

Evaluation of Surfactant-Induced Irritation by Cell Membrane Model System

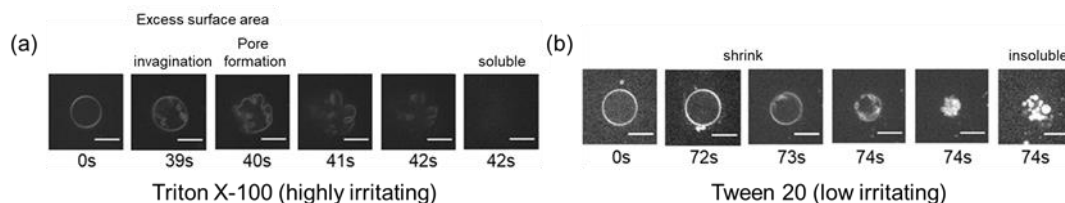
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【Background】 There are many surfactant-containing products. Since surfactants may cause skin and eye irritation, they should be evaluated beforehand. Existing evaluation methods include the Draize test, which evaluates the degree of inflammation by dropping surfactants to eyes of rabbits, and the alternative evaluation method by quantifying cell viability after adding surfactants to corneal cells. These methods have the problems of animal welfare and low quantitativity. We have been studying to evaluate the irritation of surfactants by characterizing the membrane dynamics after adding surfactant to biomimetic membranes¹.

【Method】 Cell-sized liposomes composed of unsaturated phospholipids (1,2-dioleoyl-sn-glycero-3-phosphocholine) were prepared, and the membrane dynamics of liposomes after the addition of surfactant was observed using laser confocal microscopy. Flip-Flop rates of surfactant-containing biomimetic membranes were measured using asymmetric nano-sized liposomes in which only the fluorescent dye of the outer leaflet was quenched. The ratio of the fluorescence intensity of the outer leaflet to the total was examined by fluorescence spectrophotometer and the data was fitted to obtain the Flip-Flop rate.

【Result & Discussion】 An increase in excess surface area of liposomes occurred for the addition of strongly irritating surfactants, while they shrank by adding low or no irritating surfactants. Similar membrane dynamics was observed with amino acid surfactants depending on the stimulus intensity. Our method is applicable for mixtures of surfactants. In this presentation, we will discuss the molecular mechanism of membrane dynamics caused by the addition of surfactants based on the Flip-Flop rate. In addition, the correlation between the results of this evaluation system and the stinging test, a sensitivity test to evaluate itching and tingling sensations in people with sensitive skin, will be presented.



- (1) Hamada, T., et al., Physicochemical Profiling of Surfactant-Induced Membrane Dynamics in a Cell-Sized Liposome. *J. Phys. Chem. Lett.* 2012, 3 (3), 430–435.