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Don't mess with "Heavy Metals"

You have certainly heard about "**heavy metals**" especially over the past two decades when you were jumping up and down in a concert, but most likely also in other contexts. The term "heavy metals" has in fact been **increasingly (mis)used, usually with a negative connotation** in various scientific publications, regulations and even industry restricted substance lists. It was probably used to refer to substances that could endanger human health and the environment, seeming to suggest that *heavy metals* are a group of substances having in common some bad features. But this is not correct.

Let's take one step back.

The term "heavy metals" appeared for the first time in the English literature in 1936 in Bjerrum's Inorganic Chemistry (3rd Danish edition). Since then, over the years the term has been queried many times, but efforts to find a common definition have failed. According to a survey conducted in 2001, tens of definitions are currently in use¹ and none of them has been **included in the IUPAC Compendium of Chemical Terminology**², i.e. the gold standard in terminology for chemists.

The scientific community has never considered it worthwhile spending time to arrive at a common definition probably because deciding univocally which metals and metal compounds should be placed into a phantomatic "heavy metals" box appears to be a useless exercise!



¹ "Heavy Metals - A Meaningless Term?" (IUPAC Technical Report), by John H. Duffus, Director of the Edinburgh Center for Toxicology. 2001.

² A. D. McNaught and A. Wilkinson. Compendium of Chemical Terminology, IUPAC Recommendations 2nd ed., Blackwell Science, Oxford (1997).



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Actually, even if there was an agreement on what to consider “heavy” - for example by defining a threshold value for the density of the atomic mass, any attempt to associate “heaviness” to toxicity would be scientifically vain!

“There is a tendency, unsupported by the facts, to assume that all so-called “heavy metals” and their compounds have highly toxic or ecotoxic properties. This has no basis in chemical or toxicological data.” [...] “Thus, any assumption of underlying functional similarity in biological or toxicological properties is bound to be wrong”.

John H. Duffus, Director of the Edinburgh Center for Toxicology.

Why? Because the toxicity of a substance is not directly linked or proportional to its “weight”, however you define it. Additionally, metals can be chemically linked with many other elements, providing in nature a **myriad of metal compounds each one with unique characteristics and variegated toxicological properties**. Some might be safe and essential for life, others might be toxic to the environment. It simply does not make any sense from a toxicological perspective to put them into the same box.

So, should we stop talking about “heavy metals”? Yes, certainly! Avoiding to refer generically to *heavy metals* is wise and would help stop propagating the wrong myth and belief in today’s society that “heavy metals are dangerous substances”.

If, for whatever reason, you want to talk about a specific group of metals having in common a high molecular weight, it is strongly recommended to explicitly mention which metals or their specific compounds you are referring to.

“Eventually, one should continue to educate people to avoid the term “heavy metals”, especially in non-peer-reviewed regulations or governments’ research reports.”

O. Pourret (UniLaSalle, France), A. Hursthouse (University of the West of Scotland, UK)

In conclusion, **the only thing that “heavy metals” have in common is the molecular weight above a certain threshold - however you define it - and this has nothing to do with toxicity whatsoever!**

In the same way that you do not judge a book by its cover, **you should not draw hasty conclusions on the toxicity of a metal and its compounds by their weight**. So, from now on, if you cannot avoid using the term “heavy metals”, at least, use it to refer to wild concerts, without linking it to metals toxicity. And if you hear someone speaking about *heavy metals* why don’t you ask “which metals or metal compounds you exactly referring to?”.

Heavy metals can be good or bad, but do not mess with them!



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For more details and quirky facts about the nonsense use of the term “heavy metals”, you can read these interesting publications, from which I have been inspired:

- [“Heavy Metals - A Meaningless Term?”](#) (IUPAC Technical Report), by John H. Duffus, Director of the Edinburgh Center for Toxicology.
- [“It’s Time to Replace the Term “Heavy Metals” with “Potentially Toxic Elements” When Reporting Environmental Research”](#), by Olivier Pourret from UniLaSalle (France) and Andrew Hursthouse from the University of the West of Scotland (UK).

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About Eurometaux: Eurometaux is a trade association representing the collective European non-ferrous metals industry, including miners, smelters, refiners, fabricators and recyclers. The industry employs 500,000 people across over 900 facilities, with an annual turnover of €120bn

