



Skin-in-Silico

Skin absorption and permeation model

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The skin, our protective barrier, is constantly exposed to chemicals, either intentionally through cosmetics, topical formulations, and patches; or unintentionally through pollen, radioactive materials, insecticides and other environmental pollutants. *Are these chemicals being absorbed and permeating the skin?*

The **Skin-in-Silico** software utilizes a mathematical model to estimate the absorption of the components of a given dose into the topmost layer of skin (stratum corneum), the permeation through the subsequent two layers (viable epidermis and dermis) and release into a fluid (*in vitro*) or clearance into the bloodstream (*in vivo*).


Skin-in-Silico considers the skin physiological structure as well as physico-chemical properties of the components to simulate the **absorption** and **permeation**.

Applications

- Dermal and transdermal drugs, including patches
- Skincare products and cosmetics
- Sunscreen protectors
- Fragrances
- Household and industrial chemicals
- Environmental pollutants

Key features

- Multilayer skin structure based on physiological stratification
- Multicomponent dose with at least two absorbing components, active and vehicle
- Vehicle effects included
- Industry-recognized estimators of simulation parameters
- *In vitro* and *in vivo* modes
- Graphical and numerical representations of simulation results
- User-friendly interface
- Possibility of defining dosing intervals



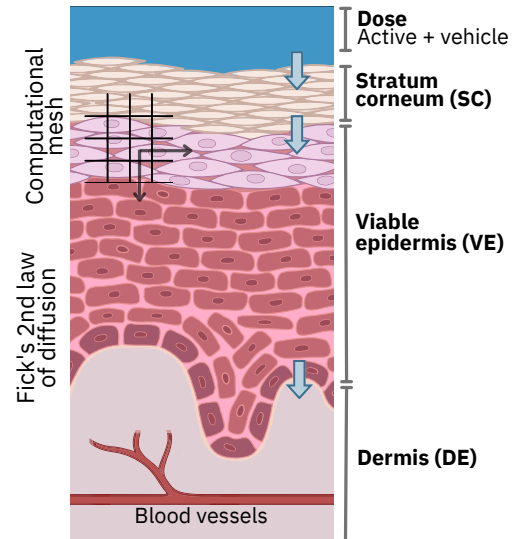
LEADING PHARMACEUTICALS AND SKINCARE COMPANIES ARE INCREASINGLY ADOPTING OUR SERVICES AND SOFTWARE TO REDUCE AND REPLACE *IN VITRO* AND *IN VIVO* TESTING.

Useful for

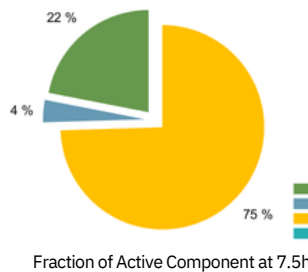
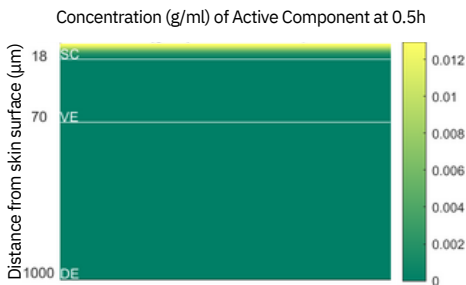
- **Quickly estimate absorption and permeation** for a skin formulation using physico-chemical data of each component and the composition of the dose(s).
- **Optimize dosage, formulation, and pharmacokinetics** for improved skin absorption by testing various components, concentrations and regimens.
- **Evaluate unsynthesized or virtually** generated compounds.
- **Exposure risk assessment** of industrial chemicals as required by REACH legislation.

Mathematical model

Absorption and permeation in Skin-in-Silico are predicted numerically by using the **Finite Element Method**: the skin is represented by a finite number of small elements called a *computational mesh*. Simulation of the permeation process through the skin layers is based on Fick's 2nd law of diffusion considering the partitioning between the layers. The respective equations are applied to each element of the computational mesh and are solved simultaneously to calculate the change of the concentrations of the permeants with time.

