Summary of the PhD thesis of Anna Helena Mazurek

Thesis: A study of selected endocrine disrupting chemicals and their binding to host molecules with molecular modelling

Endocrine Chemical Disruptors (EDCs) are substances that exhibit adverse effects as a consequence of an endocrine mode of action. It often includes interaction with receptors in the same way as receptor's natural ligands. Among EDCs there are Active Pharmaceutical Ingredients (APIs) such as steroid hormones. Cyclodextrins (CDs) are cyclic oligosaccharides used as drug delivery systems for APIs of a low solubility in water, and as toxin removing agents. The goal of this study was to develop different molecular modelling techniques to analyze interactions between chosen EDCs and Estrogen Receptor or CDs.

Following methods have been applied: parametrization of chosen EDCs (estradiol, progesterone, biephenol A) and CD in AMOEBA polarizable force field and succeeding Molecular Dynamics simulation of the Estrogen Receptor + EDC system; benchmark tests of various Quantum Mechanics (DFT, semi-empirical) and Molecular Mechanics (MD/MMGBSA) based computation approaches and applicable parameters, on the example of estradiol+βCD system.