**Nanobiotechnology for health-care**

**Effect of gold nanocomposites and Quercetin**

**treatment on male reproductive function**

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` Due to the peculiarities of structure and control of intramolecular structure, branched polymer systems are interesting objects of basic research, as well as promising functional materials of the new generation. Polymers with a dextran core and grafted polyacrylamide chains dextran-polyacrylamide (D-PAA) in the anionic form of D-*g*-PAA(PE), as a polymer matrix carrier, in particular gold nanoparticles (AuNPs) - are being actively studied.

*The aim* is to evaluate the effect of five treatment of gold nanosystems (D-*g*-PAA(PE)/AuNPs) and Ouercetin on male reproductive function in mice in experimental chronic kidney disease (EChKD).

The study was performed in two series of experiments on male and female mice with EChKD, a model of which was created by immunizing animals with kidney homogenate.

*Introduction of substances*: according to TEM, AuNPs loaded (synthesized, retained) in D-*g*-PA (PE) are spherical in shape, size 4-11 nm. D-*g*-PAA(PE) (2.00 mg/kg), D-*g*-PAA(PE)/AuNPs (1.96 mg/kg), saline was administered intravenously (in a tail vein of 0.3 ml) once a day, five times according to the immunization schedule after the fourth immunization (the last, 3 weeks after the start of the experiment). Quercetin (Quercetin, Sigma, USA) (50 mg/kg) was administered intraperitoneally once daily, five times according to the immunization schedule after the fourth immunization (last, 3 weeks after the start of the experiment) and after the introduction of gold in the group where they were injected together.

*Estimated*: sperm viability; the number of sperm (sperm concentration (thousand/ml)) and the number of abnormal forms of sperm (%); the ratio of cells of different generations of spermatogenic epithelium; pathways of cell death of testicular cells (spermatocytes (primary)) and sperm cells of testicular appendages (epididymis); embryonic mortality in mice; the number of live pups per female.

Under conditions of EChKD, the treatment of D-*g*-PAA(PE)/AuNPs in comparison with the following values ​​under conditions of EChKD decreased: 1) the number of abnormal sperm (%) (1.41 times); 2) the number of necrotic cells (1.69 times) of the testes (sperm cells (primary)); 3) the number of necrotic cells (1.71 times) of the epididymis (sperm) and 4) preimplantation mortality of embryos (1.61 times). Under conditions of EChKD+D-*g*-PAA(PE)/AuNPs+Quercetin found: 1) decrease in the number of abnormal sperm (%) (1.88 times); 2) increase (1.17 times) in the number of spermatids in the testes; 3) increase (1.18 times) of living cells and decrease (2.43 times) of necrotic cells of the epididymis (sperm); 4) reduction (1.84 times) of preimplantation mortality of embryos; 5) increase (1.64 times) in the number of live newborns (pups) compared to such values ​​under the conditions of EChKD.

Our data suggest that Quercetin has a positive effect on spermatogenesis in EChKD, in the early stages of chronic kidney disease, when there is already kidney damage, accompanied by impaired filtration and manifested by proteinuria (the appearance of protein in the urine); gold nanosystems (gold nanoparticles in the polymer matrix D-*g*-PAA(PE)) are of particular interest for possible therapeutic applications to improve reproductive function.

The effect of such gold nanosystems may be manifested in the reduction of oxidative stress and improved repair (restoration of the integrity of fragmented DNA) of spermatocytes, which requires further study.

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