

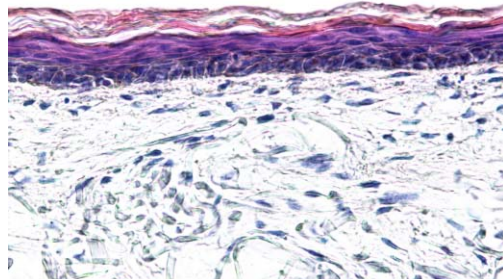
# Characterization of chemical and physical parameters of a full thickness skin equivalent in a two-organ-chip

Hao-Hsiang Hsu, Katharina Schimek, Moritz Boehme, Jacob Jan Kornet, Uwe Marx, Ralf Pörtner

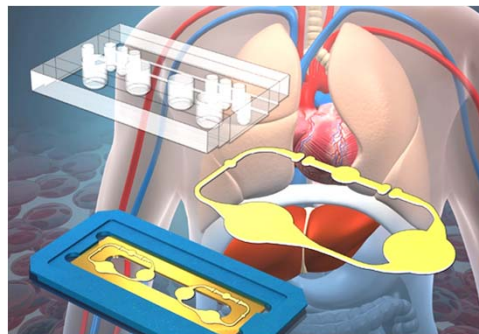
# Project



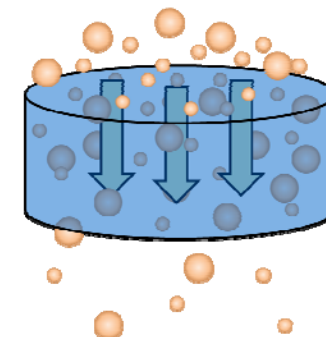
Develop full thickness skin equivalent



Substance testing in organ on a chip system



Characterization & parameter measurement



# Motivation



- In 2013 European Regulation prohibited animal experiments for cosmetic products

- Cosmetic industry needs alternatives for substance testing

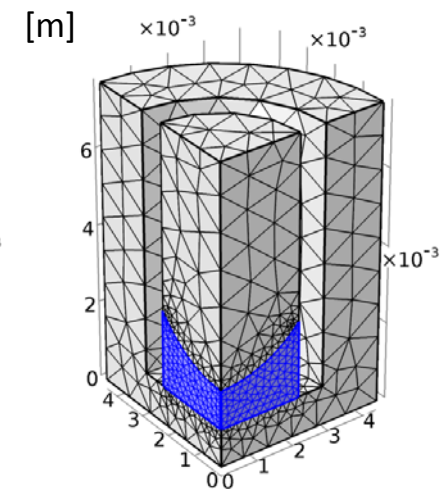
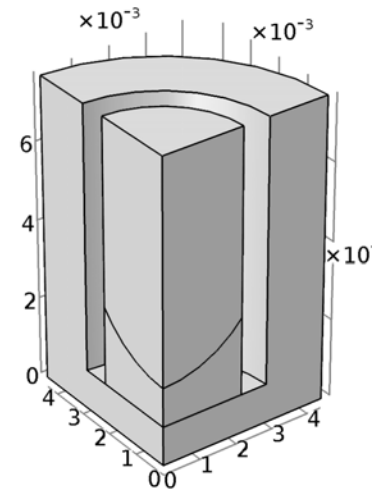
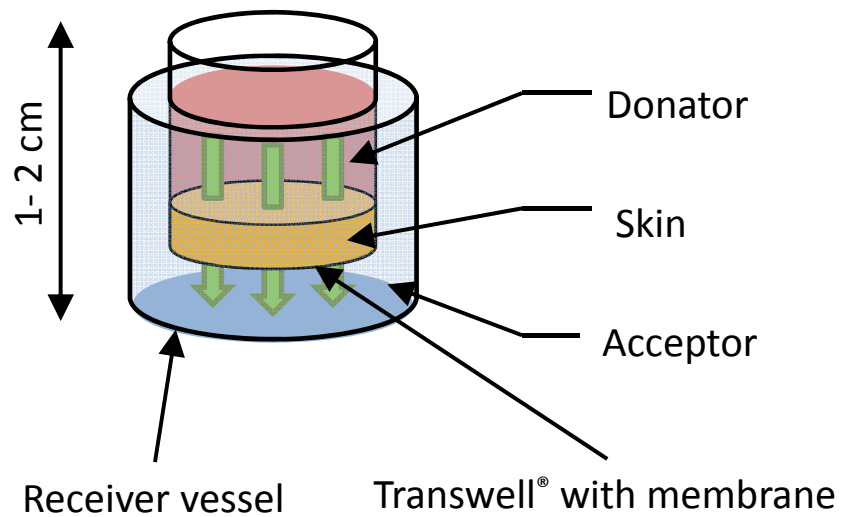
- Use human skin model and organ on a chip



