Enhanced Cancer Immunotherapy by Microneedle Patch-Assisted Delivery of Anti-PD1 Antibodies

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Purpose: Despite recent advances in melanoma treatment through the use of anti-PD-1 (aPD1) immunotherapy, the efficacy of this method remains to be improved1,2. How to improve, widen, and predict the clinical response to anti-PD therapy is a central theme in the field of cancer immunology. Here, we describe the physiologically self-degradable MN patch-assisted cancer immunotherapy for controlled delivery of aPD1 toward melanoma. Our strategy ensures sustained release of antibodies in a controllable manner, minimizing the cost of treatment with essential dose and providing potential for combined therapy with other immunomodulators for local induction of durable and specific anti-tumor immune responses in the tumor site.

Methods: We synthesized self-degradable microneedle (MN) patch for the sustained delivery of aPD1 in a physiologically controllable manner3. The microneedle is composed of biocompatible hyaluronic acid integrated with pH-sensitive dextran nanoparticles (NPs) that encapsulate aPD1 and glucose oxidase (GOx), which converts blood glucose to gluconic acid. The generation of acidic environment promotes the self-dissociation of NPs and subsequently results in the substantial release of aPD1.

Results: We find that a single administration of the MN patch induces robust immune responses in a B16F10 mouse melanoma model compared to MN without degradation trigger or intratumoral injection of free aPD1 with the same dose. Moreover, this administration strategy integrate with other immunomodulators (anti-CTLA-4) to achieve combination therapy for enhancing antitumor efficacy.

Conclusion: In conclusion, we report the MN patch-assisted immunotherapy that delivers aPD1 for the enhanced treatment of the skin cancer. These results suggest that the MN-assisted delivery system provides a new platform technology for administration of cancer immunotherapeutics with improved safety, immunogenicity and logistical operations.

References: