Engineering of Ecdysteroid Containing Liposomes

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Phytoecdysteroids are known for their wide range biological activity in mammals - tonic, adaptogenic, anabolic, wound-healing and others. They are already used as a part of adaptogenic remedies, though their wide use is retarded by limited stocks of plant raw material and high price of ecdysteroids. One of the ways to increase proficiency of remedies is the obtaining of prolonged forms based on liposomes. The aim of our work was to achieve an effective ecdysteroid loading into liposomes.

Liposomes were obtained from the egg lecithin by hydration of dry lipid films followed by ultrasonication. 20-Hydroxyecdysone (20E) isolated from *Serratula coronata* L or its apolar conjugates - 20E 2,3,22-triacetate, 20E 2,3,22,25-tetraacetate and 20E 2,3,22,-tripalmitate obtained by chemical modification of 20E - were added before obtaining of the lipid film. Sitosterol or total lipids of yeast *Sporobolomyces paroroseus sp.680* were used to study their influence on the insertion efficiency of ecdysteroids into liposomes. The liposomes sizes were controlled with a help of light and electron microscopes. Gel permeation chromatography was used to separate liposomes with encapsulated substances from free substrate. Ecdysteroid content in the fractions was determined with a help of HPLC. The ecdysteroid loading of liposomes was calculated relative to the total ecdysteroid content in liposomal suspension. Potential biological activity of 20E apolar conjugates was proved *in-vitro* by cleavage of 20E 2,3,22,25-tetraacetate by *Helix* enzyme.

The experimental data obtained allowed to conclude that improved loading of ecdysteroids into liposomes can be achieved by using their long-chain fatty acid conjugates. 24.5% of 20E 2,2,22-tripalmitate insertion into liposomes indicates that it was incorporated into lipid bilayer. The use of liposome stabilizers influences on the insertion efficiency of ecdysteroid apolar conjugates into lipid bilayer. *In-vitro* study of 20E apolar conjugates stability to hydrolitical enzymes revealed their lability. Thus, studied conjugates can realize biological activity in mammals when used in forms allowing a prolonged mode of action.