[www.onthemoswy.eu](http://www.onthemoswy.eu)

[www.henkel.com](http://www.henkel.com)

# Permeation Measurement



Hsu et al. Jove 2018

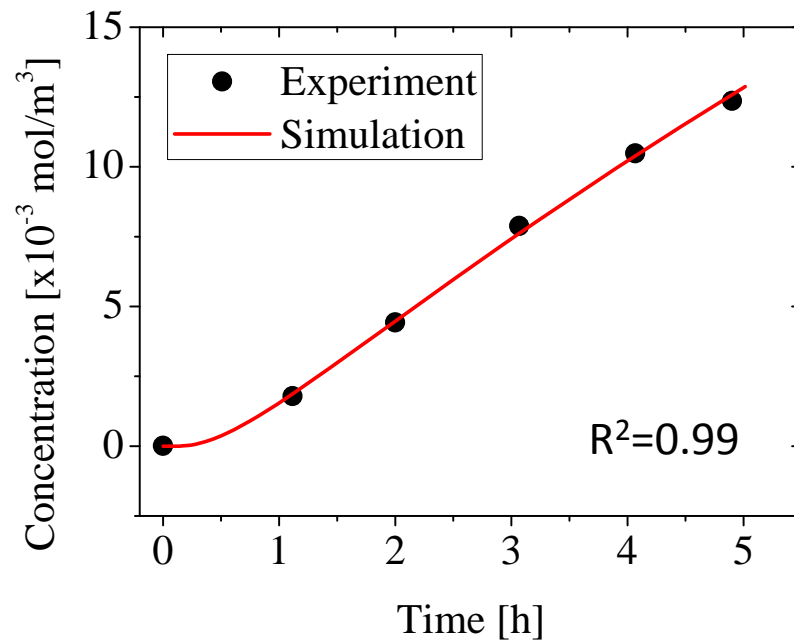
Used module: transport of diluted species, optimization

# Permeation Measurement

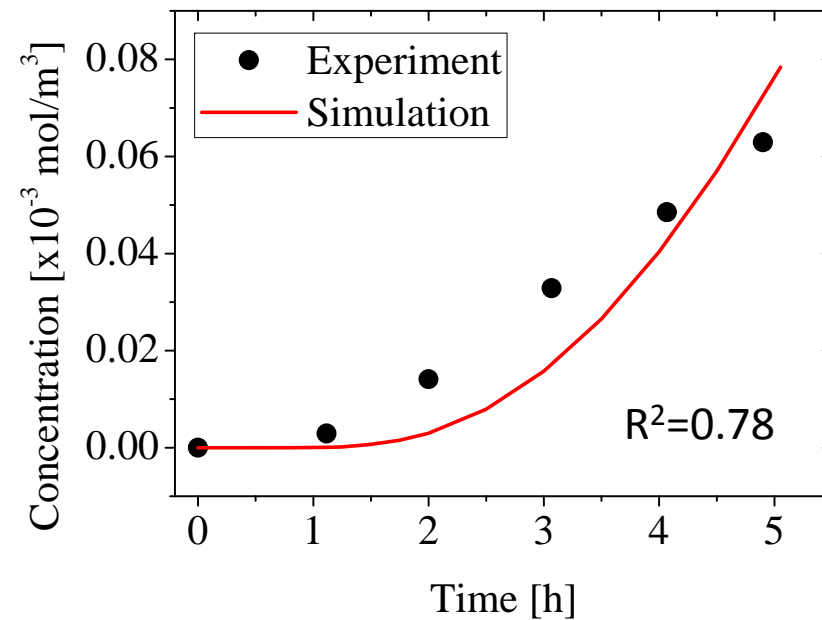


- Substance with different particle size through 2 % agarose gel

Fluorescein sodium salt (0.5 nm)



