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Solvay Colloquium

“Neurovascular Coupling: a Fine Tuning Between Neuronal Activity and Oxidative Stress in Brain”

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Abstract



Oxidative stress damages are important causative factors in several human pathologies (DNA alteration, aging, several cancers, AIDS, Parkinson and Alzheimer diseases, etc.). Yet, oxidative stress is also used positively by living organisms to manage the size and shape of organs in aerobic complex organisms via control of cell population growth by apoptosis. Oxidative stress is also central to macrophage functions in preventing bacterial infection of organisms. All these important issues are well known by physicians and biologists but only through long and middle terms results investigated on cells, tissues and organisms metabolites and proteins expression. However, investigations of the primary effect of oxidative stress machinery remained for long impossible because of the lack of analytical methods. Using platinized carbon fiber ultramicroelectrodes positioned in the “artificial synapse” configuration we have been able to establish that the so-called “oxidative stress cellular bursts” consist into the release of a cocktail composed of a few femtomoles of hydrogen peroxide, nitric oxide, peroxy nitrite and nitrite ions. This complexity was unsuspected by biologists and physicians who were simply referring to ROS, viz., “Reactive Oxygen Species”. The same methodology allows also a precise kinetic and analytical characterization of the nature of functional hyperemia, viz., of the fine tuning mechanism linking neuronal activity to the local blood flux supply in the brain. This process, which is precisely the one giving rise to nmr or PET-scan imaging of the brain activity, was investigated on stellate neurons within perfused rat cerebellum slices to establish for the first time the validity of a very old hypothesis, viz., that when active a single neuron release a timely and local of an important flux of NO^o which provokes an increase of blood flow in capillaries.

Tuesday 16 December 2008 at 16h00

COFFEE AND TEA WILL BE SERVED AT 15H45 IN FRONT OF THE SOLVAY ROOM

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