〈原　著〉

CHO 細胞に及ぼす界面活性剤の影響

徳永　裕司*，鄭　然 孫*，内 野　正*，安藤　正典*

Effect of Surfactants on CHO Cells

Hiroshi TOKUNAGA,* Yonson Chung,* Tadashi UCHINO,* Masanori ANDO*

Abstract

In order to estimate the effect of surfactants on cell viability, the effect of 9 cationic surfactants, 8 anionic surfactants, 12 nonionic surfactants and polyoxyethylene nonylphenyl ether (POE. NPE), polyoxyethylene lauryl ether (POE. LE), polyoxyethylene castor oil and polyoxyethylene oleyl ether having several different EO chains was studied by using Chinese Hamster Ovary (CHO) cells. After incubating CHO cells of 1×10^4 cells/0.1 ml in the CO_2 incubator for one day at 37℃, each 10 μl of surfactant's solution was added into the 96-well microplate and then the 96-well microplate was continuously incubated for one day in CO_2 incubator. The cell viability was determined with the 1-Methoxy PMS/WST-1 mixture. The concentration of surfactant having the residual percentage of CHO cells at 50% (IC_{50}) was calculated by using the linear regression. IC_{50} obtained from each surfactant's solution were compared with both flux (%) of methylparaben (MP) or salicylic acid (SA) after treating the guinea-pig skin with surfactant's solution and the concentration of surfactant having the residual percentage of red blood cells at 50% (EC_{50}) after treating the rabbit's blood cells with surfactant's solution. Cationic surfactants showed that the increase of the carbon number of their aliphatic chain from 10 to 18 depended on the increase of $1/IC_{50}$ and that the relationship between $1/IC_{50}$ and $1/EC_{50}$ was on good agreement ($p<0.01$). These results suggested that cationic surfactants should give the damage on the cell membrane and that the negative effect on cell membrane should be increasing depending on the stretch of the carbon number of their aliphatic chain. The effect of POE.NPE and POE.LE having different EO chains on cell viability depended on their hydrophobic/lipophilic balance. After treating CHO cells and red blood cells with POE.NPE and POE.LE having different EO chains, both $1/IC_{50}$ and $1/EC_{50}$ and both $1/IC_{50}$ and flux (%) of MP or SA were on good agreement ($p<0.05$). These results showed that the lipophilic part of POE.NPE or POE.LE such as nonylphenyl group or lauryl group should give the same damage as on biological membrane.

Key words: cell viability, Chinese Hamster Ovary cell, excised skin, red blood cells, surfactants, permeation, hemolysis.