FITC-Dextran 40.000 (4.5 nm)



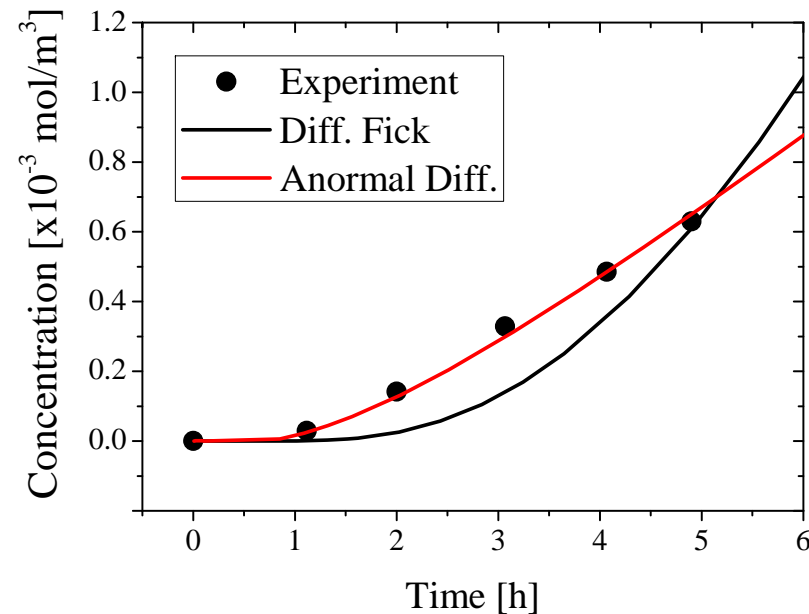
Schimek & Hsu et al. Bioengineering 2018

# Permeation Measurement

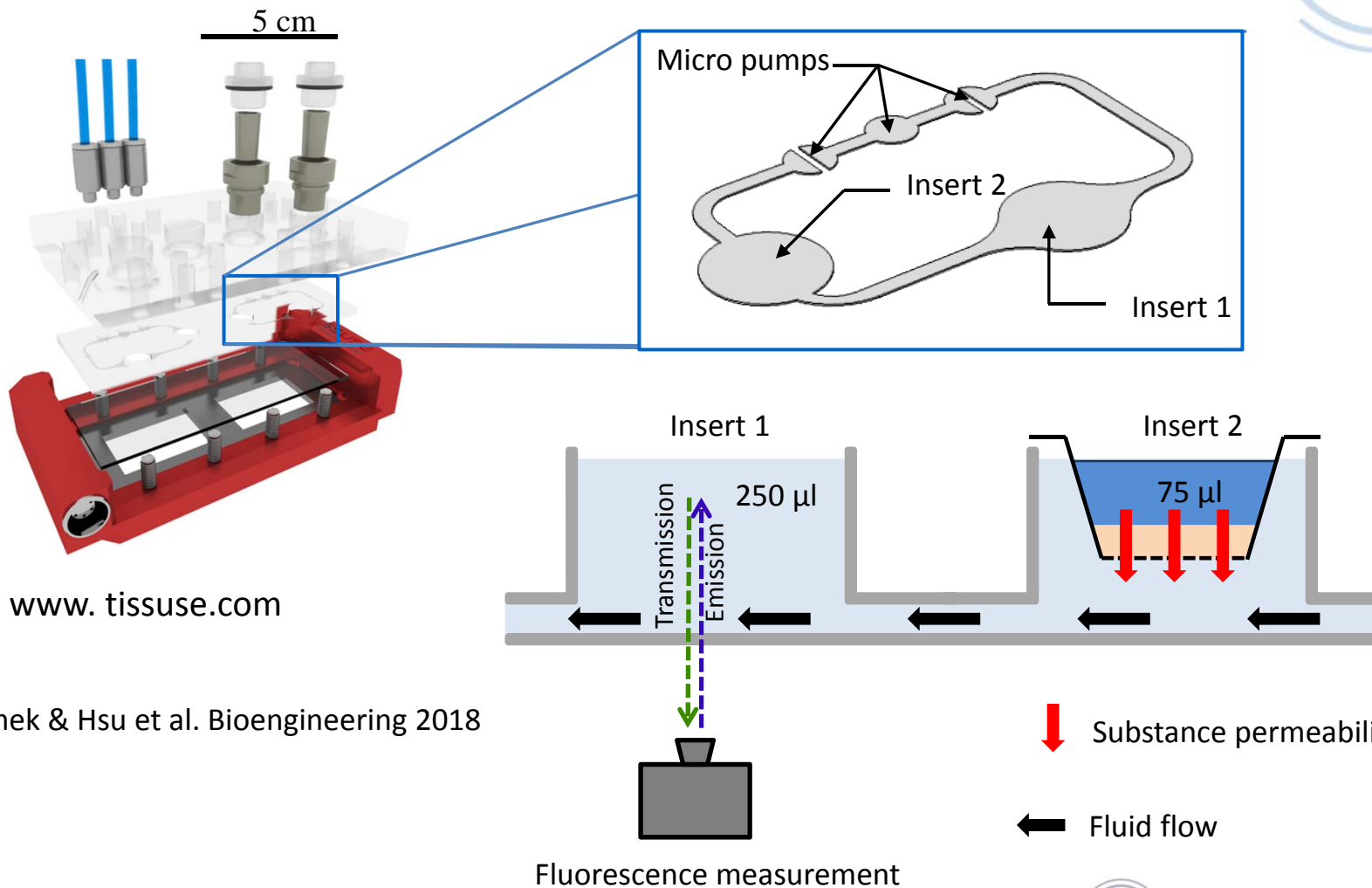
- Expanded the simulation with anormal diffusion

