Exploring influence of inorganic cell microenvironment on NO signalling deregulation in age-related disorders. From molecular mechanistic insight in model systems to new therapeutic targets.

Our life expectancy is increasing and age-related diseases such as neurodegenerative, cardiovascular, metabolic or autoimmunological conditions are becoming a huge challenge for healthcare systems. Aging research has experienced an unprecedented advance over recent years. Nevertheless, the fundamental chemical processes responsible for the disturbance of physiological aging leading to the induction and development of age-related diseases are still unknown. Understanding these mechanisms at the molecular, cellular and systemic levels and identifying their risk factors are essential for their effective prevention and treatment. There is no doubt that dysregulation of cell signaling processes plays a key role in development of age-related disorders. With this in mind, particular attention is paid to redox signaling pathways, in which small inorganic molecules such as nitric oxide (NO) or hydrogen peroxide (H_2O_2) are involved. This project is about understanding the mechanisms of reactions that may critically affect the cellular nitric oxide signaling pathways observed in age-related disorders. Determination of the effect of changes in the cellular **inorganic microenvironment** on (i) deregulation of redox cycles in non-enzymatic nitric oxide generation, (ii) deregulation of nitric oxide transport via changes in small peptide and protein thiols nitrozation and denitrozation processes, (iii) deregulation of metal active centre nitrozylation processes for enzymes and modulators involved in nitric oxide signalling pathways is of great importance. This project may help in identifying new therapeutic targets for the prevention or treatment of age-related diseases. Also, due to the universal character of NO signaling processes, the results obtained in this project will contribute to a better understanding of the regulation/dysregulation of signaling processes at the molecular level not only in humans but also in microorganisms, plants and animals.