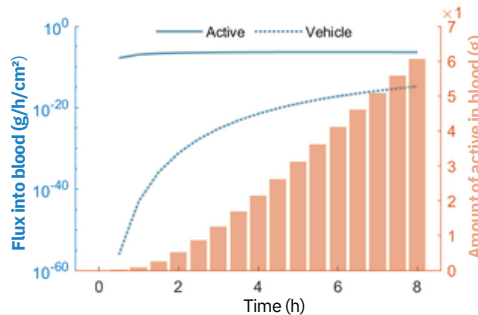
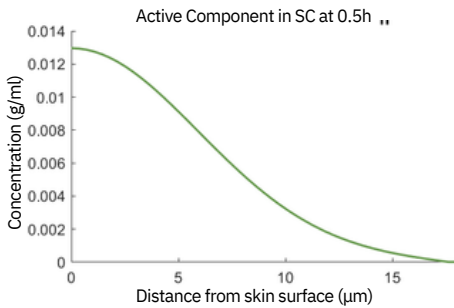


Simulations



- **Concentration** gradients in each skin layer.

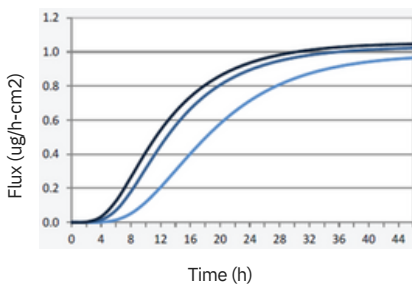
- **Total amounts of the active and vehicle**, in each skin layer and in the reception fluid (*in vitro*) or in the blood (*in vivo*).



- **Flux of the active and vehicle** into the receptor fluid (*in vitro*) or into the blood (*in vivo*). **Amount of the active in blood** (*in vivo*).

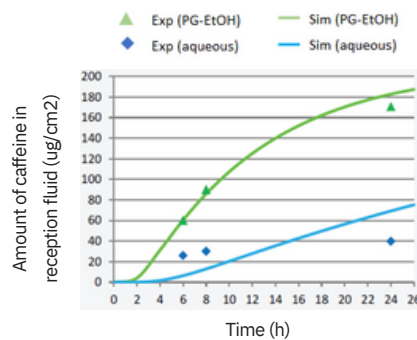
Why use Skin-in-Silico?

Skin thickness effect



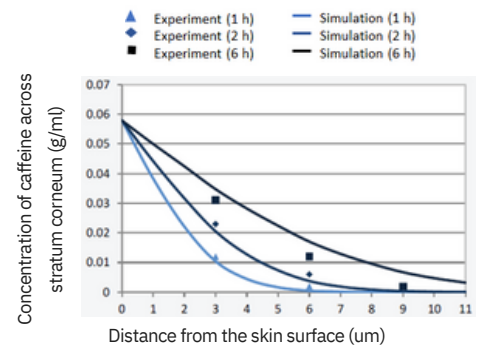
Investigate

Variations and other factors



Optimize

Compounds, formulations, dosing and other parameters



Reduce

Development time and cost

ABOUT US

PUISSAN BIOTECH

We are a rapidly growing biotech startup with operations in Finland and China. Our international and multidisciplinary team develops software solutions, microfluidic devices, and provides consulting services in the field of Life Sciences to pharmaceutical industries, research institutions, and personal care companies.

At Puissan, we understand the challenges faced during drug discovery and development. Therefore, our goal is to enhance the efficiency of R&D processes by offering a combination of **organ-on-chips** and **PBPK modelling** expertise, providing a unique and synergistic approach to improve and accelerate drug development processes.

OUR SOLUTIONS AIM TO



**Replacement,
Reduction,
Refinement**



Reduced costs



Reliability



Time saving







More data

Examples of our recent projects include:

- Simulation of absorption and permeation of chemicals into and through human skin
- Prediction of drug pharmacokinetics in mice
- Investigation of anticancer drugs effectiveness on-chip
- Development of an ovarian cancer chip in collaboration with the University of Helsinki

CONTACT US

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