SUMMARY

Molecular imprinting of polymers is a technique to create selective recognition sites within a synthetic polymer network via the template polymerization process. The main goal of the present thesis was the investigation of the parameters influencing the molecular imprinting process as to create artificial polymeric receptors for the selected molecules. For the synthesis of molecularly imprinted polymers (MIP) the following templates were used: the amino acids L-methionine and L-lysine, the biogenic amine histamine, the C-terminal pentapeptide of cholecystokinin (CCK-5) and cytochrome c. For the synthesis of molecularly imprinted polymers for the amino acids, precipitation polymerization was employed. Several parameters that influence the imprinting phenomenon were investigated (functional monomer to cross-linker ratio, type of initiation and concentration of the initiator). In the case of L-methionine, it was found that both the concentration of the initiator and the type of initiation influence the imprinting process. Specifically, UV-polymers had similar morphological characteristics and higher affinity for the template molecule compared to their thermal counterparts. Regarding L-lysine, affinity of the imprinted polymers for the template was observed only in the case of UV initiation while thermal polymers exhibited poor affinity for the template. The next aim of the present study was the synthesis of molecularly imprinted polymers for histamine. Initially, bulk polymerization was employed. MIPs affinity and recognition mechanisms were investigated both in aqueous and organic media, as well as affinity against structurally and functionally related to histamine compounds. In aqueous environment, imprinted polymers selectively recognized histamine over L-histidine, putrescine and a putrescine's analogue and histamine antagonist-ranitidine. In organic environment, imprinted polymers selectively recognized histamine against histamine's antagonists, fluoxetine, ranitidine and dimentidene. When imprinted polymers were employed as stationary phases in solid phase extraction, the separation of histamine from putrescine (normal phase) and taurine (reversed phase) was achieved. Molecular imprinting of histamine was proceeded with precipitation polymerization. The influence of porogen's polarity on polymers affinity was investigated. It was shown that the increment of porogen's polarity resulted in a reduction of template-functional

monomer interactions. As a consequence, the number of affinity binding sites was reduced. The final goal of the present project was the molecular imprinting of the C-terminal pentapeptide of cholecystokinin (CCK-5) and cytochrome c. Molecularly imprinted polymers for CCK-5 were prepared using the precipitation method. The polymers were synthesized according to the epitope approach and demonstrated positive results. Regarding cytochrome c, polyacrylamide gels were chosen due to the inert polymerization conditions. It was found that the combination of two functional monomers had a positive impact on polymers affinity. In particular, the combination of acrylamide and methacrylic acid enhanced the imprinted gels affinity for cytochrome c. The molecular imprinting of polymers is a new research area with numerous applications. In the following years, molecularly imprinted polymers have to overcome many limitations until they are considered as artificial antibodies.