Insight sin seleno-proteins interactions with metal complexes to develop new bioinorganic drugs. Studies of model systems with high toxic heavy metals

Keywords: Seleno-proteinns, Structure-Activity Relationship, Drug design, Bioinorganic drugs, Heavy metals

Seleno-proteins constitute validated bio-inorganic protein target in the human genome. Their role in the development of human diseases is not fully known, but there is evidence that they may be targets for new drugs. They can also be targets for heavy metals with high toxicity. The goal is to join a PhD student in a multidisciplinary network to investigate the structure activity relationships (SAR) to identify new bioinorganic drugs capable of acting on these targets through the use of physical-chemical identification methodologies such as: circular dichroism, fluorescence spectroscopy, mass spectrometry, nuclear magnetic resonance (NMR). Furthermore, by same methodologies, interactions of heavy metal ions with proteins will be studied using model systems. Molecules selected among those that interact significantly with the seleno-proteins will be encapsulated in nanoparticles to induce their delivery towards cancer cells. The goals of the research work will be:

1 Insight on molecular basis and SAR in seleno-proteins;

2 Design new bioactive molecules for cancer therapy though rational design and screening *in silico*;

3 Chemical synthesis and test *in vitro* of new bioactive molecules. The starting point of the research will be the design of new drugs based on gold complexes which interact with *soft* Lewis bases such as sulphur or selenium.

4. Physical-Chemical interactions with heavy metal ions for environmental impact

5. Complexes with pharmacological activity will be encapsulated in nanoparticles to improve cellular penetration and to vehicle to cancer cells *target*.

The interdisciplinary project will involve an join network with other scientific expertises of the Department of Pharmacy.

- The project provides for the opportunity to spend periods of training abroad at the University of Pau et des Pays de l'Adour (France) seeing that an Erasmus + agreement is already in place with our University for research activities in favor of PhD and master's degrees students. In addition, the PhD may apply for a grant (Vinci cap II) to obtain co-financing joint projects and co-protection Italy / France through the UIF (Italian-French University).

- Moreover economic resources will be available from the joint project of pharmacy department with IC-CNR e CNRS (France): "*The Bioinorganic Drugs joint laboratory: a multidisciplinary platform promoting new molecular target for drug discovery*".