

¹ University of Hohenheim, Institute for Nutritional Science, Department for Nutritional Science, Germany, ² Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), ³

University of Hohenheim, Core Facility-Module 3: Analytical Chemistry Unit, ⁴ University of Hohenheim (former member)

Heavy metals in Zambian fish as potential hazard for

food safety and nutrition security

Nils Nölle¹, Sven Genschick², Klaus Schwadorf³, Holger Hrenn³, Sonja Brandner⁴, Hans Konrad Biesalski¹

Introduction

Background: Fish is an important source of micronutrients (*calcium*, *iron, zinc*), missing in the diet of poor Zambians, thus showing great potential to alleviate malnutrition

Challenge: Heavy metal pollution is a common problem in Zambia, but only little data on potential heavy metal contaminats in fish exists

Could consuming fish to fight malnutrition put consumers at risk?



Fig. 2 preparation of samples prior to analysis. Large and medium fresh fish were fileted and their flesh was cubed (a).

The flesh of large and medium processed fish was broken from the skeleton and their heads were removed as well (b). Small fresh (c) and processed (d) fish were left whole or chopped into small pieces.

Results

Methods

Fish were collected directly from Zambian water bodies, or major fish trading sites (**Fig. 1**)

Samples were prepared following local customs (**Fig. 2**)

Analyzed via inductively coupled plasma mass spectrometry (ICP/MS) for cadmium and lead or atomic absorption spectrometry (AAS) for

mercury

Results were compared to legal maximum levels (fresh weight basis): lead 0.3 mg/kg, mercury 0.5 mg/kg, cadmium 0.1 mg/kg



Fish samples (with scientific name and origin), that exceed the legal maximum levels of analyzed heavy metals are shown in **Fig. 3**

Large and medium fish: a sample of Mbubu contained 0.76 mg/kg of mercury (a), while a sample of Nsuku contained from 0.87 mg/kg mercury (b).

Small fish: a sample of Kapenta contained 0.25 mg/kg of cadmium (c), while another sample of Kapenta contained both 0.19 mg/kg cadmium, and 0.44 mg/kg of lead (d). Also a sample of *Inchunga* contained 0.104 mg/kg cadmium (e).



Fig. 1: Fish sampling sites in Zambia. Map adapted from (Ezilon Maps 2009)



Department of Nutritional Science (140a) Garbenstraße 30 BIO I Zi. 131 70599 Stuttgart +49 (0)711 459 23691 nils noelle@uni-hohenheim.de

19 212 13 14 15 18 17 18

Fig. 3 Fish samples with heavy metal contents above the respective legal maximum level. Samples are presented in a clockwise order. Mbubu (Mormyrus lacerda) (a), Nsuku (Serranchromis robustus) (b). Both samples collected at Lake Kariba. Kapenta (Limnothrissa miodon & Stolothrissa tanganicae) (c) & (d). Both samples collected in Kasama, reportedly coming from Lake Tanganyika. Inchunga (Barbus radiatus) (e). Sample collected in Mpika, reportedly coming from the Bangwuele swamps.

Conclusion

Apart from the presented samples no other fish were found to go beyond the

legal maximum levels of the analyzed heavy metals

- \Rightarrow Fish from Zambia, are generally safe for human consumption
- \Rightarrow Should be strongly considered in strategies against micronutrient

malnutrition

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