

Basic: Michaelis-Menten type enzymatic reaction

Summary: Michaelis-Menten (MM) type enzymatic reaction is often used in pathway simulations, because there are many such reactions in the activation of proteins. In MM reaction, the enzyme-substrate interaction is described by a forward and backward reaction (equilibrium reaction), and that for the generation of product is described by a 1st order reaction.

Cartoon and A-Cell model: MM reaction is a simple example and the cartoon and A-Cell model is the same as shown in left panels in Fig.1.

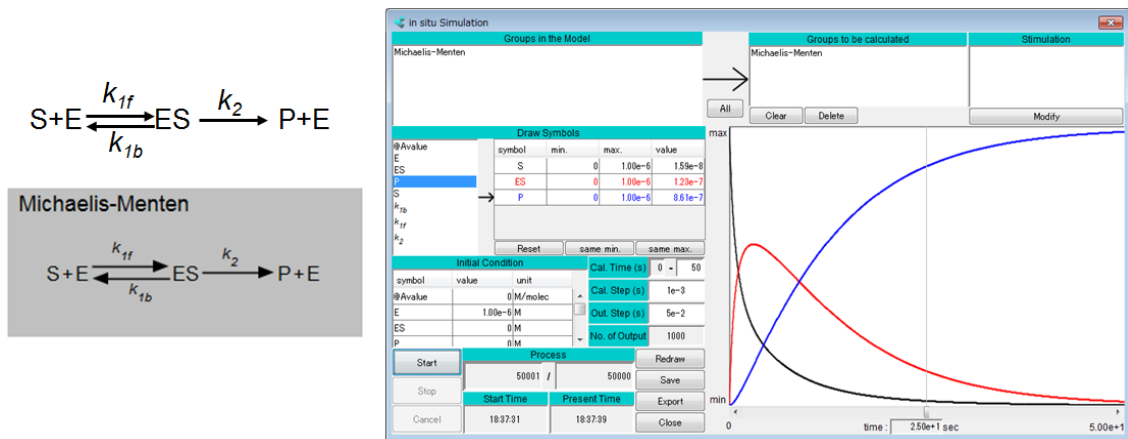


Fig.1 Cartoon and A-Cell model for Michaelis-Menten enzymatic reaction (left) and its simulation result (right).

Simulation result is shown on the right of Fig.1. The substrate (black line) decreases monotonically, enzyme-substrate complex (red line) is transiently formed with a single peak, and the product (blue line) monotonically increases. The simulation condition was as follows: simulation time = 0-50 s; calculation step = 1 ms; output step = 0.05 s. While the basic behavior of substrate and product is not change by parameter values as monotonic decrease and increase in substrate and product, respectively, the time course of enzyme-substrate complex is different by different values of rate constants. It is often assumed that pseudo equilibrium is realized between E, S and ES but within a certain range in values of rate constants. It will be valuable to test to what extent this assumption holds by the change in the rate constants.