Neurodegeneration is a process of neural cells death due to the impact of external (e.g., ischemia) or internal (e.g., congenital or age-related metabolic dysfunctions) factors. The central nervous system neurons are unable do undergo spontaneous regeneration after insult, thus neurodegenerative processes are basically irreversible. This process is the main pathomechanism of various nervous system diseases, such as Alzheimer's disease, multiple sclerosis, or strokes. Neurodegeneration also underlies glaucoma, which main feature is the death of retinal ganglion cells - cells that are responsible for transmitting signals from the eye to the brain. Taking into consideration the global aging of societies and the increasing incidence of age-related diseases, a better understanding of neurodegeneration mechanisms has become the challenge in order to develop better treatment strategies for this kind of diseases. Recent studies showed that estrogens (which are women's major gonadal hormones) and selective estrogen receptor modulators (SERM - synthetic compounds with the ability to activate an exact type of estrogen receptor with no side effects typical for estrogens themselves) may play a role in neurodegeneration-related processes. Estrogens interact with intracellular signaling pathways, mainly the FasR/FasL pathway responsible for apoptosis - a programmed, "suicidal" death of cells. It is considered that estrogens are the protective factors for nervous tissue and their lack, e.g., in the postmenopausal period, promotes the development of neurodegeneration diseases. The aim of this study is to evaluate the neuroprotective actions of 17βestradiol (the main estrogen), raloxifen (SERM's group drug), and ONL1204 (a protein that inhibits FasR/FasL pathway) on rodent retina under experimentally induced ischemic conditions. The ischemia, caused by increased intraocular pressure, leads to the retinal neurons death, including retinal ganglion cells. It's useful animal model for all of the vascular diseases of the retina and optic nerve, caused by ischemia. In the first stage of the project, the impact of surgically induced menopause on retina functioning will be evaluated by evaluating retinal ganglion cells count and RGC response to visual stimuli. Animals will be divided into two groups, one is going to undergo ovariectomy (a surgical removal of ovaries, leading to sudden decrease of the blood serum estrogens' level) and the second will be the control group. Both groups will be divided into two subgroups and one will undergo a retinal ischemia induction, the other one will serve as control. We will perform repeatable ERG recordings (electroretinography - an objective method of evaluating retinal function) and then animals will be sacrificed. The number of retinal ganglion cells will be assessed manually (using microscope photographs) and data will be analyzed to check the differences between groups. We expect a better retinal ganglion cells functioning and survival ratio among non-ovariectomized rats, which will prove the neuroprotective features of estrogens. The second stage of the project will be divided into in vivo and ex vivo part, and in both parts, the scheme of study and control group setting will be the same as in the first stage. In the ex vivo part, isolated retinas will be placed in a culture system with tested composites (17βestradiol, raloxifen, and ONL1204) added into medium, and next will undergo a microscopic evaluation, fractionated Western Blots and analysis of LDH activity in the culture medium. It is going to allow us to evaluate the impact of mentioned compounds on retinal ganglion cells' survival in acute-injury conditions (induced by the retinal isolation itself). In the in vivo part, study and control groups will be divided into multiple subgroups and each of them will be treated with one of the tested compounds (raloxifen orally, 17βestradiol, and ONL1204 intravitreally) under the ERG control. Then, the ischemia will be induced, drug administration and ERG recordings will be continued, and finally, animals will be sacrificed in order to evaluate the differences in survival ratio of retinal ganglion cells between groups. We expect the better survival of cells exposed to tested compounds proving their neuroprotective actions and the possibility of usage as a drug in retinal ischemia.