Synthesizing a STAT3 Dimerization Inhibitor Molecule via Retrosynthetic Analysis

Jurado, Maria

The purpose of this experiment is to synthesize a compound that will inhibit the dimerization of the Signal Transducer and Activation of Transcription-3 (STAT3) protein, by altering its active site via Retrosynthetic Analysis. The STAT3 protein dimerizes upon the phosphorylation of the pTyr-705 – Src H2 domain. The dimerization of the STAT3 protein is an object of interest in cancer research due to its ability to inhibit apoptosis and its induction of cellular proliferation and tumor invasion. Using Boc anhydride, an acylation reaction is done to protect the aniline of the 4-aminosalicylic acid synthon from dialkylations. The intermediate is then alkylated using 1M KHMDS to deprotonize the carboxylic acid and the phenol. Afterwards, 4-Cy-BnBr is introduced in the molecule under a mild Cs2CO3. In a different reaction, a small amount of COCl2 is used to activate the N-methyl, n-perfluorophenylsulfonyl glycine acid. After this, the Boc anhydride in the molecule is removed using TFA. Finally, the carboxylic acid and the phenol is protonated through hydrogenolysis using 10% Pd/C and hydrogen gas. All the reactions were done to synthesize a molecule that would adhere to the active sites of the STAT3 protein. All intermediates were subject to column chromatography using different systems of ethyl alcohol and hexane, depending on their observed polarity and purity using the thin layer chromatography plates. All intermediates were analyzed using 1H NMR to confirm the success of a reaction, confirm an expected reaction and identify any impurities. After the reactions, a 3D model of the STAT3 protein and the inhibitor molecule were printed.

Awards Won:
Fourth Award of $500