

Biochemical Mechanisms of Rat Sperm Radiostimulation by Gamma-RaysK. Andreichenko^a, A. Klepko^b and N. Nurischenko^a^a*Taras Shevchenko National University of Kyiv, 60 Volodymyrska str., Biological Faculty, 01033 Kyiv, Ukraine;* ^b*SE 'Scientific Center for Radiation Medicine', 53 Melnikova Str., 04050 Kyiv, Ukraine**nnurish@mail.ru*

Low ionizing irradiation of sperm has proved to be helpful for improving sperm quality and increasing progeny production in some animal species. Therefore we have focused on studying radiation effects on rat sperm motility and fertilization potential. The rat sperm was gamma-irradiated in the isolated epididymises in the dose range 1-100 Gy with dose input 0,20 Gy/sec. Immediately after irradiation the caudal spermatozoa were incubated in nutrient solution containing 125mM NaCl, 2,7mM KCl, 1,8mM CaCl₂, 0,5mM MgCl₂, 0,36mM NaH₂PO₄, 11,9mM NaHCO₃, 4,5mM glucose, 0,09mM piruvate, 8,9mM lactate. At specific time intervals the relevant parameters were identified. Thus, progressive motility and spermatozoid hyperactivation were evaluated microscopically, cAMP and prostaglandin contents through radioimmunoassay, intracellular concentration of free extramitochondrial calcium by the aid of fluorescent indicator Fura, mitochondrial membrane potential using Rhodamine 123 dye on flow cytometer. Apart from this, K⁺/Na⁺-ATPase and Ca²⁺-ATPase activities were measured spectrophotometrically according to standard protocols. The data received have shown specific correlations between ion transporting and the accumulated radiation dose. Further, spermatozoid progressive motility and hyperactivation tended to raise significantly at the doses 5-20 Gy. In these conditions cAMP production was up-regulated by Ca²⁺ uptake, the latter being dependent on external concentration of E-prostaglandins. Therefore under radiation induced transformation of E-prostaglandins in F_{2α}-prostaglandins the spermatozoa's activity highly decreased. The present research has found out the radiation dose span for rat spermatozoa fertility potential elevation. Moreover, the biochemical background of this phenomenon was uncovered.