B-CYCLODEXTRIN, A MAGIC CAVITY FOR FABRICATION OF BIOMOLECULES–RECENT ADVANCES IN COMPLEXATION DYNAMICS AND EXPLOITATION OF ITS MACROMOLECULAR INTERACTION FOR TOXICOLOGICAL CALIBRATION

Souvik Basak
Dr. B.C. Roy College of Pharmacy & Allied Health Sciences, Durgapur-713206, WB, India.
Email: *souvik_basak1@yahoo.com*

Beta cyclodextrin (β-cyclodextrin, BCD) has been being used as a lucrative polymer for decades as a fabricating agent for poorly soluble compounds especially compounds of medicinal interest. For compounds belonging to Biopharmaceutical Classification System-II, It has been used as an excellent polymer to improve their solubilities. However, most of the studies on BCD have been involved in three genres: forming monomolecular inclusion complex, incorporating hydrophobic molecules and improving pharmacological activity. In this study, we are going to highlight three silent potentials of BCD: forming multimolecular inclusion complex, incorporating hydrophilic molecules for its steady release and reducing toxicological potential of bioactive compounds. Gefitinib (Gef) and Simvastatin (Simv) are two anticancer and anti-hyperlipidemic drugs respectively which have been reported to form individual BCD complex for improving their solubilities. However, we have prepared a BCD-Gef-Simv ternary complex which has improved the individual solubility of all the candidates better than that reported earlier. The concomitant embedding of the molecules in BCD matrix have delved in slow steady release of them resulting in higher residence time of them inside body together with increment in plasma Cmax. A 2D-COSY spectrum of the complex revealed interaction of all guest molecules with the host which probably enabled them to form a stable multi-molecular inclusion complex. Recently BCD has been revealed to entrap hydrophilic drugs such as meropenem which may encourage the transport of the same through cell membrane by utilizing the BCD property of inhibiting P-glycoprotein. In a more recent study BCD has been revealed to exert anti-toxin dynamics in reproductive toxicology. *Jatropha species* is known to exert toxicity to various visceral organs which we revealed holds true for reproductive endocrinology as well. *Jatropha meal* which can be used as an excellent protein supplement however creating severe reproductive toxicity due to the presence of enriched content of phorbol ester and jatrophone. Interestingly, while encapsulated with BCD or its Hydroxy Propyl derivative (HPBCD), the complex toxicity reduced to a significant extent in rat reproductive pharmacology. Such activity of BCD can be attributed to its sequestration property of various small or macromolecules which helped to ensheath the cytotoxic phorbol ester and jatrophone. This toxin-antitoxin dynamics of the supramolecular BCD is not much explored and needs further investigation for future application. Overall, we propose that BCD has several outstanding applications in biophysical systems which are still not explored; but once done, can create wonders in biopharmaceutical fields.

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