$$\frac{\partial c}{\partial t} + u \cdot \nabla c = \nabla \cdot (D \nabla c) + R$$

$$D(t) = K_{\alpha} t^{\alpha-1}$$



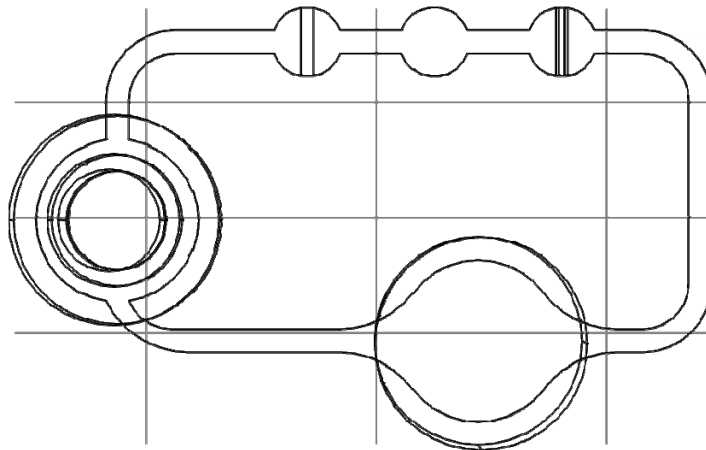
# Permeation Measurement in 20C



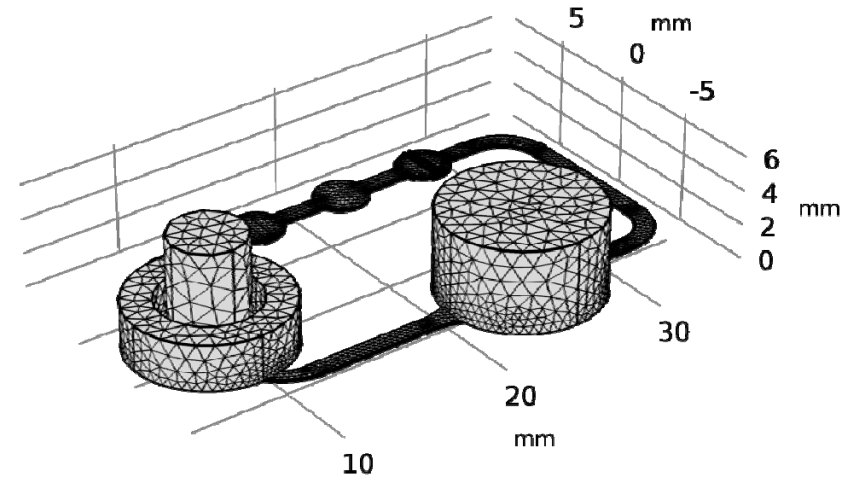
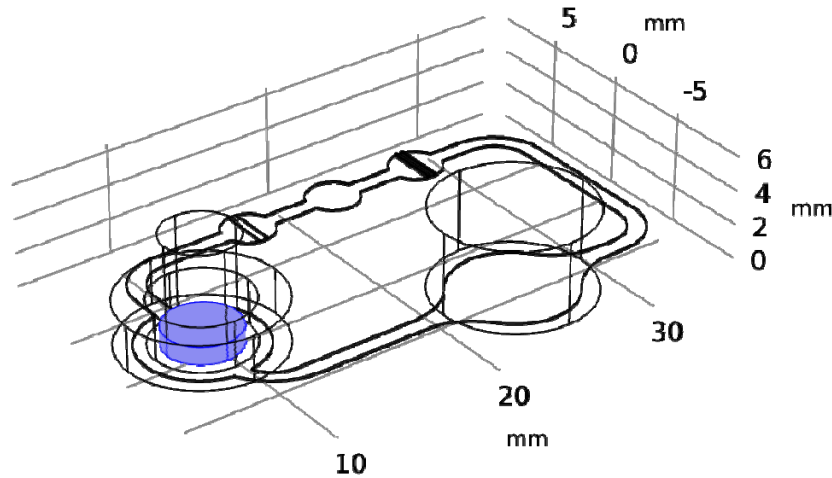
[www.tissuse.com](http://www.tissuse.com)

