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AN UPDATED REVIEW OF CYCLODEXTRIN

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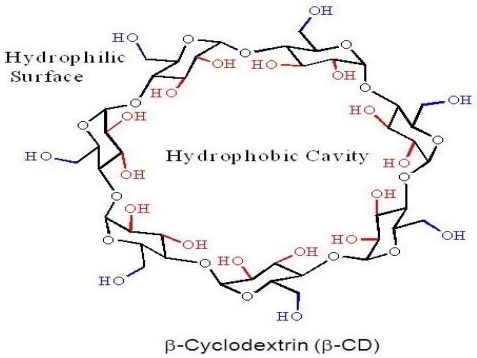
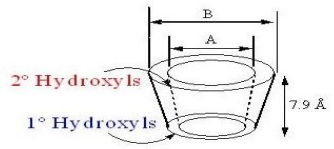
INTRODUCTION

Cylodextrins [CD] are family of oligosaccharides bound together in a single ring. There are 3 types of cyclodextrins these are α-c, α-CD[6-membered sugar ring],β-CD[7-membered sugar ring] and γ-CD[8-membered sugar ring].β –CD has 2 derivatives these are hydroxyl propyl –beta-cyclodextrin [HPβCD] and carboxy methyl-beta cyclodextrin[CMβCD]. Comparision of the capacity of β-CD derivatives and cyclophanes to shuttle cholesterol between cells & serum liproprotin. Cyclodextrins are non-hygroscopic, white, odourless, fine crystalline powder having a slight sweet taste. The most important key differences in physical properties between 3 cyclodextrin is their water solubility and α–CD is most commonly used CD although it is least stable and β-CD was found to impact better stability to various drugs.

Structure



β-Cyclodextrin (β-CD)



	Number of Glucose Units	A (Å)	B (Å)
α-CD	6	5.3	14.6
β-CD	7	6.5	15.4
γ-CD	8	8.3	17.5

Mechanism

Inclusion complexation form when aqueous solution of CD is shaken with drug molecule or its solution. In aqueous solution the hydrophobic cavities of CD are occupied by water molecules, which can be replaced by appropriate drug molecules that are less polar than

water. The solubility of the complex is usually lesser than the solubility of CD and hence the complex may be free ppt out from its saturated solution, as micro crystaliine powder and this powder is subsequentely separated by filtration and 1:1 complex are formed but when the guest molecule is too large to find complete accommodation in one cavity, its other end is also amenable to complex formation leading to 1:2 (drug: cyclodextrin).Thus the net pharmacological result of the complexation of the β-CD with the drug is to increase the solubility of the drug, decrease its participation in chemical reaction, such as hydrolysis and oxidation during the transists between ingestion and absorption. The oral bioavailability of the water insoluble drugs is increased by molecular dispersion and increase in dissolution. The "driving force" in the complexation is due to combination of different effects depending on the specific guest and CD. The effects can be hydrophobic interaction, vanderwall interaction, hydrogen bonding, dipole-dipole interaction and release of "enthalpy-rich" water. So β-CD increases the solubility, stability, bioavailability and therapeutic efficacy of drugs.

Application

1-Now β-CD is applied in the design of some novel drug delivery system like CD in liposome, microspheres, osmotic pump tablet, nanoparticles, micro-capsule.

2- β-cyclodextrins are used in formulation of different dosage forms like solution, suppositories and cosmetics.

CONCLUSION

Overall concept on Cyclodextrins are, to extend the function of pharmaceuticals additives, the combination of molecular encapsulation with other carrier matterials. Moreover the most desirable attribute for the drug carrier is its ability to deliver a drug to a targeted site. The article highlights on needs, limitation and advantages of cyclodextrin based delivery system.

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