

Scientists use bacteria to pinpoint chloride toxins

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Scientists have studied the sensor with which bacteria detect chloride compounds, many of which can be carcinogenic or dangerous to the environment, and now hope to speed up identification of these dangerous toxins from weeks to just a few hours.

Dr David Leys at the University of Manchester's Faculty of Life Sciences has won a prestigious European Research Council (ERC) starting grant to further understand this process and to develop a biosensor that will alert us to contamination in environmental or foodstuff samples quickly.

Many man-made compounds that are toxic contain chlorine, such as dioxins and polychlorinated biphenyls (PCBs), and some of these can be extremely dangerous carcinogens.

The compounds can contaminate food, for example when dioxins were discovered in citrus pulp from Brazil 1998, the 1999 Belgian dioxin crisis involving chicken products and contaminated bakery offal from Germany in 2003. Ukrainian President Viktor Yushenko fell seriously ill when his food was laced with the dioxin 'Yellow Rain' during the 2004 election campaign. The compounds can also be found in the environment and while contaminated soil can be burned clean, contaminated water systems are difficult to deal with.

Dr Leys said: "There are many different types of PCBs or dioxins and they are all very alike in structure, so it takes time to identify them. Time is unfortunately in short supply during potential dioxin/PCB food

contamination scares. We hope to speed detection up so that if a particularly carcinogenic flavour of PCB/dioxin is involved, we know quickly.

“We are studying the process by which bacteria can remove halogens, the chemical group which includes chloride compounds, by a process called halorespiration. These bacteria will only make the key enzyme required if they come across a halogen containing compound so we can employ this feature to develop a biosensor. For example in the Belgium chicken crisis we could have arranged an assay and tested suspect food samples rapidly – if the cells containing the biosensor had become green, we would have known whether a particular dioxin was present and that further tests were needed.

“The second phase of the study will find out if we can use our newly found knowledge of the halorespiration process and actually break the toxin down using these bacteria.”

Dr Leys was awarded the grant after identifying the structure and mechanism of the sensor for a [non PCB] chlorine molecule and publishing these results in the Journal of Biological Chemistry and more recently in Molecular Microbiology.

ERC Starting Grants aim to support up-and-coming research leaders who are about to establish or consolidate an independent research team and to start conducting independent research in Europe. The scheme targets promising researchers who have the proven potential of becoming independent research leaders. Only 3% of applicants were successful in this round with Dr Leys receiving 1.15M euros.

Dr Leys said: “It is great to receive substantial, long-term funding from the ERC recognising the potential of this research to contribute to detection and removal of toxic chloride-compounds.”

Provided by University of Manchester

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