AAO Foundation Award Final Report

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Award Type	Biomedical Research
Project Title	Development of a Liposome-Based Carrier System for Stimulants of Bone Growth
Project Year	1999
Institution	University of the Pacific, Arthur A. Dugoni School of Dentistry
Summary/Abstract	Clinical control of bone growth will be possible using drugs like dexamethasone (D) to control the differentiation of osteoblasts from fibroblasts. A major obstacle will be to find a way to localize these drugs in the tissues near the target cells. Some of these drugs can be sequestered inside bacterial-sized spheres of liposomes whose surface can be chemically modified to adhere to fibroblasts providing a constant, discrete stimulation of only the desired cells. Our goal was to identify the needed chemical modification for the adherence and then to test whether an entrapped D would be released in amounts that would control differentiation into osteoblasts as expressed by alkaline phosphatase activity (ALP). In the first study we examined the ability of a series of unilamellar liposomes to bind human periodontal fibroblasts. We tested neutral (N) liposomes composed of lecithin and cholesterol (2 : 1 mol/mol), and the anionic (A) and cationic (C) liposomes prepared by adding a negatively or a positively charged lipid, respectively. All liposomes contained a fluorescent phospholipid that we used to quantify binding. After 2 hours the cells were rinsed exhaustively and the bound liposomes were removed with a detergent and measured for fluorescence. The best binding was achieved with C-type liposomes. We then exposed human fibroblasts to C-liposomes containing 10 nM D for 20 minutes compared to others continuously exposed to 1000nM of D for 4 Days. After 4 days, both groups produced the same amount of ALP activity suggesting that the liposomes stationed D long enough to promote the formation of osteoblastic cells. This study was reported at the 2000 I.A.D.R. Meeting.