Analysis of bee venom components for their anti-glioma activity in a cell and fish model (Danio reiro)

Background

Among various types of cancer, those that growth inside the skull deserve special attention. This is due to; limited space for tumor growth within the non-stretchable skull, damage of the brain - an extremely important organ, which dysfunction of even a small fragment may result in a direct threat to life and finally, low sensitivity of this type of tumors to currently used treatment. Therefore, the search for new methods of therapy of intracranial tumors is very much needed. The member of those tumors is glioblastoma, which is sometimes called a "terminator" due to its high degree of malignancy.

One of the natural substances with potential anti-cancer properties is bee venom (BV), otherwise known as apitoxin. This compound is a mixture of many biologically active compounds that can be potentially used for pharmaceutical purposes. The first reports about the anti-cancer properties of bee venom appeared in the 1950s. Later observations reported a lower incidence of cancer among beekeepers, which was explained by more frequent stings compared to the rest of the population. It is now known that bee venom exhibits antitumor properties against many types of cells, but its mechanism of action appears is both complex and different for various types of cancer. However, there is very little literature data on the effect of bee venom on glioma cells, despite the fact that constituents of apitoxin has a high ability to cross the blood-brain barrier, which effectively limits the penetration of many therapeutic substances into the nervous system.

Aim of the study

This project is aimed at assessing the influence of BV and its individual fractions on the survival of glioblastoma cells carried out in cell culture conditions and with the use of a fish model on zebrafish embryos into which neoplastic cells will be transplanted.

Methods

Both BV without fractionation and after isolating its individual fractions will be analyzed. BV will be collected by a non-invasive, well-known method of stimulating the bees with pulses of electric current using a specially designed device. Then, a part of the resulting venom will be fractionated by liquid chromatography. In cell cultures, the influence of BV on cell survival and their ability to synthesize two enzymes from the group of matrix metalloproteinases, compounds proven to promote tumor development, will be analyzed. The most active fraction and the venom without fractionation will be used to evaluate their antitumor activities in the zebrafish embryo model into which human glioblastoma cells will be transplanted.

Conclusions

The conclusions of the study will determine whether apitoxin or its components may be candidates for further research into developing an effective treatment for glioblastoma.