Glycophorin A in phosphatidylcholine bilayer membranes

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Glycophorin A is one of the major integral proteins in erythrocyte membranes. We will report on the reconstitution of Glycophorin A into artificial phosphatidylcholine membranes (DMPC) in the concentration range between 0,1 and 10 mol %o proteins. The influence of the protein on the structure and the dynamics of the lipid matrix has been investigated by the following techniques:

1) Electron paramagnetic resonance (EPR) and calorimetry (DTA). We observed a slight shift of the main phase transition temperature of about 3°. The order degree of the lipid fatty acid chains shows a minimum at a molecular content of 0,7 %o Glycophorin.

2) Fluorescence recovery after photobleaching (FRAP) and excimer technique
The lateral mobility of Glycophorin and lipid analoges is determined. It shows a quite complex dependence from the protein/lipid molar ratio. The "pretransition" of the lipid matrix is clearly more important for the lateral diffusion of Glycophorin A than the main transition. For comparison excimer-technique was applied to determine the lipid mobility by using the lipid analogue pyren lecithin.

3) Energy transfer
Glycophorin and lipids were labelled with two fluorophores. Energy transfer is measured in different experiments between Glycophorins as well as protein to lipid transfer. Lipid to lipid transfer experiments serve as standard of statistical distribution. At 0,8 %o is a local maximum of protein-protein ET and a minimum of lipid protein ET.

4) Electronmicroscopy
The experiments yield information about the surface texture of individual lipid bilayers. Glycophorin seems to be preferentially located in defect lines and - 1/2 defects of the P_β'phase. Higher concentration of protein leads to a suppression of the P_β'phase, but by lowering the temperature the P_β'phase reappears. Above 1 %o and at low temperatures particles are observed in the defects of the P_β' phase. Glycophorin blocks the pretransition to the L_β'phase.
We can differenciate three regions of concentration
0 - 0,8 , 0,8 - 4 , 4 - 10 mol %o.
0,8 %o is a distinguished point. The interpretation will be given in terms of aggregational and conformational changes of the glycophorin molecules, carbohydrate-lipid interactions, defect of the lipid matrix, long ranging protein-protein lipid mediated interactions.