New Semi-Synthetic Agents With Antibacterial and Antifungal Properties

Teleuca, Iulia (School: Theoretical High School " Orizont, Durlesti ")

Bacterial resistance to antibiotics is a global threat for public health. The resistant forms of pathogenic microorganisms develop due to the uncontrolled use of antibiotics. So, the synthesis of new substances with increased antimicrobial/antifungal properties remains an actual problem. Thiosemicarbazones represent a class of organic substances which usually manifest biological properties. The aim of this work is the synthesis of 2-acetylpyridine N4-(bicyclo[2.2.1]hept-2-yl)thiosemicarbazone (HL) that contains a bicyclic fragment from the natural biological active substance Camphor, and the determination of its influence on biological properties of the Cu(II) complexes. The process of condensation of thiosemicarbazides with ketones requires 5-8 hours of heating in presence of the catalytic amount of acetic acid. So, a modified two-step mechanism was developed. The first step was a reaction between N4-(bicyclo[2.2.1]hept-2-yl)thiosemicarbazide, 2-acetylpyridine and HCl in a 1:1:1 molar ratio that requires only 30 minutes of heating. The second step was neutralization. The structure of HL was proven using the NMR methods. Three new complexes were synthesized by the interaction of HL with Cu(II) salts. The samples of these compounds were transferred for the screening of biological properties to the Moldova State University of Medicine. Cu(II) complexes showed high antibacterial/antifungal properties against B.cereus, A.baumannii, C.albicans, and surpassed Tetracycline and Fluconazole in terms of activity. The appearance of bicycle from the Camphor in the structure of thiosemicarbazone led to obtaining of highly active Cu(II) complexes with HL. The modified method of condensation significantly reduced time of the synthesis and can further be used in similar processes.

Awards Won:
University of Texas at Dallas: Scholarship of $5,000 per year, renewable for up to four years