Comparison of morphological changes in organs and tumors in mice bearing CT-26 tumors and rats bearing PC-1 tumors during photodynamic therapy with a submicron-scale complex

Artyom M. Mylnikov[1], Nikita A. Navolokin[1], Irina Yu. Yanina[2]

[1]Saratov State Medical University, Saratov
[2]Saratov State University, Saratov

ABSTRACT

The aim of the study was to compare morphological changes in internal organs and tumor tissue in mice bearing CT-26 tumors and rats bearing PC-1 tumors after administration of the submicron-scale complex $NaYF_4$ + HSA + Cy3, irradiation, and a combination of both.

MATERIALS AND METHODS

Histological examination of the liver, spleen, lungs, kidneys, myocardium, and tumors of experimental animals was performed. Each model included a comparison group, a group receiving the complex, a group receiving irradiation, and a group receiving the combined treatment. The complex was administered intravenously. Photodynamic therapy was performed using a 980 nm laser.

RESULTS

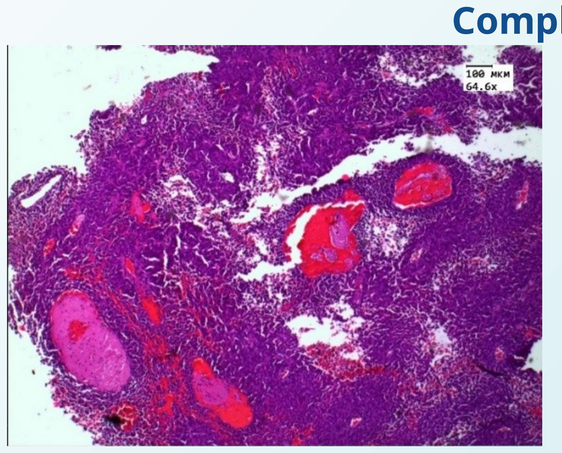
Tumor necrosis

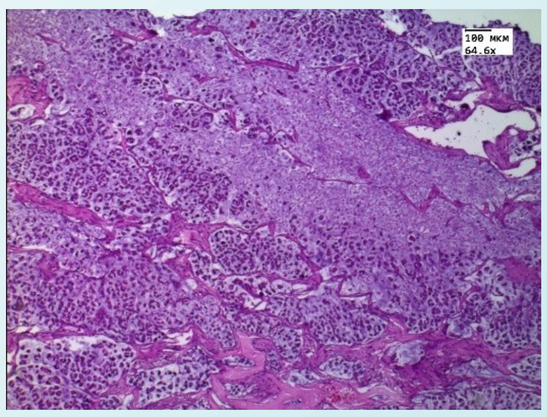
Treatment	CT-26 Mice	PC-1 Rats
Comparison group	10–20%	10–20%
Complex alone	10–20%	Up to 30%
Irradiation alone	Up to 30%	30–40%
Complex + irradiation	**≈20%**	**40–50%**

Estimated tumor necrosis. Representative histological fields are shown below.

