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# Bioconcentration of Ag, Cd, Co, Mn and Zn in the Mangrove Oyster (*Crassostrea gasar*) and Preliminary Human Health Risk Assessment: A Radiotracer Study

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**Abstract** Bioaccumulation kinetics of five dissolved metals were determined in the mangrove oyster *Crassostrea gasar*, using corresponding radiotracers ($^{54}$Mn, $^{57}$Co, $^{65}$Zn, $^{109}$Cd and $^{110m}$Ag). Additionally, their bioaccessibility to human consumers was estimated. Results indicated that over a 14-day exposure $^{54}$Mn and $^{57}$Co were linearly concentrated in oysters whereas $^{109}$Cd, $^{65}$Zn and $^{110m}$Ag were starting to saturate (steady-state not reached). Whole-body concentration factors at 14 days ($CF_{14d}$ in toto) ranged from 187 ± 65 to 629 ± 179 with the lowest bioconcentration capacity for Co and the highest for Ag. Depuration kinetics were best described by a double-exponential model with associated biological half-lives ranging from 26 days (Ag) to almost 8 months (Zn and Cd). Bioaccessible fraction of the studied elements was estimated using in vitro digestions, which suggested that oysters consumed seasoned with lemon enhanced the accessibility of Cd, Mn and Zn to human consumers, but not Ag and Co.

**Keywords** Metals · Bioaccumulation · Tropical African bivalve · Seafood safety

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The use of bivalves to assess trace metal contamination in aquatic environment is well described in the literature (e.g. Liu and Deng 2007; Birch et al. 2014). Among bivalves, oysters are often used as bioindicators; they are strong accumulators of both essential and non-essential metals and display strong retention capacities for some elements (Hédouin et al. 2010b). Their place in food webs makes their study of further interest, since their trace metals content is susceptible to be transferred to upper trophic levels, humans included, and they thereby provide valuable information for seafood safety assessment (Wang and Rainbow 2008; Metian et al. 2009a).

Biokinetic studies using non-destructive radiotracer techniques have proven to be a powerful tool to investigate the differences in the behavior of metal accumulation among species (e.g. Wang et al. 1996; Metian et al. 2008a; 2009b; Hédouin et al. 2010a), especially in determining uptake and depuration kinetic parameters. Additionally, the latter approach combined with in vitro digestion simulation has shown to provide crucial information for metal risk assessment to humans (e.g. Metian et al. 2009a).

However, so far little attention has been paid to metal bioaccumulation capacities of bivalves from the African Sub-Saharan region although substantial levels of metals have been measured in some species from this region (e.g. Otchere 2003; Obodai et al. 2011). Among these bivalves, the mangrove oyster *Crassostrea gasar* is widely distributed in the region and commonly consumed by coastal populations. Bodin et al. (2013) indicated that this species tended to accumulate metals efficiently compared to other molluscs from the region. However, to the best of our knowledge, no study has been conducted to characterize its bioaccumulation capacities.

The present study aimed at: (1) investigating the metal bioconcentration capacities of the mangrove oyster