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# Metabolomic and proteomic investigations of impacts of titanium dioxide nanoparticles on *Escherichia coli* [P53]

Gaspard Huber <sup>\*</sup> <sup>1</sup>, Mariane Planchon <sup>1</sup>, Olivier Spalla <sup>1</sup>, Thibaut Leger <sup>2</sup>,  
Roselyne Ferrari <sup>†</sup> <sup>3</sup>

<sup>1</sup> Nanosciences et Innovation pour les Matériaux, la Biomédecine et l'Énergie (NIMBE) – Commissariat à l'énergie atomique et aux énergies alternatives, Université Paris-Saclay, Centre National de la Recherche Scientifique – NIMBE, CEA, CNRS, Université Paris-Saclay, CEA Saclay 91190 Gif sur Yvette, France

<sup>2</sup> Institut Jacques Monod – CNRS : UMR7592, Université Paris Diderot - Paris 7 : UMR7592 – Plateforme Protéomique Structurale et Fonctionnelle Institut Jacques Monod - CNRS et Université Paris-Diderot Bâtiment Buffon - AileB -piece 657B- 6ème étage 15, rue Hélène Brion 75205 PARIS cedex 13, France

<sup>3</sup> Laboratoire Interdisciplinaire des Energies de Demain (LIED) – Université Paris Diderot - Paris 7 : UMR8236, CNRS : UMR8236, 11 rue Alice Domon et Léonie Duquet Bât. Condorcet, case postale 7040, 75205 Paris cedex 13, France

The ecotoxicological impact of manufactured titanium oxide (TiO<sub>2</sub>) on *Escherichia coli* in a natural environmental medium, Seine River water, has been established through colony-forming unit technique and is closely related to the presence of little aggregates. Proteomic analyses by mass spectrometry and metabolomic analyses by NMR have been performed on water extracts. The influence of TiO<sub>2</sub> concentration and ultraviolet irradiation on metabolomic profiles has been investigated. Processing metabolomics through Principal Components Analysis, together with an original method for processing proteomics data, revealed the up-regulation of proteins and the increase of fraction of metabolites related to energy and growth metabolism while other proteins are down-regulated and the fraction of other metabolites decreases. Moreover, the ATP content gradually rises in relation with the nano-TiO<sub>2</sub> concentration in the medium, indicating a dramatic release of ATP by the damaged cells. These apparently contradictory results accredit the thesis of a heterogeneity of the bacterial population. This heterogeneity is also confirmed by Scanning Electron Microscopy images which show that while some bacteria are fully covered by nano-TiO<sub>2</sub>, the major part of the bacterial population remains free from nanoparticles, resulting in a difference of proteome and metabolome. The poster will particularly focus on the methodology used for metabolomics.

**Mots-Clés :** metabolomics, proteomics, TiO<sub>2</sub> Nanoparticles, *Escherichia coli*, nuclear magnetic resonance, mass spectrometry

Programme

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<sup>\*</sup>Intervenant

<sup>†</sup> Auteur correspondant: [roselyne.ferrari@gmail.com](mailto:roselyne.ferrari@gmail.com)