

## DEVELOPMENT OF DRIED LIPOSOMES CONTAINING $\beta$ -GALACTOSIDASE FOR THE DIGESTION OF LACTOSE IN MILK.

Lee-Na Choi<sup>o</sup> and Chong-Kook Kim

College of Pharmacy, Seoul National University, Seoul 151-742, Korea

The hydrolyzed-lactose milk for the lactase-deficient subject is sweeter than whole milk, and some subjects dislike its taste. To overcome this shortcoming the dried liposomes containing  $\beta$ -galactosidase to digest lactose in milk after drinking were prepared and examined the possible application of this dried liposomes to the lactase-deficient subjects.

To improve the stability of conventional liposome suspension, the dried liposomes in the presence of trehalose were prepared by the dehydration-rehydration vesicles method. Small unilamellar vesicles, prepared with egg phosphatidyl choline and cholesterol, were mixed with  $\beta$ -galactosidase solution and then lyophilized. The freeze-dried liposome was rehydrated and centrifuged. The resultant multilamellar vesicles were mixed with trehalose (4 g/g lipid) and then lyophilized to produce final dried liposomes. Trehalose increased the entrapping efficiency of liposomes by 3 fold compared to the liposomes without trehalose (13% vs. 46%).

In case of the dried liposomes stored at 4 and 17°C for 60 days, and 37°C for 30 days, they were reconstituted into liposomes by rehydration satisfactorily and maintained the activity of entrapped enzyme sufficiently. The dried liposomes stored at 37 or 50°C for 30 days were more stable than the multilamellar vesicle suspension prepared before adding trehalose. At 50°C, the dried liposomes were not able to reconstitute into liposomes properly and did not maintain the activity of entrapped enzyme.

The dried liposomes lyzed little in the simulated gastric fluids, but lyzed immediately more than 90% on 0.01 M deoxycholic acid solution. The percentages of lactose-hydrolysis were examined after adding the  $\beta$ -galactosidase encapsulated in the dried liposomes to milk in the presence of deoxycholic acid. Lactose-hydrolysis was stimulated according to the activity of entrapped  $\beta$ -galactosidase and the quantity of dried liposomes.