Organometallic marriage of sugars with porphyrins. Towards new photosensitisers.

Porphyrins and porphyrynoids are naturally occurring group of compounds playing an important role in photosynthesis or oxygen transport. Nowadays, porphyrin derivatives are widely explored because of their potential biomedical application. They are studied as photosensitizers in Photodynamic Therapy (PDT) and cancer diagnosis. In the light of worrisome, worldwide tendency related to continuously and rapidly growing cancer cases, porphyrins should catch special attention because they let not only to detect cancerous changes but they are used in anticancer treatment. Both possible applications are related to natural properties of porphyrins: (a) firstly, the affinity of porphyrins to rapidly multiplying cells; (b) secondly, the tendency to produce reactive oxygen species after radiation of particular wavelength. Thus, for biomedical application, it is convenient if photosensitizers absorb more effectively penetrating light of lower energy (from infrared region). However, it is not typical attribute of synthetic porphyrins. What is more, standard porphyrins have one more drawback in common. It is low solubility in aqueous media and physiological milieu what significantly reduces their potential medical application.

This project is focused on the introduction of the method to synthesize new, original porphyrins that will better meet the criteria for photosensitizers in PDT. One of the most important challenges of Sonata research will be to develop method to combine members of two families of compounds – porphyrins with sugars. It is planned to apply for that palladium-catalysed reactions – a group of reactions well recognised in modern organic synthesis. However, this type of reactivity has never been used before to link porphyrins with expected sugar derivatives.

In Sonata research, it is planned to obtain potentially promising photosensitisers. It would be glycoporphyrins – macroheterocycles consist of two subunits bringing the specific properties to the whole system. The porphyrin part allows to accumulate nearby the cancer cells and to destroy them, while the sugar moiety will improve solubility of the molecule in aqueous media and provides better selectivity of the therapy. Furthermore, both subunits will be tied *via* the way that allows target products to absorb the light of the lower energy. The usefulness of the synthesized compounds in PDT will be examined in the biological tests.

This project focuses on creating a new paths towards synthesis of glycoporphyrin hybrids and might contribute to obtain effective photosensitizers that could be finally applied in anticancer treatment.