Smart bioevaluation of chemicals and biopolymers using *C. elegans*.

Amanda Muñoz-Juan, Miquel Nuez-Martinez, Soledad Roig-Sanchez, Núria Benseny-Cases, Clara Viñas, Anna Laromaine

Institut de Ciència de Materials de Barcelona, ICMAB-CSIC, Campus Universitat Autònoma de Barcelona, Bellaterra, Spain
amunoz@icmab.es

Introduction

Caenorhabditis elegans (*C. elegans*) is a 1-mm free-living soil nematode with easy experimental manipulation, short life cycle, transparency, and highly conserved genome, which makes it a powerful and informative in vivo model[1]. Here we performed the initial evaluation of the potential use of bacterial nanocellulose fibers[2] (BNCf) as a dietary fiber and the biointeraction of inorganic chemicals[3] designed for different biomedical applications.

Methodology

Regarding BNCf, we studied its toxicity after 24h of exposure and its effects in development, by measuring the final worm's size; genetic expression profile, by RNAseq; and lipid levels by Oil-red-O or bodipy staining. The chemical's toxicity profile was analyzed after 24h of exposure at L4 *C. elegans* stage, obtaining the LD50 by counting the percentage of alive worms. Worms' eggs were exposed 24h and molecules inside them were characterized by different physico-chemical techniques.

Results

BNCf was not reducing the survival rate of worms but BNCf-treated worms wereslightly shorter than controls and had a reduction of lipid levels. Moreover, a significant difference in the genetic expression profile was observed, being the immunological genes activated and mitochondrial genes downregulated. In the case of chemicals, the LD50 was lower than the IC50 obtained in in vitro experiments, and compounds were located in embryos through different characterization techniques.

Conclusion

In both cases, the importance of testing novel compounds in simple models has been proved before going one step further. For BNCf, the *C. elegans* model replicated some of the already observed effects in complex animals, such as the decrease of lipid levels but it also revealed new insights in BNCf's biointeraction such as the upregulation of the immune response genes. In the chemicals' bioevaluation, a different effect in the entire organism in comparison with in vitro studies was observed.

References

[1] Gonzalez-Moragas, Roig, A. and Laromaine, *A. Adv. Colloid Interface Sci*,219(2015),10-26.
[2] Mira-Cuenca, C. *et al*. *ACS Appy. Polym*, 3 (2021), 4959-4965.
[3] Nuez-Martinez, N. *et al*. *Cancers,* 13 (2021), 6367.

Figures

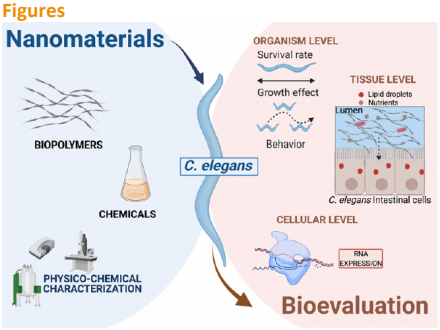

Figure 1.-Graphical abstract of the project.