NONLINEAR TRANSPORT OF MOLECULES THROUGH CELL LAYERS

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Absorption of pharmaceuticals happens mostly in the small intestine. Many drugs have the ability to pass through the cell membrane with a flux proportional to the concentration difference. This linear process is usually limited by efflux transporters. These membrane proteins clean the cell volume of unwanted molecules. This process is nonlinear, shows saturation for high concentrations and is usually described by MICHAELIS-MENTEN dynamics [1,2]. However absorption measurements focus on the time before saturation and deal with linear concentration changes.

In our work we take the dynamics of the linear and nonlinear processes together. Equilibrium concentrations can be solved exactly.

Simplifying the model to a mathematically treatable form the time evolution can be approximated. Characteristic time scales as well as slopes in the unsaturated case can be given.

Analytical solutions give a tool to analyse sources of high variablity which is - as common in many biological systems - observed in the experiments.

[1] Ruiz-García et al., Journ. of Pharm. Scien., **91**, 2511-2519 (2002).

[2] Gonzalez-Alvarez et al., Xenobiotica, 1067-1088 (2005).