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

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The ecotoxicological impact of manufactured titanium oxide (TiO₂) 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 TiO₂ 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-TiO₂ 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-TiO₂, 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, TiO₂ Nanoparticles, *Escherichia coli*, nuclear magnetic resonance, mass spectrometry

[Programme](#)

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