ABSTRACT

It was discovered in the 1960s that the cisplatin molecule exhibits excellent anticancer properties.[1] After the discovery many scientists focused on different platinum complexes.[5] The main strategy was to develop a compound with broader spectrum of activity, less side effects and the ability to overcome cisplatin resistance. After a while it was shown that complexes with different metal ions can also exert anticancer properties. Among others, ruthenium compounds were extensively studied and recognized as targeted therapeutic drugs which only attack cancer cells, leaving healthy cells unharmed. KP1019 and NAMI-A have recently been studied in the preclinical and first two stages of clinical trials. In general, the use of ruthenium compounds is very versatile in many areas of science. Such complexes can also be used as catalysts in organic chemistry and as dyes in Grätzel solar cells. In many scientific papers it has been shown that prospective anticancer ruthenium compounds show similarities with complexes that are specific for stereoselectivity in organic synthesis.

My PhD research was mainly focused on the catalytic and biological properties of ruthenium complexes. Synthesis and physicochemical characterization have been performed for all novel compounds with fluorinated β-diketonates. Three larger groups were chosen: (a) chlorido complexes, (b) complexes with 1,3,5-triaza-7-phosphaadamantane and (c) complexes with 1,4,7-trithiacyclononane ligand. In collaboration with other researchers it was shown that some of the compounds are toxic towards the ovarian and osteosarcoma cancer cells lines. Chlorido complexes were shown to be cytotoxic, whereas pta analogues tend to be more cytostatic. Interactions with biomolecules (G-quadruplexes) were intensively studied and lead to a conclusion that nucleobase binding is probably not the cause of their anticancer properties, as it is in the case of cisplatin. Some of the isolated complexes are useful in catalysis, more specifically for *ortho*-arylation *via* C–H activation mechanism.

Keywords: ruthenium coordination compounds, crystal structures, anticancer activity, C–H activation, G-quadruplexes.