Acadamh Ríoga na hÉireann
Royal Irish Academy

Charlemont grant report

Recipient name:	Dr Konstantinos Panagiotidis
Discipline and subject area:	Sciences; Biology
Amount and year awarded:	€2,330 in 2022
Title of project:	Metabolomic analysis of nanocoronas and their impact in ecotoxicity

Summary of findings:

Mechanistically several aspects regarding toxicity of nanoparticles remain to be discovered and a critical parameter for the mediated toxic effects of nanoparticles lies in the interactions with biological systems occurring on the surface of nanoparticles, via the formation of coronas. During my visit to the Helmholtz Centre for Environmental Research in Leipzig, I used the available high sensitivity and resolution mass spectrometers to analyze the molecular composition of daphniid conditioned media with a focus on metabolites secreted. This high-throughput approach generated a large amount of targets that could potentially be responsible for the alteration of nanoparticle toxicity through the formation of coronas. A preliminary analysis has validated the presence of a plethora of molecules of interest. This step was critical as it provided valuable insight and will allow me to further investigate the mechanistic impact of metabolite coronas on the toxicity of silver nanoparticles. Specifically, coming back to Dublin, I worked with this media and discovered that it affects the toxicity of silver nano ink, thereby, proving a connection of this eco-corona. Additionally, while in Leipzig, I investigated the impact of amine- and carboxy functionalized microplastics on daphniid physiology with mass spectrometry and analysed samples I prepared and brought with me from Dublin.

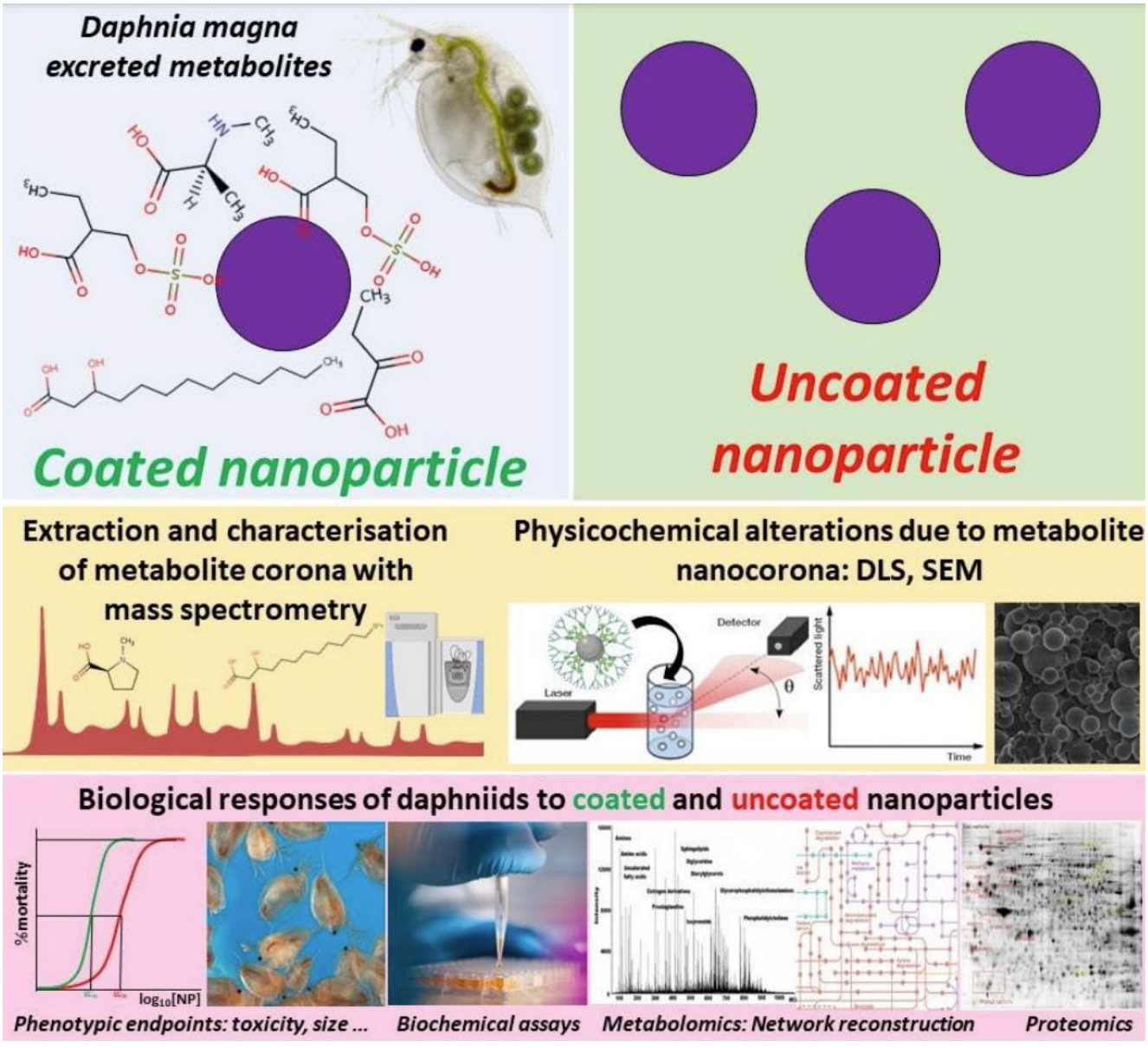
Plans for continuing collaboration:

