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Synthesis and Characterization of New Prodrug Polymers and Study of Their Biological Activity

[1]Ahmed Kareem Obaid*, [2]Mohanad Mousa Kareem,
[2]Saadon Abdulla Aowda, [3]A. Krishnam Raju,

[1]Osmania university, Science college, Chemistry Department, India
[2]University of Babylon, Science college, Chemistry Department, Iraq
[3]Department of Chemistry Nizam College, Osmania University, India

Abstract : The term drug refers to any substance whose administration results in a recognisable change in the body. Although these drugs are highly effective in their action as discovered, their activity, efficiency are affected by in vivo conditions and they also have the ability to cause a variety of side effects and toxicity to the body. To solve these problems, prodrugs were devised. Prodrugs, also called as metabolites of drugs or targeted drugs, are being very regularly used in pharmaceutical region. Prodrugs are biologically transformable agents which are derived from active drug molecules. Actually a prodrug is synthesised by conjugating an inert molecule or compound to an active drug. In vivo the bond between these two molecules is broken leading to release of the drug molecule. These prodrugs usually in vivo undergo enzymatic or chemical transformation which leads to release of the active drug molecule which shows its specific activity. In the process of discovering lead molecules and their development into potential drug molecules, the role of these prodrugs is becoming extensively established. This is because these prodrugs have the ability for enhancement of various properties of a drug like its biopharmaceutical, physicochemical, and pharmacokinetic also. In conventional drug formulations various problems related to drug's solubility, side effects or toxicity, absorption, excretion, delayed activity or low effective concentration at target site etc are faced frequently. Prodrugs strategy is considered to be having the preferred characteristics providing an advantage over the conventional methods. Prodrugs are usually synthesised to improve oral bioavailability, selectivity, specificity, sustained blood plasma levels of a drug molecule and it also improves the physical characteristics of the drug and protects it from immediate degradation in vivo.

In the present study prodrugs of ciprofloxacin and norfloxacin have been synthesised. Compound M was used for synthesising ciprofloxacin prodrug and norfloxacin prodrug with the use of N,N'-Dicyclohexylcarbodiimide and 4-Dimethylaminopyridine. These prodrugs were then polymerised using Nitrogen Benzoyl peroxide. These two polymeric prodrugs were then evaluated for potential antibacterial and anticancer activity in vitro. In antibacterial activity it was observed that as compared to original drug molecules, these prodrugs were observed to more bactericidal. In anticancer activity performed using cervical cancer cell lines (HeLa), these two polymeric prodrugs showed high activity as compared to cisplatin as a standard.

Keyword : Prodrug, Polymer, Ciprofloxacin, Norfloxacin, Anti bacterial activity, Anti Cancer activity, DNA Cleavage Studies.

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