

**PROJECT CNCSIS PNII-ID1138/2009**

**COMPLEX MECHANISMS OF CALCIUM CELLULAR SIGNALLING UNDER  
NORMAL OR OXIDATIVE STRESS CONDITIONS - THE ROLE IN  
PROLIFERATION, APOPTOSIS AND IN EXCITATION/MUSCLE CONTRACTION  
COUPLING**

This project proposes modern approaches of experimental investigation and theoretical modelling of the complex mechanisms underlying cell calcium signalling, as well as the interaction of some pharmacological agents with calcium-dependent cellular processes, under normal and oxidative stress conditions. Measurements of the intracellular concentration of calcium ions, redox-active iron ions, free radicals and mitochondrial membrane voltage will be performed on human Jurkat T-lymphoblasts, in order to characterize the calcium signals produced by cell stimulation, under normal or oxidative stress conditions, in the presence or absence of a natural polyphenolic compound. These measurements will be correlated with determinations of clonogenic cell survival, proliferation, cell cycle phase distribution, viability, apoptosis and necrosis. At the moment, the correlation between calcium signals, proliferation and apoptosis is not well known. We also intend to investigate the properties of delayed luminescence of cell suspensions under the same conditions and to determine whether there is a correlation between the features of photon emission in delayed luminescence and calcium signals-proliferation-viability-apoptosis. These subjects have not been investigated so far. We will develop an advanced method of analyzing calcium signals by elaborating a complex theoretic algorithm, which will be optimized to accurately reproduce various experimental data available in the literature or obtained in this project, characteristic for both excitable cells (muscle cells from myocardium or skeletal muscle) and non-excitable cells (*Xenopus laevis* oocytes, cancerous Jurkat or HeLa cells). The results of our experimental and theoretical investigations will contribute to a better understanding of the modes of cellular organization in the complex network of calcium signalling, and of their importance in various physiological processes under the action of external physico-chemical factors.