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## Development of hyaluronan-based dissolving microneedle arrays for dermal vaccination

Leone, M.

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# Stellingen

Behorende bij het proefschrift

## Development of hyaluronan-based dissolving microneedle arrays for dermal vaccination

1. The molecular weight of hyaluronan and the increase in antigen loading significantly affect the dissolution time of dissolving microneedles.

*Chapter 4 and 5*

2. Vaccination by means of dissolving microneedles evokes an immune response comparable to the subcutaneous vaccination.

*Chapter 4 and 6*

3. The design of the mold is a critical parameter in the fabrication of dissolving microneedles by micromolding.

*Chapter 4*

4. The presence of a curved microneedle array-surface improves the penetration efficiency of microneedles both by impact and pressing force application.

*Chapter 3*

5. Vaccines are efficient tools to reduce disparities in wealth and inequities in health.

*F. Andre et al, Bulletin of the World Health Organization (86) 2008*

6. Dissolving microneedle patches are well tolerated and strongly accepted by human subjects, which will facilitate further clinical translation of this technology.

*Arya et al, Biomaterials (128) 2017*

7. Microneedles shorter than 400  $\mu\text{m}$  do not cause pain. Microneedles are significantly less painful than hypodermic needles.

*Kim et al, Adv. Drug Deliv. Rev., (64) 2012*

8. Transient mechanical stress from microneedle insertion can induce a natural local innate immune response which can serve as a physical adjuvant to enhance antigen-specific adaptive immunity.

*Depelsenaire et al, J. Invest. Dermatol., (134) 2014*

9. The value and the utility of any experiments are determined by the fitness of the material to the purpose of which it is used.

*Gregor Johann Mendel*

10. In the middle of difficulty lies opportunity.

*Albert Einstein*

11. No man ever steps in the same river twice.

*Eraclito*

12. Chiano, mierulo, ca 'a via è petrosa.  
(Carefully, blackbird, on the street you will find a lot of stones.)

*My father, Daily life proverb*