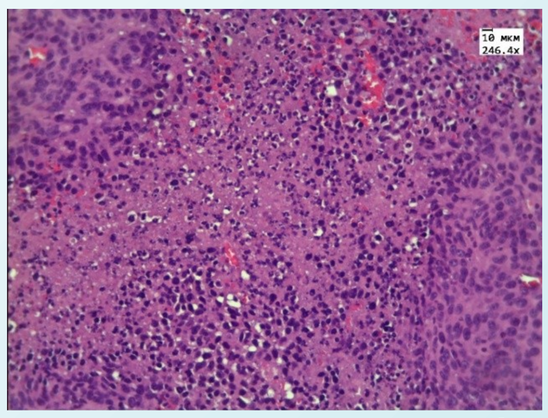
CT-26 (mice) **PC-1 (rats)**

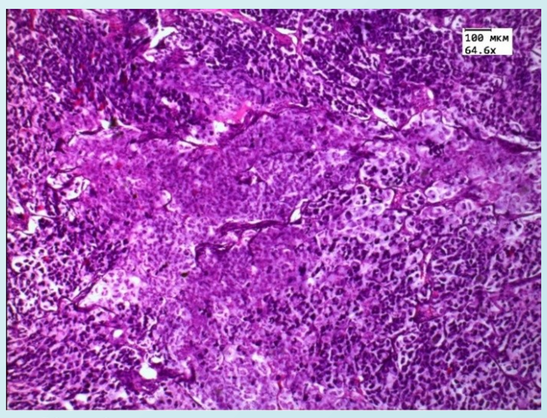
Complex alone



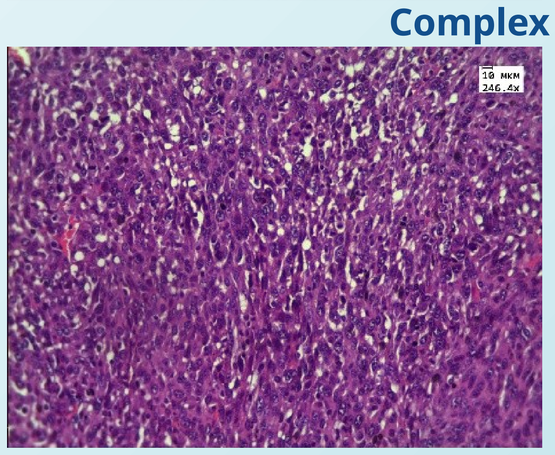


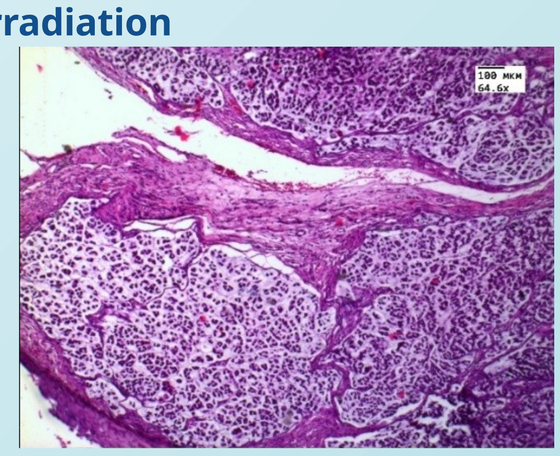
Irradiation alone





Complex + irradiation





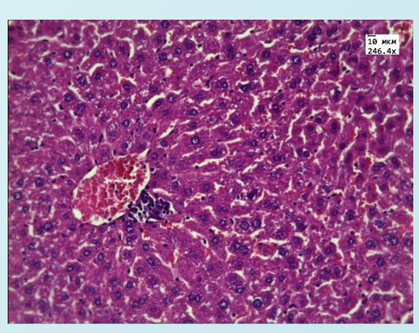
Internal organs

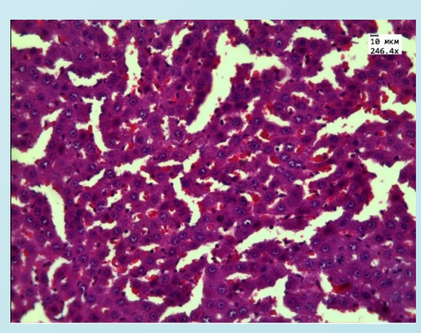
In both models, vascular changes predominated, with varying degrees of congestion, moderate myocardial edema, and isolated alterative changes in hepatocytes. No irreversible damage or necrosis was detected in the examined organs.

