.

The CALUX bioassay is sensitive down to the picogram/liter range, which could be useful for companies that want to measure low concentrations. These sensitive measurements take place in the BDS laboratory in Amsterdam and takes two days. Companies from all over the world send their samples for analysis. In this way, the analysis will be performed correctly by trained laboratory staff. However, this could be seen as a disadvantage for the companies, since they have to wait for the results.

To prevent noise from disruptive compounds, the samples will undergo a pre-cleanup. Bio-assays are less sensitive to these disruptive compounds and require a simple filter method called Oasis, whereas chemical analysis demands multiple filter steps, which is costly and time consuming.

Stakeholders

The Dutch government uses the CALUX bioassay for detection of dioxin(like) compounds. Other compounds are still detected by using chemical analysis despite the disadvantages, since implementing new assays takes a long time. One of these disadvantages is the expense off the assay, which can reach up to thousands of euros, considering each compound requires a

different assay. Moreover, these chemical assays do not provide any indication of the health effects of the compounds. For this, they determine the effects by animal testing, which is possibly unethical as well as adding up to the costs. BDS acts as a solution by being cheaper, providing health effects and being animal friendly.

However, manufacturers, for example of pharmaceuticals, do utilize the services of BDS, since they have to keep a very close eye to the amount of waste product that leave the factory. Hence, (pharmaceutical) manufacturers are the biggest group of stakeholders of BDS's CALUX bioassay.