

GERMANY/HONG KONG JOINT RESEARCH SCHEME
THE PROJECT REPORT
(for Project Completion)

Project Number: G_HK027/10-II

Title

Protein particles for skin drug delivery

Particulars

	Hong Kong team				German team	
Name of Project Co-ordinator (with title)	Prof. Reinhard Renneberg				Prof. Juergen Lademann	
Name of Co-Investigator (if any)	Dr. Martin MAK					
Institution or Institutional affiliation	<input type="checkbox"/>	CityU	<input type="checkbox"/>	HKU	<input type="checkbox"/> University of _____	
	<input type="checkbox"/>	CUHK	<input checked="" type="checkbox"/>	HKUST		
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	<input type="checkbox"/>	HKIED	<input type="checkbox"/>	PolyU		
Other project team members (if any)	Mr. Kwok Kei LAI				Ms. Heike Richter	

Funding Period

	1 st year	2 nd year (if applicable)
Start Date	2011-01-01	2012-01-01
Completion Date	2011-12-31	2012-12-31

Objective(s) as per original application

To develop an advanced protein particle system for controlled drug delivery via hair follicles.

i) Outline of proposed research and results obtained

The aim of the research was to explore the possibilities of using hair follicle as a penetration pathway for drug delivery and to use protein particles system for drug carrying and controlled release. Porcine ears were used as a model for mimicking human skins.

Experimental results have proven that the protein particles fabricated successfully carried the model drug (fluorescence dye) deep down to the hair follicles. A second phase of particles encapsulating proteolytic enzyme was then administered. The release of enzyme reacted with the drug carrying particles to release their content by digesting the protein shell. By this strategy, the drug contents were able to be discharged in a controlled manner and the released drugs could reach hardly accessible structures such as the sebaceous glands.

ii) Significance of research results

The skin is a strong natural barrier to prevent infiltration of pathogens or external threats, but at the same time restricting the absorbance of medicines for disease treatments. Our research results have given a breakthrough in transdermal drug delivery as the particle system could bypasses the stratum corneum. The released drugs can get into the sebaceous glands for curing acnes or other skin related diseases. This can also work as a long-term storage of drug for continuous treatment, which can reduce the number of dosing for the convenience of patients. Moreover, the drugs kept inside the follicles can prevent loss by daily washing or clothing contacts.

iii) Research output

Part of the results were organized and successfully published in Journal of Controlled Release, volume 160 (2012) page 509–514.

iv) Potential for or impact on further research collaboration

This project has laid a milestone for drug delivery via hair follicle. Further studies on the controlled release approaches of drug carrier, optimization on drug encapsulation and discharge efficiency, *in vivo* clinical assessment on drug take up, etc. will be necessary to realize the technique to practical applications for curing skin diseases and promotes better healthcare.

Furthermore, research efforts should be put forward to investigate the potentials of transporting drugs into systemic circulation by capillary network underneath the skin. If it is possible, our technology can be evolved into a non-invasive drug administration pathway which is more convenient than oral dosing and at the same time avoids first-pass effect.