Environmental pollution by heavy metals and their toxicological effects on Man

This article dealing with the pollution and toxic effects engendered by heavy metals was written by Jessica Briffa, Emmanuel Sinagra and Renald Blundell, and published last September in the journal "Heliyon".

The term "heavy metals" is used to describe the metallic chemical elements and metalloids that are naturally toxic or exceed a certain threshold acceptable for the environment and for Man. The aim of this study is to bring to light the toxicological effects of heavy metals on Man (1), the sources of pollution caused by these elements, how they are produced in our environment (2), and the solutions to combat the penetration of heavy metals into the human body (3). The authors do not, however, provide any statistics regarding the evolution of the presence of heavy metals in the environment-

#1

The authors recall that not all heavy metals are toxic to Man. Some, known as the essential elements, are necessary for life in that they are required for various biochemical and physiological functions. On the other hand, others may have a negative effect on the human organism and cause damage to cell organelles. Their presence in the human body engenders numerous toxic effects such as carcinogenesis[1], infertility, and deficiency of the immune system and of DNA[2].

#2

The use of heavy metals is due to urbanisation and industrialisation. **They can generate three types of pollution: in soil, water and air.** When they are present in the soil, they are not degradable. They affect the biodegradability of organic pollutants[3] and their toxicity may increase when they react with other components. In the case of water pollution, they are transported over long distances and seep into sediment or at surface level. Passing into the food chain by direct or indirect ingestion, they thus constitute a risk for the entire biosphere. Heavy metals can also be present in the atmosphere in various forms (as particles, droplets, in gaseous form, etc.) and are at the origin of the formation of acid rain and serious health problems.

#3

The study analyses two possible solutions to reduce to a minimum the penetration of heavy metals in the human body. It is possible to remove heavy metals from the soil, from sediment and from water by using vascular and hyperaccumulator plants[4] which absorb heavy metals and then decompose until the latter are totally eliminated. Various species absorb various heavy metals, so that the correct choice of plant is vital. The application of intercropping, by which more than one crop is grown at the same time in the same field (such as maize combined with chickpeas, for example), works in the same way, increasing the diversity and stability of fields by reducing the use of fertilisers.

The opinion of Géraud Guibert, the Chairman of LFE

The effects of heavy metals on our health remain insufficiently identified and taken into consideration. Solutions based on natural resources nevertheless exist to limit their presence, and more needs to be done to develop them.

[1] Carcinogenesis: the propensity of a substance to cause cancer.
[2] According to the authors' research, it appears that metal ions interact with DNA and nuclear proteins, thus causing damage to DNA.
[3] Organic pollutants: chemical substances deriving from human activity or from organic matter, which are normally absent or present in the environment in less intense natural concentrations. Depending on their specific characteristics, some are biodegradable (carbamates) and others are persistent (dioxins).
[4] Hyperaccumulator plants: this type of plant has a root system that allows for selective absorption of pollutants. This process is known as bioaccumulation.