



Universiteit  
Leiden  
The Netherlands

## **Intradermal delivery of nanoparticulate vaccines using coated and hollow microneedles**

Du, G.

### **Citation**

Du, G. (2018, October 30). *Intradermal delivery of nanoparticulate vaccines using coated and hollow microneedles*. Retrieved from <https://hdl.handle.net/1887/66514>

Version: Not Applicable (or Unknown)

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/66514>

**Note:** To cite this publication please use the final published version (if applicable).

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/66514> holds various files of this Leiden University dissertation.

**Author:** Du, G.

**Title:** Intradermal delivery of nanoparticulate vaccines using coated and hollow microneedles

**Issue Date:** 2018-10-30

# Propositions

1. To enable efficient coating of nanoparticles onto pyridine-modified microneedles, the nanoparticles should have a negative surface charge and a good colloidal stability.

This thesis, Chapter 2

2. Co-encapsulation of ovalbumin and poly(I:C) in nanoparticles modulates the immune response towards a Th1 direction following intradermal vaccination.

This thesis, Chapter 4

3. The in-house developed hollow microneedle/applicator system is an excellent tool to screen formulations for intradermal vaccination.

This thesis, Chapter 4

4. The aggregation of nanoparticles after being released from coated microneedles into skin leads to suboptimal immune responses.

This thesis, Chapter 6

5. Developing the next generation of vaccines will be increasingly challenging.  
Greenwood et al., *Phil. Trans. R. Soc. B* (369) 2013.

6. Cationic liposomes are the most effective liposomal delivery systems for vaccine antigens.

Christensen et al., *Expert. Rev. Vaccines* (10) 2011.

7. The interest in combining microneedle and nanoparticulate vaccine technologies will continue to grow with the emergence of new types of nanoparticles and new methods to fabricate microneedles.

Larraneta et al., *Pharm. Res.* (33) 2016.

8. The ultimate measure of the impact of microneedles is their translation into use in clinical medicine to benefit patients.

Prausnitz. *Annu. Rev. Chem. Biomol. Eng.* (8) 2017.

9. If you don't have perseverance, you cannot achieve anything.

–Adapted from Guofan Zeng's diary and family letter

10. If you have a lemon, make lemonade.

- Adapted from Dale Carnegie: *How to stop worrying and start living*

11. Tell me and I forget. Teach me and I remember. Involve me and I learn.

–Adapted from *Biography of Benjamin Franklin*