TRANSFER OF ORGANIC MOLECULES THROUGH AQUEOUS LAYERS MEDIATED BY CD'S AND CD-DERIVATIVES

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SUMMARY

Organic (e.g. hydrocarbon) molecules were transferred from one hydrogen bubble stream to another through an aqueous barrier. The transferred molecules were detected by flame ionization detector. Dissolving CD's or CD-derivatives in the water, the transfer could be facilitated by about one or two orders of magnitude. Non-volatile guest molecules in the solution acted as competitive inhibitors of this "facilitated transport". Kinetic analysis of the transport and the inhibition provided simple means for estimating the stability constants of CD-complexes for both volatile and non-volatile guest molecules in dilute aqueous solution.
Introduction

In the classical "carrier mediated transport" experiments the carrier facilitates the permeation of hydrophylic substances (e.g. ions) through lipid membranes of biological or artificial origin. The ability of CD's of forming water soluble complexes with highly hydrophobic guest molecules suggests an inversion of this situation: the CD's may act as carriers facilitating the transfer of these guest molecules through aqueous barriers. The higher is the equilibrium concentration of the complex in aqueous solution, the more efficient facilitation can be attained. Moreover, the transfer of a given substance can be hindered by adding another type of guest molecule to the solution. Both the facilitation itself and the inhibition can be used for estimating the stability constants of CD-complexes in dilute aqueous solutions.

Experimental procedure

All the applied chemicals were of reagent grade. CD's and CD-derivatives were prepared and supplied by the Biochemical Laboratory of the Chinoin Pharmaceutical Works, Budapest.

A schematic diagram of the complete experimental setup is depicted in Fig. 1. In the experiments transfer was induced from a \( \text{H}_2 \) stream (upstream gas) containing volatile organic substance (permeant) to a pure \( \text{H}_2 \) stream (downstream gas) through an aqueous solution. Electronically controlled constant flows of \( \text{H}_2 \) were produced by electrolytic \( \text{H}_2 \) generators. The upstream and the downstream gas flows were bubbling through the solution simultaneously without direct contact between them; this could be attained using a