Evaluation of dietary selenium and methylmercury interactions on growth, digestibility and retention in rainbow trout (Oncorhynchus mykiss)

Marius Bidon, Antony Jesu Prabhu Philip, Axelle Braun, Anne Surget, Frédéric Terrier, Jerome Roy, Zoyne Pedrero, Stéphanie Fontagné-Dicharry

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M. Bidon[1], A.J.P. Philip[2], A. Braun[1], A. Surget[1], F. Terrier[1], J. Roy[1], Z. Pedrero-Zayas[3], S. Fontagné-Dicharry[1]

[1]INRAE, Univ. Pau & Pays Adour, E2S UPPA, NUMEA, 64310 Saint-Pée-sur-Nivelle, France
[2]Feed and Nutrition group, Institute of Marine Research, Bergen 5817, Norway
[3]CNRS, Univ. Pau & Pays Adour, E2S UPPA, IPREM, 64000 Pau, France
E-mail: marius.bidon@inrae.fr

Summary

Tuna by-products appear to be an interesting supply for fishmeal production. Although tuna by-products contain high levels of selenium (Se), a micronutrient essential for growth and antioxidant protection, they also contain contaminants like mercury (Hg), a toxicant of concern for aquatic food chain. The present work aimed to study interactions between dietary Se and Hg on growth performance, Se and Hg apparent availability, retention and body composition in rainbow trout juveniles (*Oncorhynchus mykiss*). A 6-month feeding trial was carried out with diets supplemented with 0 or 2 mg Hg per kg supplied as methylmercury (MeHg) combined with 0 or 1.5 mg Se per kg supplied either as selenomethionine (oSe) or selenite (iSe) in six tuna-based diets (Hg and Se basal levels: 0.3 and 8.2 ppm, respectively) and six plant-based diets (Hg and Se basal levels: 0.3 and 0 ppm, respectively).

Growth was temporarily reduced after 3 weeks of feeding in fish fed with Se-rich tuna-based diets in relation with decreased feed intake but increased feed efficiency and reduced final survival rates. Within fish fed plant-based diets, growth was temporarily reduced with dietary MeHg supplementation in absence of Se supplementation. At the end of the feeding trial, dietary oSe supplementation improved fish growth compared to iSe supplementation within groups fed tuna-based diets. Dietary oSe supplementation increased body Se content to a higher extent than iSe in both tuna- and plant-based groups. Though body Se levels were higher in fish fed tuna-based diets than in fish fed plant-based diets as expected, the body Hg levels were reduced, associated with decreased Hg digestibility. Se digestibility was also reduced in tuna-based diets as well as body Se retention. Within tuna-based groups, iSe intake temporarily reduced Hg body contents in fish fed MeHg whereas MeHg intake decreased Se retention. However, at the end of the feeding trial, MeHg intake increased Se digestibility, retention and body Se concentration in plant-based groups. Present results highlight novel interactions between dietary Hg and Se depending on the Se form and levels that deserve further investigation for a better understanding of the Hg and Se metabolic pathways in the different tissues of fish.