Measurement of Polyethylene Glycol by a Novel Cell-Based Anti-Polyethylene Glycol ELISA

I-Shiuan Chiang (江怡宣)[1], Kuo-Hsiang Chuang (莊國祥)[1], Yu-Ling Lu (呂玉玲)[2], Steve Roffler (羅傳倫)[3], and Tian-Lu Cheng (鄭添祿)[1]

[1] *Kaohsiung Medical University Joint Research Center, Kaohsiung, Taiwan*
[2] *Chia Nan University of Pharmacy and Science, Tainan, Taiwan*
[3] *Institute of Biomedical Sciences, Academia Sinica, Taipei, Taiwan*

Polyethylene glycol (PEG) is increasingly used in clinical and experimental medicine. However, quantification of PEG and PEGylated small molecules remains laborious and unsatisfactory. In this report, we stably expressed a functional anti-PEG antibody on the surface of BALB 3T3 cells (3T3/αPEG cells) to develop a competitive enzyme-linked immunosorbent assay (ELISA) for PEG quantification. The αPEG cell-coated plate bound biotinylated PEG_{5K} (CH_3-PEG_{5K}-Biotin) and CH_3-PEG_{5K}-^{131}I more effectively than did a traditional anti-PEG antibody-coated plate. Competitive binding between PEG (2, 5, 10 or 20 kDa) and a known amount of CH_3-PEG_{5K}-Biotin allowed construction of a reproducible competition curve. The αPEG cell-based competition ELISA measured PEG_{2K} PEG_{5K}, PEG_{10K}, PEG_{20K} and PEG_{5K}-derivatived small molecules at concentrations as low as 58.6 ng/ml, 14.6 ng/ml, 3.7 ng/ml, 3.7 ng/ml and 14.6 ng/ml, respectively. Notably, the presence of serum or bovine serum albumin enhanced PEG measurement by the αPEG cell-based competition ELISA. Finally, we show here that the αPEG cell-based competition ELISA accurately delineated the pharmacokinetics of PEG_{5K}, comparable to those determined by direct measurement of radioactivity in blood after intravenous injection of CH_3-PEG_{5K}-^{131}I to mice. This quantitative strategy may provide a simple and sensitive method for quantifying PEG and PEGylated small molecules *in vivo*.