**Design and Evaluation of Vaccine Formulation Using Needle-Free Intraepidermal Administration Device Technology**

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**Background and aims.** Subcutaneous and intramuscular injections are widely used for vaccination. However, the pain during and/or after vaccination and fear of needles have become problems. Therefore, we focused on needle-free intraepidermal administration device technology. This technology is a combination of the microporation device and drug-loaded dry patches, which enables painless and easy administration without needles. Furthermore, it is possible to target antigen-presenting cells such as Langerhans cells, which are rich in the epidermis. In this study, we applied ovalbumin (OVA) as a model antigen and aim to clarify whether needle-free intraepidermal administration device technology can deliver OVA antigen efficiently and induce potent immune responses compared to conventional vaccination.

**Methods.** OVA-loaded dry patch formulations were prepared by adding the OVA solution to empty patches and drying. Physicochemical properties of OVA before and after drying were evaluated in terms of particle size, steric structure, and binding ability to antibodies. Percutaneous immunization was performed by applying the dry patch after microporation to the lateral abdominal skin of mice with a needle-free intraepidermal administration device. Blood samples were collected after prime and boost administration to evaluate antibody induction ability and safety.

**Results.** The physicochemical properties of OVA during dry patch preparation showed negligible change. Furthermore, antibody induction ability of microporation on mice skin, followed by OVA-loaded dry patch application, was significantly higher than that of subcutaneous administration. The group administered OVA-loaded dry patches showed similar blood biochemical values to the non-treated group, suggesting that this technology may be safe *in vivo*.

**Conclusion/Discussion.** These results suggest that this technology has the potential as a novel vaccine delivery technology. In the future, the transdermal immune induction mechanism should be investigated in detail.