data, an immunohistochemistry (IHC) study of tumor tissues with the hypoxia marker pimonidazole (PM) was performed.
The study was carried out on Balb/c-nude female mice with tumors inoculated subcutaneously. Three tumor models based on cell lines SN-12C (human kidney cancer, n = 4), HCT116 (human colon cancer, n = 4), Colo320 (human colon cancer, n = 4) were selected for the experiment. The study was performed at an average neoplasm volume of 700 mm3 on day 29 of growth of HCT116 and Colo320 tumors, and on day 125 of growth of SN-12C.
For OA and DOS studies, animals under isoflurane anesthesia were fixed in a side position on a portable base plate with a hole for positioning the study area above the OA sensor of the microscope. For OA, a setup (IAP RAS) with a laser with a wavelength of 532 nm and a repetition rate and pulse duration of 2 kHz and 1 ns was used. For the ODS, we used an installation (IAP RAS) with an optical probe of four fibers, using a light-emitting diode with a wavelength of 400–700 nm as a source and a spectrometer as a detector. For IHC, PM was injected intraperitoneally, after 45 minutes the tumors were removed, and cryosections were made. Sections were stained with mouse monoclonal antibodies to pimonidazole conjugated with fluorescein isothiocyanate. The relative hypoxic fraction was calculated as the percentage of the area of PM-positive zones of the total area of the sample.
In the course of the work, it was shown that SN-12C tumors are characterized by a low growth rate compared to Colo320 and HCT116, the doubling time of the tumor volume of this model exceeds that for Colo320 by 2.5 times and for HCT116 by 2.3 times. The DOS method in Colo320 showed an increased content of hemoglobin and a reduced level of blood oxygen saturation compared to SN-12C and HCT116. The reason for reduced oxygenation is the high content of deoxyhemoglobin, which characterizes the oxygen consumption of tissues. Using OA imaging, the absence of a regular structure of the vasculature of all experimental neoplasms was shown. The Colo320 tumor is characterized by the presence of extensive hemoglobin-containing structures, presumably hemorrhages, as well as higher values of vessel size and fraction. For HCT116 and SN-12C, the values of these indicators were comparable to the norm. The IHC method revealed higher values of the relative hypoxic fraction in Colo320 compared to SN-12C and HCT116, which confirms the results of the DOS.
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S6.418. Synuclein and singlet oxygen regulation of insulin production in mice

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Diabetes mellitus is a chronic disease characterized by elevated blood glucose levels. The state of hyperglycemia results from two main factors: insufficient insulin production by the pancreas and a decrease in the sensitivity of cells to insulin. Diabetes is characterized by complications that affect all body systems.
It has previously been demonstrated that there is a close relationship between glucose metabolism, mitochondrial function, and insulin secretion. Loss of PINK1 function (a major cause of early onset of autosomal recessive Parkinson's disease (PD), a common progressive neurodegenerative disease) has been shown to impair glucose sensitivity, leading to increased insulin release. Based on these findings, the association of PD with type 2 diabetes was reported. There are common mechanisms in the pathophysiology of both diseases, including mitochondrial dysfunction, oxidative stress, hyperglycemia, and inflammation. The formation of neurotoxic aggregates of neuronal synuclein proteins caused by various factors, including mutations in synuclein genes, is a histopathological characteristic of PD. Under physiological conditions, monomeric α-synuclein has demonstrated the ability to increase the efficiency of ATP synthase.
Therefore, the aim of this work was to study the regulation of insulin production by synucleins. In addition, we aimed to evaluate the possible effect of 1267 nm light irradiation, which leads to singlet oxygen production, on insulin production in the animal organism.
An enzyme immunoassay using phospho-specific antibodies against insulin receptors (Rat/Mouse Insulin ELISA, Merck KGaA, Germany) was used for measurement. Blood plasma was used for the assay. Plasma was obtained by taking 200 µl of whole blood from mice, allowing it to clot at room temperature for 30 min and subsequently centrifuging it at 4 °C. Mouse insulin samples at concentrations of 0.2, 0.5, 1, 2, 5, and 10 ng/ml were used as positive controls. Transgenic mice knockout for the SNCA, SNCB, and SNCG genes and triple knockout for the α-, β-, and γ-synuclein genes were used in the study; wild-type mice were used as controls.
To evaluate the effect of low-intensity 1267 nm infrared irradiation on insulin production, two wild-type mice were irradiated. Radiation was delivered via an optical fiber of a specially designed device, which was fixed on the proximal part of the middle of the animal's tail to irradiate the caudal vein. The irradiation dose was 50 J/cm2 for one animal and 100 J/cm2 for the second animal. Five minutes after irradiation, 200 µl of whole blood was taken from each animal for further immunoassay. The results showed that the blood of wild-type mice contained 2.7±0.2 ng/ml of insulin. Almost the same value (2.8±0.3 ng/ml) was observed in mice with double knockout of α- and γ-synuclein genes. The lowest insulin levels were observed in mice with β- (0.2±0.1 ng/ml) and γ-synuclein (0.6±0.1 ng/ml) gene knockout, and in mice with triple knockout of α-, β-, and γ-synuclein genes (0.3±0.0 ng/ml). Irradiation of animals with 1267 nm laser led to an increase in blood insulin concentration, and this increase appeared to have a dose-dependent effect. When irradiated with 50 J/cm2 light, insulin concentration in blood was 0.6±0.1 ng/ml, and at 100 J/cm2 it was 1.9±0.2 ng/ml.
Thus, the present work showed that knockout of genes encoding synuclein proteins is associated with a decrease in insulin production with the most prominent manifestations in the knockout of β- and γ-synuclein genes as well as in the triple knockout. Noninvasive optical generation of singlet oxygen in the animal leads to a dose-dependent increase in blood insulin concentration.
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S6.419. Tetra(aryl)tetracyanoporphyrazine free bases and their metal complexes for photodynamic therapy of oncological diseases

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Photodynamic therapy (PDT) is an intensively developing direction in the treatment of oncological diseases, which is based on the use of a photoactive compound, the so-called photosensitizer (PS), which, under local exposure to visible or near-infrared light, can enter into photochemical reactions with the formation of reactive oxygen species