

A solid-in-oil dispersion of gold nanorods to enhance protein delivery and immune response through the skin

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Transdermal delivery systems have been developed for various pharmaceuticals [1]. For effective transdermal delivery, the protein/drug must be able to pass through the skin barrier and attain the specific target. There has been recent interest in the use of solid-in-oil dispersions for transdermal protein delivery developed by Goto *et al.*[2]. Unfortunately, the permeability of high molecular weight protein through the skin using this technique is still low. Here, the further development was addressed by combining gold nanorods with solid-in-oil dispersions to enhance the skin permeation of large proteins and induce an immune response through the skin. When the surfactant-protein-gold nanorod complex was applied to the skin *in vitro* and irradiated by a near infrared (NIR) light, a model protein (ovalbumin, OVA) could be delivered through the skin and induce an immune response in mice. This combination provides a higher efficiency for OVA delivery through the skin than the original formulation using the solid-in-oil dispersion without gold nanorods [3]. Therefore, it would be well suited for the improvement of transdermal delivery and skin vaccination of proteins.

1. Thomas BJ, Finnin BC. The transdermal revolution. *Drug Discov. Today*, 2004,9(16):697-703.

2. Tahara Y, Honda S, Kamiya N, Piao H, Hirata A, Hayakawa E, et al. A solid-in-oil nanodispersion for transcutaneous protein delivery. *J. Controlled Release* 2008,131(1):14-18.

3. Pissuwan, D., Nose, K., Kurihara, R., Kaneko, K., Tahara, Y., Kamiya, N., Goto, M., Katayama, Y., Niidome, T. Solid-in-oil dispersion of gold Nanorods can enhance transdermal protein delivery and skin vaccination. *Small*, 2011, 7(2):215-220

