



H.F.R.I.
Hellenic Foundation for
Research & Innovation

Description of the funded research project
2nd Call for H.F.R.I. Research Projects
to Support Post-Doctoral Researchers

**Title of the research project:
Advanced Metallomics Analysis in Fish for Improved
Assessment of Human Risk and Environmental Quality**

**Principal Investigator:
Dr Ioanna Kalantzi**

**Reader-friendly title:
MetaFRisks**

**Scientific Area:
Agricultural Sciences–Food Science & Technology – Food chemistry**

**Institution and Country:
Institute of Oceanography, Hellenic Centre of Marine Research, Greece**

**Host Institution:
Institute of Oceanography, Hellenic Centre of Marine Research**

**Collaborating Institution(s):
Chemistry Department, University of Crete**

**Project webpage
(if applicable):
<http://metafrisks.hcmr.gr/>**

Budget: 169,775 €

Duration: 3 years (2020-2023)



**Principal Investigator:
Dr Ioanna Kalantzi**

Scientific Advisory Board



**Dr Spiros A.
Pergantis**

**Dr Manolis
Tsapakis**

**Dr Stylianos
Somarakis**



**Dr Lambros
E. Kokokiris**

**Dr Vassilia J.
Sinanoglou**

**Dr Smaragdi
Antonopoulou**

Research Project Synopsis

Fish is an important part of the human diet as it provides many essential nutrients. However, these health benefits may be compromised by the presence of toxic metals and metalloids, which can have harmful effects on humans if present at elevated concentrations. Until today, only the total concentration of some toxic elements is regulated and there is limited specific legislation on metal species levels. It has become apparent, however, that this is no longer a valid approach as it has been shown that different species of the same metal (e.g., As, Hg) may exhibit vastly different chemical and/or toxicological properties. In addition, biological, environmental and seasonal factors may influence the presence and formation of different forms of metal species in fish.

MetaFRisks project aims (i) to investigate the metal speciation in Greek fisheries (wild and farmed fish) and (ii) to find the biological (fish species type, size, protein/lipid content) and environmental (location, habitat, season, temperature and substrata type) factors that may affect metal species transformations, in order (iii) to make more reliable assessments of human health risks and benefits from fish consumption. To the best of our knowledge MetaFRisks project will be the first to determine such an extensive range of metal species in wild and farmed fish from the Greek sea area, and to evaluate their human health risks and benefits.

Project originality

Given that fish is one of the most important food resources for human beings, it is fundamental to investigate the metal species content in consumed fish in order to understand true toxicity and eventual effects on the consumer. Furthermore, our current understanding of metal speciation in fish and the biological and environmental factors that may affect metal species transformations, and their connection with food safety and nutritional value remains relatively poor. To our knowledge, **very limited research has been published on the human risks and benefits from the individual metal species present in seafood products in Greece.** Considering the prevailing environmental conditions expected in tomorrow's ocean and the contamination of the marine environment, investigating the mechanisms of metal species transformations in the environment would be particularly important. Until recently, only the total concentration of some toxic elements is regulated and there is limited specific legislation for metal species levels. The MetaFRisks project focuses on providing critical information to enhance the human risk and benefit assessment for the consumption of fish and to provide a more reliable assessment of the health risk and nutritional value associated with fish consumption. The outcome of this project will provide risk assessors with urgently needed information to realistically evaluate the risk and benefit for humans from fish consumption.

Expected results & Research Project Impact

The MetaFRisks project is expected to (1) optimize and validate robust analytical techniques for the qualification and quantification of different metal species in edible fish tissues, sediment, and seawater; (2) evaluate the present status of metal forms in commonly consumed wild and farmed fish in Greece; (3) assess the biological, environmental and seasonal factors affecting the presence and formation of different metal species in fish; and (4) evaluate the risks and benefits of fish consumption in Greece.

Ultimately, the data generated from the MetaFRisks project could be used by researchers and other stakeholders in the food sector and in the environmental sciences. For instance, they could be used (1) by food chemists to characterise unknown metal species found in foods thus allowing for the assessment of health effects associated with their consumption; (2) by environmental scientists to gain information that will allow for the refinement of existing models of metal cycling in the environment; (3) by food authorities such as Hellenic Food Authority and EFSA to establish new regulations on foodstuffs. Continued research in the area of metal speciation is expected to provide societal benefits, particularly with respect to the improved understanding of the toxicological risks or health benefits that are associated with the chemical forms of metals and metalloids present in foods and dietary supplements, and, as a consequence, benefiting public health and safety. Also, as the optimized/ validated analytical methods can be used to study metal species' stability, fate, impact, and mobility in the various compartments of ecosystems, it is expected that improved management of ecosystems will be possible. In addition, a better understanding of the function of metal species in environmental and in living systems could potentially provide a sound scientific basis for improving existing legislation with respect to the chemical forms of an element (speciation).

The importance of this funding

Through the MetaFRisks project, I will have the opportunity to acquire expertise in advanced analytical methods for the speciation analysis of various metals and metalloids, the effect of biological, environmental and seasonal factors on the presence and formation of different metal species in fish, and the assessment of seafood safety for humans. This new expertise will complement my existing expertise in metal distributions in fish tissues and will help me advance scientifically. In addition to technological and scientific aspects, I will gain experience in project management and budget control and develop leadership skills which are highly appreciated in academia and research institutes. This knowledge and skill set will allow me to achieve professional maturity and build up a well-established research team in this exciting research area thus expand my existing national and international research network and be strong candidate for outside funding. In addition, several complementary skills will be further nurtured within this project, such as student supervision, team coordination, presentation skills, proposal writing, etc. These skills are essential for my career development and for broadening the impact of my research.



H.F.R.I.
Hellenic Foundation for
Research & Innovation

COMMUNICATION

185 Syggrou Ave. & 2 Sardeon St. 2
171 21, N. Smyrni, Greece
+30 210 64 12 410, 420
communication@elidek.gr
www.elidek.gr