Oxidative stress parameters in serum of Hashimoto's thyroiditis patients

T.M. Vicchio[1], R. Certo[1], D. Caccamo[2], G. Certo[3], A. Speciale[3], F. Centorrino[3], A. Saija[3], S. Gangemi[4],R.M. Ruggeri[1], M. Cristani[3]

[1]Dept. of Clinical-Experimental Medicine and Pharmacology, Division of Endocrinology, University of Messina, Messina, Italy
[2]Dept. of Biomedical Sciences and Morpho-Functional Imaging, University of Messina, Messina, Italy
[3]Dept. of Pharmaceutical Sciences and Health Products (SCIFAR), University of Messina, Messina, Italy
[4]Dept. of Clinical and Experimental Medicine, University of Messina, Messina, Italy

Oxidative stress occurs as a result of the imbalance between the endogenous production of free reactive oxygen species (ROS) and/or the reduction of antioxidant defense mechanisms. Also, there is growing evidence supporting the role of ROS in the pathogenesis of thyroid disorders as well as of several autoimmune disorders. Moreover, compounds formed by the transformation of proteins, as advanced glycation end products (AGEs), are considered as markers of oxidative stress in several diseases. The aim of our study was to investigate in patients with Hashimoto's thyroiditis (HT), a common organ-specific autoimmune disorder, the changes in oxidative balance by means of routine specific serum tests, such as d-ROMs (derived Reactive Oxygen Metabolites) test and BAP (Biological Antioxidant Potential) test, and to investigate the role of AGEs as new markers of oxidative stress in this disease.

In the study we included 70 HT patients and 70 healthy donors as controls. Serum total oxidant capacity was determined by performing the d-ROMs test, whose chemical principle is based on the ability of a biological sample to oxidize N,Ndiethylparaphenylenediamine (results expressed as Carratelli Units; 1 U. CARR = 0.8 mg/L H_2O_2) the BAP test, which measures the ability of a serum sample to reduce iron from the ferric to the ferrous ionic form (results expressed as µmol/L of Vit C used as an iron–reducing reference*)*. These tests were performed using the Free Radical Electing Evaluator (FREE, Diacron, Grosseto, Italy) photometric system. Serum levels of AGEs were measured by spectrofluorimetric method. Briefly, serum was diluted 1:50 with phosphate-buffered saline (PBS; pH 7.4), and fluorescence intensity was recorded at maximum emission (~ 440 nm) upon excitation at 350 nm and expressed in arbitrary units (AU). The serum concentration of AGEs was normalized to the total protein amount determined by the Bradford assay and expressed in AU for protein gram.

Mann Whitney test was applied in order to assess any significant differences between cases (HT) and controls. $P<0.050$ two sides was considered to be statistically significant. In our cohort, d-ROMs were significantly higher in HT (mean value 338.66 U CARR, range 157.55-534.84), than in controls (267.34 U CARR, range 78.92-429.11; $p = 0.00002$), while BAP was significantly lower in HT patients (mean value 2493.76 µmol/L, range 114.00-3970.10), than in controls (mean 3380.31 µmol/L, range 1841.00-6262.40; $p<0.0001$). Moreover, AGE levels were significantly higher in patients (226.887 AU/g prot, range 29.86 - 487.09) than in controls (189.636AU/g prot, range 55.35-364.63) ($p = 0.015$).

Our study showed that oxidative/antioxidative balance shifted towards the oxidative status in HT, suggesting that oxidative stress may represent a key event in the pathophysiology of HT. Moreover, we first report data on a possible significant involvement of AGEs in HT. Our data may contribute to a better definition of the redox homoeostasis dysregulation in HT and suggest that antioxidants may be considered a support therapy for this disease.