

CHAPTER V

CONCLUSIONS

Effects of β -CD and HP- β -CD on minoxidil solutions were investigated and can be summarized as follows :

1. Effects of β -CD and HP- β -CD on minoxidil solubility

Results from solubility studies indicated that both β -CD and HP- β -CD could increase the solubility of minoxidil in water and HP- β -CD could increase the solubility of minoxidil in the greater extent than β -CD. The stoichiometric ratio of the complexes was 1: 1 with both β -CD and HP- β -CD. The formation constants (K_c) between minoxidil- β -CD complex and minoxidil- HP- β -CD complex were 953.83 and 207.91 l/mol, respectively.

The existence of complexes was confirmed by differential scanning calorimetry (DSC) and IR spectra.

2. Effects of β -CD and HP- β -CD on stability of minoxidil solutions

The stability studies showed that degradation rate constants (k) at room temperature and at 70°C of all minoxidil solutions were negligible. Therefore, the concentrations of minoxidil solutions did not change throughout the study. But the color of solutions kept at 70°C turned into 'yellow' after 2 weeks regardless of whether the solutions contained any CD or not. From this result, it indicated that both

β -CD and HP- β -CD in the concentration range studied could not prevent the color change of minoxidil solutions at 70°C.

3. Effects of β -CD and HP- β -CD on permeation of minoxidil through membranes

The in vitro permeation studies employing the Modified Franz diffusion cell apparatus indicated that β -CD at all concentrations decreased the flux of minoxidil from minoxidil solutions through newborn pig skin. For HP- β -CD, the flux of minoxidil was decreased only when the concentration of HP- β -CD was as high as 20 %w/v.

Percent cumulative amounts of minoxidil in receiver compartment at 12 hours and 24 hours showed that β -CD decreased the cumulative amounts of minoxidil permeated. For HP- β -CD, the results complied with their fluxes.

Both β -CD and HP- β -CD prevented precipitation of minoxidil on permeating membranes owing to the increment in minoxidil solubility so that the amounts of minoxidil that could be readily absorbed were increased. At the same time, the increment in hydrophilicity of minoxidil-CD complexes caused a decrement in permeation of minoxidil through newborn pig skin.