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The impact of superoxide-peroxide hydrogen imbalance on cellular dysfunction, senescence and on regenerative therapies

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The cellular control of superoxide anion (O2-•) and hydrogen peroxide (H_2O_2) concentrations is considered crucial to the cell because at low concentrations ROS can function as intracellular signaling molecules related to homeostatic regulation, whilst at high levels they can cause cellular dysfunction and senescence. To control ROS levels at physiological acceptable concentrations cells have an antioxidant enzymatic system that includes Superoxide Dismutases (SOD) enzymes that dismutate O2-• on H_2O_2 and Glutathione Peroxidase (GPX) and Catalase (CAT) enzymes that catalyse H_2O_2 in H_2O. There are three SOD isoforms, including a SOD Manganese Dependent (MnSOD/SOD2) that acts into mitochondria, a cellular compartment where there is a continuous production of O2-• by the electron transport chain. Alterations in this antioxidant reaction equation can trigger oxidative stress that is related to the risk of several chronical diseases. However, is difficult to study the impact of O2-• -H_2O_2 cellular imbalance I human cells due the influence of a large number of intervenient variables. For this reason, or research group established an in vitro experimental model with adult differentiated and stem cells that present different genotypes of a SOD2 Single Nucleotide Polymorphism (SNP) located at codon 16 (rs4880). The homozygous genotypes present different SOD2 efficiency, causing an increase in O2-• levels (VV) or an increase of H_2O_2 (AA). This genetic imbalance has been epidemiologically associated with risk of cancers (AA) or cardiometabolic diseases (VV). The results obtained suggest O2-• - H_2O_2 imbalance is involved in several pharmacogenetic, toxicogenetic and nutrigenetic responses of cell. The discussion of these results as well as the potential impact on clinical and regenerative therapies will be discussed.

Biography

Ivana Beatrice Mânica da Cruz is a Geneticist and has completed his Ph.D. at the age of 32 years from Rio Grande do Sul Federal University. Currently, she is an Associate Professor and Head of the Biogenomics Laboratory Federal University of Santa Maria, Brazil. She developed an innovative protocol that associates population epidemiologic genetics investigations and in vitro studies relevant to stem cell therapies. She has published more than 60 papers in reputed journals and has been serving as areviewer board member of repute.

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