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Superoxide-hydrogen peroxide imbalance: Potential risk and its influence on therapeutic response of chronic morbidities prevalent in elderly people

Ivana Beatrice Mânica da Cruz
Federal University of Santa Maria, Brazil

Statement of the Problem: Aging is a complex event where mitochondrial dysfunction has been in the spotlight for a long time. Since, prior evidences suggested that mitochondrial dysfunctions are related to oxidative-inflammatory and genotoxic processes, our research team has dedicated special efforts to understand the role of a bidirectional imbalance related to superoxide anion (SA) and hydrogen peroxide (SA-HP) on aging modulation and age-associated chronic non-transmissible diseases (CNTDs).

Methodology & Theoretical Orientation: Here, we reviewed 294 studies (16 from our group) English published and PubMed-Medline indexed involving a bilateral SA-HP imbalance triggered by a human single nucleotide polymorphism (rs4880 SNP) found in superoxide dismutase manganese-dependent gene (SOD2), which produces an enzyme acting inside of mitochondria (Val16Ala-SOD2).

Findings: In biological terms, SA is constantly produced by mitochondrial respiratory chain. Therefore, SOD2 is considered first line of antioxidant enzyme that dismutates SA to HP. The SOD2-SNP is located at mitochondrial sequence target that triggers SOD2-inactive cytoplasmic protein into mitochondria. A-allele produces an alpha-helix SOD2 protein that is more efficient to into mitochondria, whereas V-allele produces a beta-sheet SOD2 protein that is partially arrested in mitochondrial membranes. 132 studies analyzed association between A-allele and several cancer types, considering that A-allele increases SA-dismutation producing an excess of HP levels. HP leaves from mitochondria to cytoplasm producing hydroxyl radical (HR) that is highly mutagenic increasing cancer-susceptibility. Main risk associated to AA-genotype is prostate cancer. V-allele presents lower SOD2-efficient and SA excess react with nitric oxide (NO) triggering lipoperoxidation. Therefore VV-genotype has been associated with different metabolic diseases, such as hypercholesterolemia, its response to rosuvastatin, and chronic inflammation.

Conclusion & Significance: SA-HP imbalance seems to have a critical role on elderly-prevalent CNTDs and could be considered an emergent geriatric focus related to prevention and control of CNTDs.

Biography

Ivana Beatrice Mânica da Cruz has her expertise in genetic and environmental factors that could act on human aging modulation and risk of some chronic diseases prevalent in the elderly people. She is Biologist and has MSc and PhD degree in Genetics and Molecular Biology. Currently she is working as Associate Professor in Federal University of Santa Maria (UFSM, Brazil) where coordinates an MSc course of Gerontology. Moreover, she is Adviser of Pharmacological graduate program. Her research studies involve specially two lines projects that could be considered relevant in gerontology and geriatrics areas: Aging biology studies related to genetic and pharmacological SA-HP imbalance with approach from epidemiological investigation to cell culture *in vitro* analysis; and Pharmacogenomic and nutrigenomic studies associated to diseases prevalent in elderly people. These studies are specially concentrated about the effects of Amazon fruits on oxidative-inflammatory modulation aging-associated.

ibmcruz@hotmail.com

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