Amoxicillin Derivative for Treatment of Lyme Disease

Aboye, Meron

Ever since it's discovery in 1975, Lyme Disease has been an issue especially in North America and effects both children and adults. In 2013, the Center for Disease Control and Prevention (CDC) has reported more than 27,203 cases in just the U.S alone. This vector borne disease is caused by the bacterium Borrelia Burgdorferi, a spirochete, which is a phylogenetically-distinct bacteria. The outer membrane of Borrelia Burgdorferi is composed of various unique outer surface proteins (Osp) that have been characterized (Osp A through OspF). Although this bacterium is extracellular, its interaction with the extracellular matrix allows the blood to be released to the surrounding tissues which initiates the infection. The fact that there is a wide genetic variability of the different strands of the bacterium as well as it's ability to mimics other common diseases, makes Lyme disease very hard to detect. Currently, the most efficient drug available to treat Lyme disease is Amoxicillin. This prescribed antibiotic similar to penicillin does not completely eradicate the bacteria, but reduces the rate at which the bacteria multiplies. Through computational analysis, manipulation of the structure of Amoxicillin showed improved binding affinity to better control the multiplicity of Borrelia Burgdorferi and possibly disintegrate the bacterium completely. The main objective of this project is to develop an efficient five step synthetic route for the proposed derivative of Amoxicillin. Various spectroscopic analysis, Thin Layer Chromatography (TLC), Mass Spectrometer, Infrared Spectroscopy (IR) and Nuclear Magnetic Resonance (NMR), will be used to determine the reaction times and purity of each intermediate compound as well as the final synthesized Amoxicillin derivative.