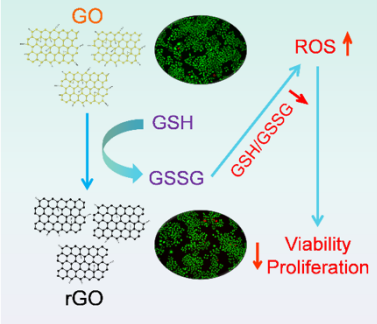
MULTIDIM : an International France/Japan joint research project - 5 years from 2020

The international research project MULTIDIM (for “Multifunctional Two-Dimensional Materials for Innovative Biomedicine”), supported by the CNRS, is focused on the collaboration between the team of Alberto Bianco, CNRS Research Director in the Immunology , Immunopathology and Therapeutic Chemistry group (CNRS and Strasbourg University), expert in biomedical applications of multifunctional nanomaterials, and Prof. Yuta Nishina's group at Okayama University, specializing in nanocarbon materials.

New types of organic and inorganic nanomaterials are currently being intensively investigated for applications in various biomedical fields such as drug delivery, imaging and diagnostics. Within these classes of materials, two-dimensional ones are particularly promising systems because of several preponderant advantages such as great versatility in their chemical composition as well as several possibilities of organic functionalizations. These characteristics are major assets to modulate their biocompatibility, their pharmacokinetics and their tissue specificity. In addition, these two-dimensional materials properties can bring substantial development in the fields of medical imaging and theranostics, a method based on the combination of specific targeted therapy and diagnosis.



Glutathion (GSH) is oxidized to GSSG by graphene oxide (GO), leading to the formation of reduced GO. Depletion of GSH would affect the intracellular reducer / oxidant balance, generating an increase in the ROS content, sequentially inhibiting cell viability and proliferation.

In this context, the MULTIDIM project is a fundamental research program which aims at the development of two-dimensional materials for applications in periodontology, as well as for fighting cancer and autoimmune and inflammatory diseases.

Two papers are already issued from MULTIDIM: one in Nanoscale Advances (DOI:10.1039 / d0na00561d). It reports on the development of controlled and mild functionalization reactions of graphene oxide.

The second study (ACS Applied Materials and Interfaces, DOI:10.1021/acsami.0c17523) demonstrated the reaction between graphene oxide and glutathion which regulates reactive oxygen species in tissues. The discovery of this mechanism of intracellular interaction helps to understand the toxicity origins of this material.