PHIME puts spotlight on toxic metals

Even low levels of exposure to toxic metals can harm human health, warn researchers from the EU-funded PHIME (‘Public health impact of long-term, low-level mixed element exposure in susceptible population strata’) project. The PHIME team is calling on policymakers to systematically monitor levels of toxic metals in populations and take steps to reduce the release of these substances into the environment.

PHIME received EUR 13.4 million from the ‘Food quality and safety’ Thematic area of the Sixth Framework Programme (FP6). The goals of the project were to investigate the extent of exposure to toxic metals and its impact on public health as well as the sources of exposure. PHIME focused in particular on vulnerable groups, namely foetuses, babies and children, and fertile and elderly women.

One metal investigated in PHIME was arsenic, which Project Coordinator Staffan Skerfving of Lund University in Sweden describes as ‘an ugly element’. ‘It’s very toxic for the foetus,’ he tells CORDIS News, explaining that foetuses exposed to high levels of the toxic metal are at greater risk of abortion, malformation and perinatal death. Arsenic also affects the development of the central nervous system and children exposed to it in the womb and in early life may have a lower IQ (intelligence quotient). Later in life, arsenic exposure can suppress the immune system and raise an individual’s risk of developing cancer.

PHIME research has revealed that people's vulnerability to the harmful effects of arsenic and other toxic metals is partly genetic. ‘Some people can detoxify arsenic much better than others and we've been looking at populations with very high exposure to arsenic to find that out,’ says Professor Skerfving.

For example, populations in the Andes have been exposed to arsenic in the environment for thousands of years and appear to have evolved the ability to cope with this. ‘There has been [natural] selection,’ notes the project coordinator. In contrast, the population of Bangladesh, where arsenic in drinking water is a relatively recent phenomenon resulting from the drilling of millions of wells, is still highly sensitive to arsenic.

Another element that fell under PHIME’s gaze is cadmium. Here the major risk group is elderly women, for two reasons. Firstly, exposure to cadmium raises women’s risk of osteoporosis. Women are particularly vulnerable to contamination with cadmium because they are more prone to iron deficiency, and this causes them to absorb more cadmium in the gastrointestinal tract. Over the years, cadmium gradually accumulates in the body. In addition, cadmium mimics the effects of the hormone oestrogen and could therefore raise the risk of oestrogen-dependent cancers such as breast cancer.

People are exposed to cadmium in their food; it is a common element in fertilisers, and plants take it up through their roots. PHIME's research has revealed that even low levels of exposure, such as those found in Sweden, can be harmful to human health. The problem is that cadmium lingers in the environment for a long time.
'Industrial emissions and fertilisers with cadmium have to be banned to get rid of the risk which is already there,' emphasises Professor Skerfving.

One toxic metal success story of recent years involves lead; removing it from petrol dramatically lowered children's exposure to lead pollution. However, there is no room for complacency, warns Professor Skerfving. 'The decrease we have seen, which is very good, is not sufficient,' he says. 'There is still an effect and there is much to gain.'

Lead is still getting into the environment from industrial emissions, and some lead from leaded petrol remains in the environment.

The PHIME project is now drawing to a close, but Professor Skerfving points out that more research in this area is still needed. 'We should monitor the exposure to toxic metals better,' he says. While there is some information on exposure to lead and cadmium for some populations, there is currently no systematic effort to gauge exposure to other toxic metals.

The PHIME team would also like to see more research into how plants handle toxic metals. The project carried out a lot of work in this area, but more information is needed. 'Can you breed strains of wheat and rice that accumulate less cadmium and more zinc?' asks Professor Skerfving.

Finally, there should be more research into the genetics behind toxic effects; again the PHIME project studied this subject extensively. 'There's a tremendous difference in the [genetic] susceptibility to toxic metals and we would like to know why,' says Professor Skerfving.

In the meantime, the team is busy meeting with policymakers across Europe to ensure their findings are translated into policies that will protect the public from the effects of toxic metals.

Source: CORDIS News interview with PHIME project coordinator

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