Synopsis of Original Research Paper

Immunological response against PEG in cosmetics

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Polyethylene glycol (PEG) is considered as non-toxic and non-immunogenic material, and surface modification with it can improve the immunogenicity and pharmacokinetics of nanocarriers. However, we recently reported that PEGylated liposome loses their long circulating properties when they are administered twice in same animal with certain interval (accelerated blood clearance (ABC) phenomenon). We elucidated that anti-PEG IgM, secreted in response to the first dose of PEGylated liposome, is responsible for the rapid clearance of the second dose via initiation of complement activation. We further elucidated that such anti-PEG IgM production is caused in nude mice (no T-cells), while it was not caused in SCID mice (no B and T cells) and splenectomized mice (no spleen). These suggest that spleen B cells produce the anti-PEG IgM in a T-cell independent manner. It appears that PEGylated liposome activates the immunity in spleen as T-cell independent antigens do. In addition, we recently reported that nucleic acids such as siRNA and pDNA in SL further enhances anti-PEG IgM production via tall like receptors (TLRs) (TLR 7 for siRNA, TLR 9 for pDNA) in their sequence dependent manner. Our studies clearly demonstrate that any PEGylated formulations may display unexpected pharmacokinetic behavior upon repeated injection if such formulation induce anti-PEG IgM production and, as a consequence, may show less therapeutic efficacy or even cause undesirable side-effects. In this study, we paid an attention to PEG in the cosmetics and studied if the PEG induces anti-PEG immunity after sequential addition for 60 days. The result clearly demonstrated that the cosmetic containing PEG induces anti-PEG IgM, not anti-PEG IgG, and accordingly the cosmetic may be a major cause to induce pre-existing anti-PEG IgM observed in sera of healthy volunteers.