**Enhancement of cytochrome c dependent lipid peroxidation in the presence of phosphatidic acid as a mechanism for triggering apo- and ferroptotic molecular processes.**

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*Discovered in the 1930s by A.G. Gurvich et al., the mitogenetic effect, which was first shown in the model of onion seedlings and consisted in an increase in their growth rate at a close location, laid the foundation for a number of very large discoveries in their field. The first of them can be considered the work of his graduate student, and then academician G.M. Frank, who managed to register the emission spectrum of the mitogenetic effect with a maximum in the ultraviolet part of spectrum.*

*This was followed by a series of studies by Yu.A. Vladimirov and colleagues who studied the ultraweak chemiluminescence of biological objects, which was later explained through the appearance of electronically excited products of lipid chain peroxidation reactions. This peroxidation can be studied by both essential and enhanced chemiluminescence methods. It is important to note that only the results of the molecular mechanisms of these studies and, for example their Fe-dependent nature, have made it possible today to make a sharp leap in explaining the mechanisms of apo- and ferroptosis. Thus, it was shown that mitochondrial cytochrome C can interact with its biological membranes and, in particular, with cardiolipin, which leads to a change in its conformation and a sharp increase of cytochrome C peroxidase activity, which, in turn, specifically oxidizes cardiolipin itself (V.E. Kagan). This oxidation leads to the development of apoptotic reactions. And the appearance of free iron and a decrease in the activity of the glutathione system leads to an increase of biological membranes peroxidation and ferroptosis. However, what contributes to the initiation (what is the trigger) of these processes is still unknown. In our work, we have shown that mitochondrial phosphatidylcholine can be converted into phosphatidic acid using phospholipase D. This phosphatidic acid, like cardiolipin, can change the conformation of cytochrome C and contribute not only to an increase in its peroxidase activity, but also stimulate lipid peroxidation of biological membranes, which most likely, it is the molecular mechanism that initiates mitochondrial processes of programmed cell death. Understanding the molecular mechanisms of apo- and ferroptosis, on the one hand, can serve as a basis for the study of such acute diseases as oncology, diseases of the cardiovascular system, developmental disorders, etc., and on the other hand, for the development of methods for treating these pathologies.*