

Polish National Cancer Registry states that 18581 Poles were diagnosed with colorectal cancer in 2016. This is the second most common malignant tumor affecting women and the third affecting men. According to statistics, the incidence and mortality rate of colorectal cancer in both sexes has been increasing for several years. In addition, more than half of the patients have metastases, most often to the liver.

Modern chemistry and pharmaceutical sciences give more and more opportunities in the field of synthesis of new drugs. A significant group of the newly obtained compounds have very promising antitumor activity, however, due to the low water solubility (too high hydrophobicity) it is impossible to obtain and administer a dose having a therapeutic effect. The lack of stability of the compounds under physiological conditions is also a common problem. In addition, effective delivery of active compound to site of action is an important issue.

The goal of this project is to develop an oral delivery system for hydrophobic compounds with anticancer properties to the intestines.

Two reference compounds used in colorectal cancer therapy (Camptosar® and Xeloda®) and four newly synthesized polypyridyl complexes of ruthenium(II) were selected as hydrophobic compounds with antitumor activity for this research. The ruthenium compounds were obtained in our team (Coordination and Bioinorganic Chemistry Group, Faculty of Chemistry, Jagiellonian University) and in the studies carried out so far they have shown very promising anticancer and antimetastatic properties. However, they are quite hydrophobic compounds that require an appropriate delivery system. The goal of this project is to develop such a system. Lactoferrin has been chosen as a carrier for these compounds due to its biocompatibility and antimicrobial and antitumor properties. It is a protein that occurs naturally in the body and in the food, it has a lot of important physiological functions. The protein adducts with the tested compounds will be encapsulated within nano/microparticles based on a polymer that allows targeted and selective delivery. The use of this type of polymer will also allow for oral administration because it will protect the protein from digestion in the stomach. The Eudragit® family of polymers was selected for encapsulation. They are multifunctional polymers, depending on the structure, they can release their content in a specific place in the digestive system.

We hope that the developed system can be used by other researchers in the future to encapsulate their compounds, which could significantly improve their performance.