Schimek & Hsu et al. Bioengineering 2018

# Permeation Measurement in 20C



Used module:  
Transport of diluted species  
Optimization  
Fluid flow

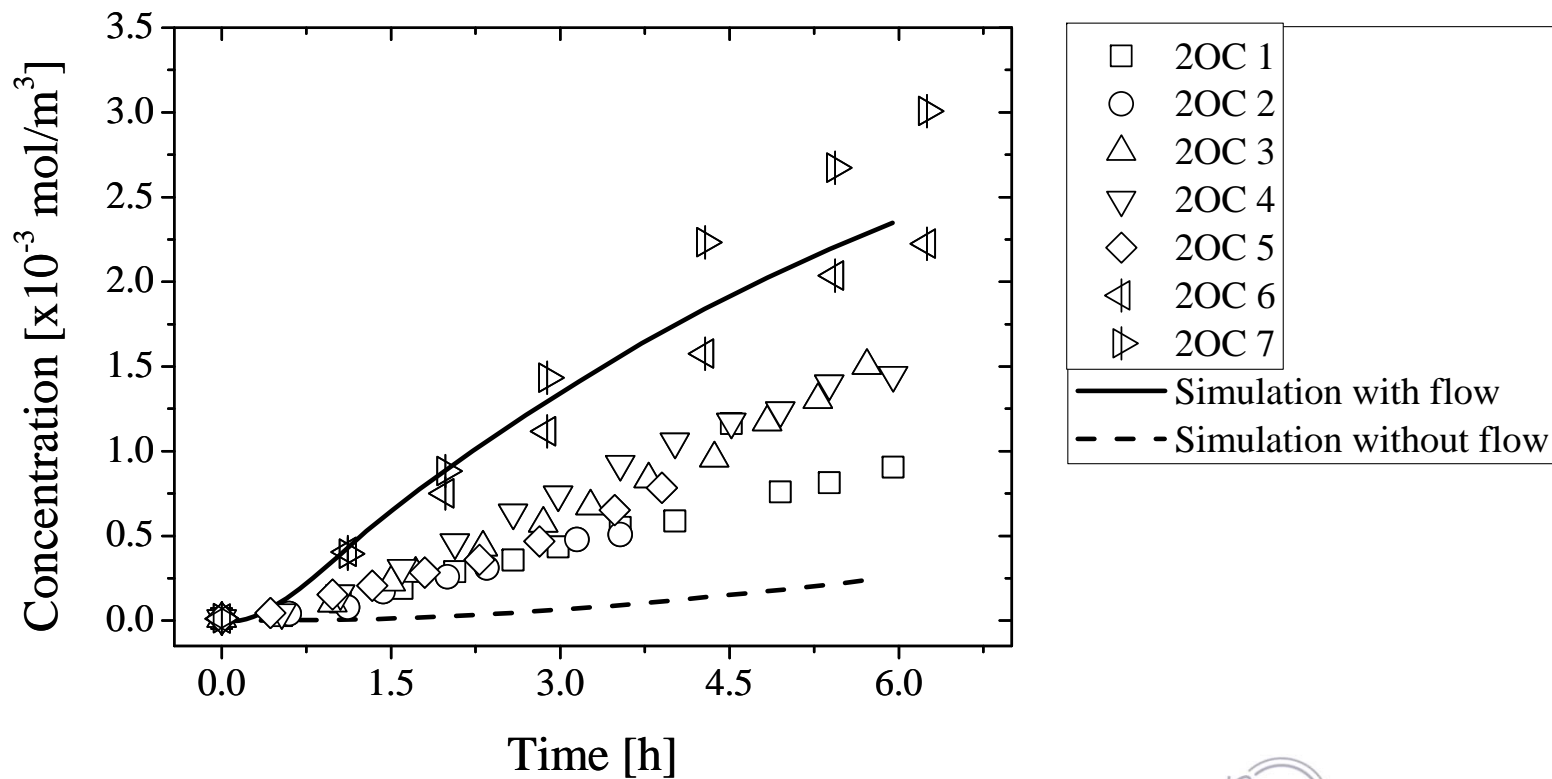




# Permeation & Simulation of 2OC

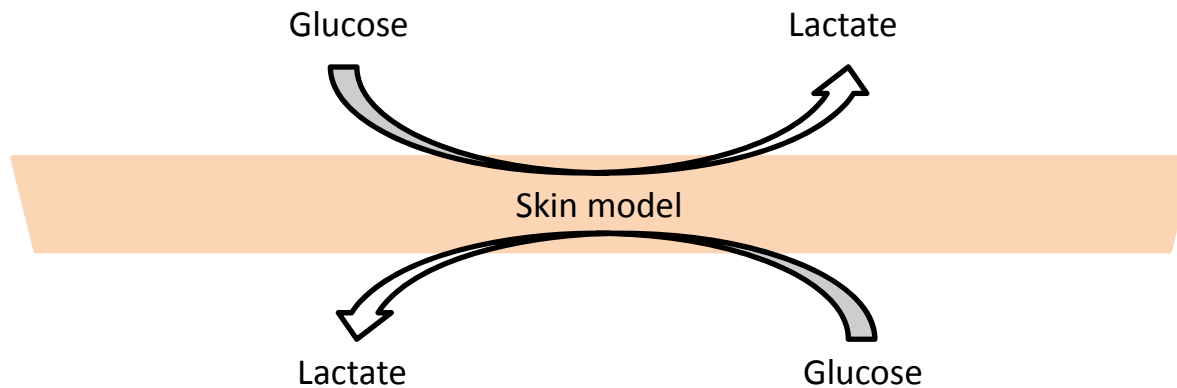
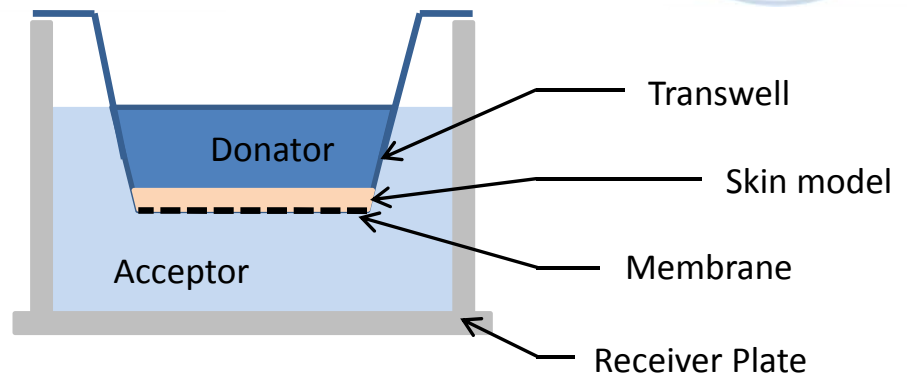