Complex + irradiation

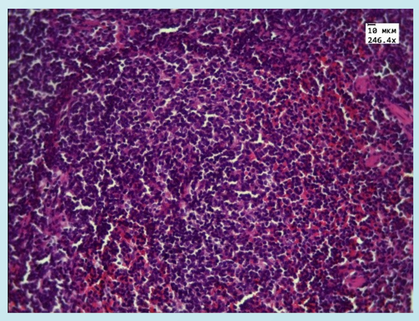
CT-26 (mice) **PC-1 (rats)**

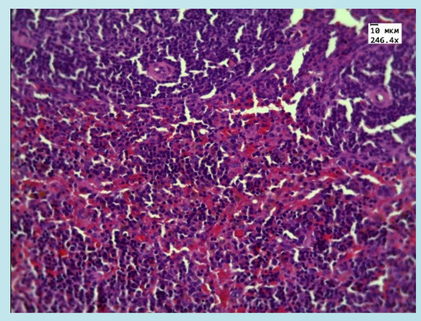
Liver



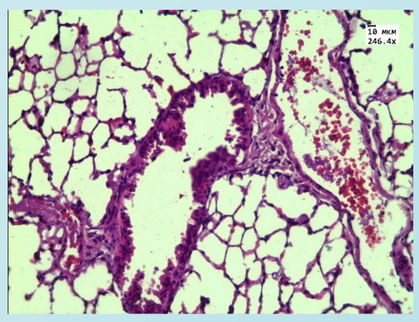


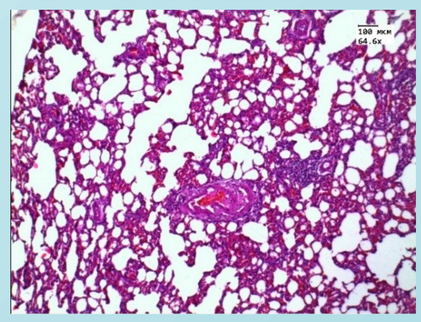
Spleen



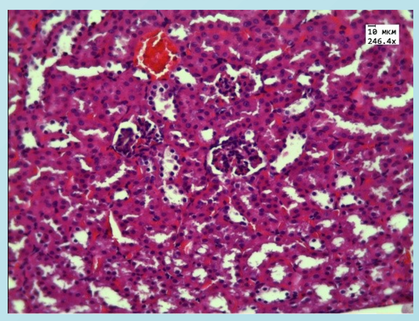


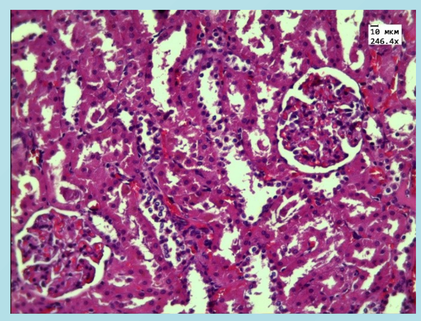
Lungs



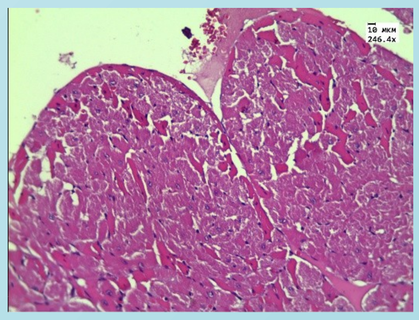


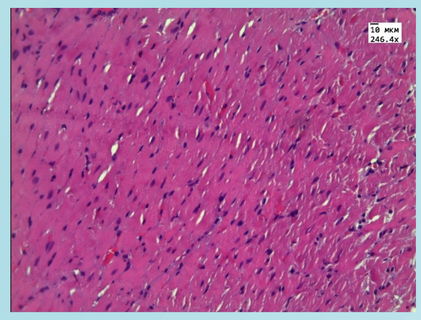
Kidneys





Myocardium





H&E. Original scale bars retained. Necrosis estimates refer to tumor sections, not individual illustrated fields.

CONCLUSION

The morphological response of PC-1 tumors was more pronounced compared to CT-26, especially with PDT using the submicron-scale complex. Differences in efficacy may be associated with the biological sensitivity of tumors, features of the experimental design, blood supply, and accumulation of nanoparticles in tumor tissue.

The work was supported by the grant of the Russian Science Foundation No. 25-22-00144.