

Peer Review

Review of: "Chelation Therapy for Rare Earth Element Toxicity: Current Evidence, Challenges, and Future Directions"

Manfred Sager¹

1. Bio Forschung Austria, Vienna, Austria

This is a comprehensive review about metabolism and biochemical effects on biota, focused on therapeutic measures for humans. As the author of reference 23, I can agree with all the text. However, there are no indications about concentrations and doses involved, such as ambient levels, no-effect levels, daily intakes, and hormesis. Particularly in the case of low-dose rare earth (REE) ingestions, defense reactions of the organism induce counteractions more than needed, and to positive effects, which has been termed as "hormesis". This has been the mechanism of REE additions to fertilizers and pig feeds to increase plant growth and weight gain. Maybe this is also the benefit of some P-mineralizers.

Indeed, the database about ambient levels in environmental items is scarce. Contrary to the statement in chapter 1.2, the solubility in water, the soil-to-plant transfer, and the uptake in the digestive tract are much lower than for the so-called heavy metals. The authors should be aware that REE concentrations in water range in the ng/l range and in food items in the µg/kg range. Maxima in food items are from seafood (non-fish), which is relevant for South-East Asia and China. Why do the authors not give data about this? The main uptake might be via dust. Pt/Pd catalysts emit REE from the carrier ceramics at every stop and go, more than Pt or Pd! Data about cosmetics are lacking also; there has been some concern about Al in cosmetics, but how about REE?

Chapter 1.3: there are regulatory restrictions in China: the critical average daily intake is 70 µg/kg.day for the sum of REE, or 4.2 mg per person (Dai et al.: Sci. Tot. Environm. 2022, 828, 154119; Zhao et al.: Mar. Poll., Bull 2022, 184, 114127). In China and Japan, soils and sediments have been screened for REE throughout.

Chapter 3: Metabolic actions of REE are easily explained by interactions with Fe, and of Ca with Eu – the text is a bit complicated. What is still lacking are interactions with fluoride, which is usually in excess over REE in body fluids. I could not find any paper about either, but complexation reactions have been known for decades.

From soil chemistry, it is known that REE have certain complexing with -OH and -COOH groups of humics, but never with -SH groups. Use of detoxifying agents carrying -SH groups is therefore nonsense and does not need to be considered. Try fluoride! Benefits of antioxidant supports seem promising.

Declarations

Potential competing interests: No potential competing interests to declare.