Abstract

This thesis describes how targeted organic synthesis can contribute to current protein research based on two areas of application. In the first part of this thesis, the methodology of developing small molecule inhibitors for protein-protein interactions with defined secondary structure by using proline-derived modules (ProMs) was further developed and successfully applied to two examples. On the one hand, the synthetic route to the α-helix-inducing ProM-5 was optimized and this module was used to synthesize α-helical peptides with high binding affinities to the spike protein of SARS-CoV-2, which is responsible viral cell-entry and the spreading of COVID-19. In addition, the new class of decarboxy-ProMs was established, which have improved calculated drug-like properties due to the lack of a *C*-terminal carboxylic acid. A methodology for the production of these building blocks was developed, and the new module Decarb-ProM-1 was used in the synthesis of an inhibitor for the EVH1 domain, which contributes significantly to the increased motility of metastatic cancer cells. The second part focuses on the study and quantification of cellular lipid degradation by lipophagy using a synthetic bifunctional lipid dye (Lipo-Fluddy). For this purpose, a method for predicting the entry of new dyes into lipid droplets was first developed. Several dyes were then synthesized and their functionality as well as mutual compatibility investigated. Subsequently, a first double dye was synthesized, with which the process of lipophagy was visualized in fluorescence microscopy and its flux quantified.