For a young researcher like myself the opportunity to establish international connections that can evolve into future collaborations is a critical step for its career. This visit allowed me to network with several young and aspiring researchers as well as established experts that are pioneers in the field of molecular ecotoxicology and specifically Dr Altenburger and Dr Krauss. The established collaborations also with other groups will be ongoing as the data generated during my visit will be utilized in upcoming research publications involving both institutions with the intent to maintain it for future projects. Finally, I envisage to apply for another fellowship via German funding agents and return to Leipzig for one or two years and work in the institute.

Published work and publication plans:

The data generated during my visit in the Helmholtz Institute for Environmental Research in Leipzig will be used in two research articles with the collaborative effort of both institutions. One article focuses on the impact of metabolite coronas in ecotoxicity.

This will capture the main course of my experiments in Leipzig. The second article investigates the impact of amine and carboxyl functionalised microplastics on the physiology of daphniids. Both articles are expected to be submitted this year.



Dissemination and plans for future dissemination:

There are currently plans to submit posters related to this project. Specifically, I will participate in the 2023 annual SETAC conference which will take place here in Dublin. I intend to present my eco-corona findings as this conference in very relevant to my research. Furthermore, I expect my colleagues from Leipzig also to participate in this conference and this will be a good chance to network more. In relation to the micro plastic work, I have connected with another institution in Germany; the Universität Bayreuth, which are leading the Limnoplast consortium. I have prepared drafts of my work to participate in their annual meeting in Paris in March 2023.

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Collaborations and planned collaborations:

During my research visit I had the opportunity to network. This is a great attribute at the stage of my career as my current post will come to an end in 2023. I intend to start mobilising my network towards academic institutions and I believe that the connections I made in Germany will be helpful for future applications in positions advertised.

I was awarded an Irish Research Council two year fellowship for the project: Nanoparticle metabolite coronas: A neglected feature with important contribution to toxicity in September 2021. The award amount was €96,417.

Outreach and engagement activities:

Communicating research is an important aspect of academia. Dublin City University has several outreach activities for both students and perspective students and society. During the orientation week of the fresher's years this year, I had the chance to discuss with first year students the research outputs generated highlighting the importance of travelling and communicating with other institutions in academia. Additionally, the Open Days of the University is a great opportunity where the university demonstrates it findings to perspective students. I find it fascinating to talk to young scholars interested in science in these occasions. Finally, as part of the Biological Research Society of the School of Biotechnology, I participate in their annual Research Day events and will present my research project based on the work that I performed in Leipzig.