- Permeation experiment with fluorescein sodium salt through 2 % agarose gel



# Glucose & Lactat

- Determine glucose consumption- and lactate production in a membrane insert system

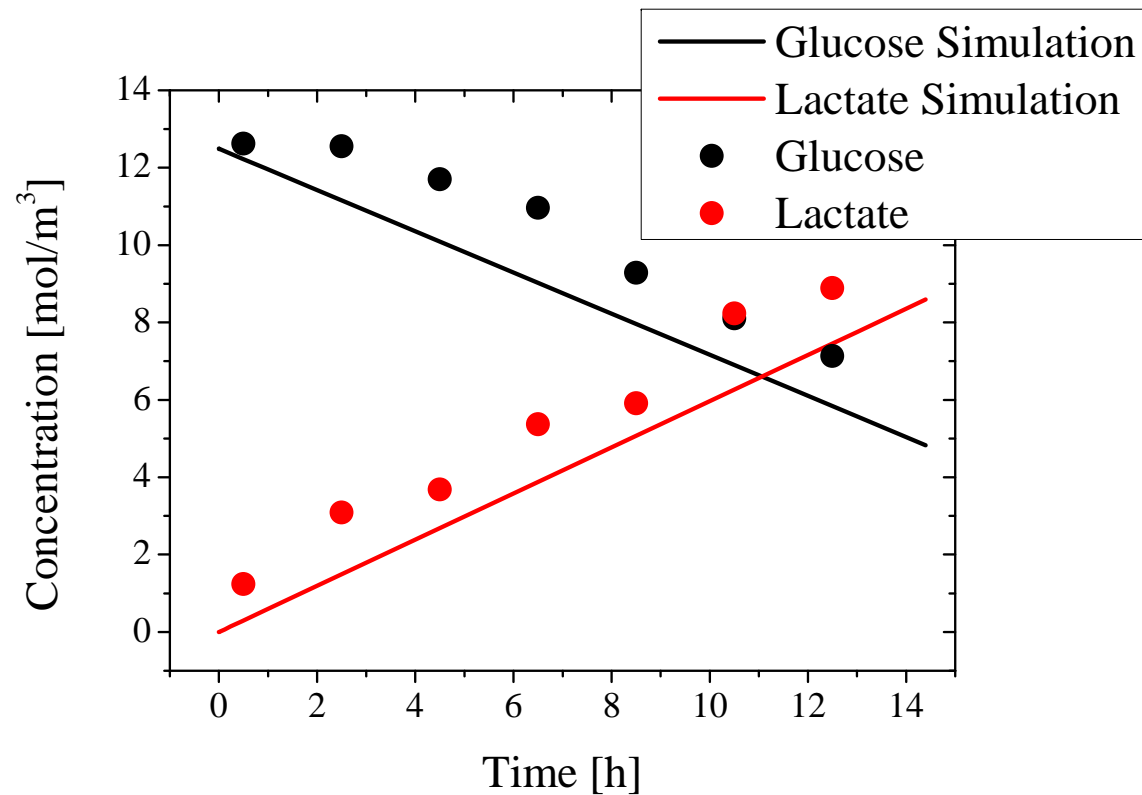


Used module:  
Chemical Reaction

# Glucose & Lactate



- Glucose consumption and lactate production



## Summary



- Main idea: Use full thickness skin equivalents for substance testing
- Possible to simulate permeation process, glucose consumption and lactate production in membrane insert system and organ on a chip
- Simulation can reduce experimental effort and time and help to understand physical side effects
- *In situ* characterization and quality control for skin models



Thank you for your attention!