X-ray Analysis as the Important Tool in Controlling Stereoselective Synthesis of Drugs

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Alkaloids form a group of natural heterocyclic compounds exhibiting valuable pharmacological properties: from painkilling and antihypertensive, through antidepressant and antipsychotic to anticancer. Some of them have dangerous narcotic, hallucinogenic and paralysing action. The bioactivity of compound, in great degree, depends on its stereochemical constitution and hence much effort has been made to develop new, bio mimetic methods of stereoselective synthesis of alkaloids and other heterocyclic compounds. Although the results of chemical synthesis are usually widely documented by many physicochemical methods, the final proof for stereochemistry is possible only after crystal structure determination. Here we propose a new method of synthesis using natural amino acids as building blocks which define three-dimensional structures of products. The case of 16 isoquinoline and β-carboline alkaloids and the application of X-ray methods to determine stereochemistry of products serve as an example. Quantum chemical calculations suggest thermodynamically controlled reaction.

Keywords: alkaloids, structure, modelling