

### Basic: Chain Reaction

**Summary:** Chain reaction is a consecutive reaction in which activation is transmitted sequentially towards downstream molecules, and is a form of signal transduction in a cell when ligand binds to cell surface receptors transmitting the signal to downstream proteins. Here a chain reaction of 1<sup>st</sup> order reaction is shown.

**Cartoon and A-Cell model:** Cartoon (top panel in Fig.1) and A-Cell model (bottom panel in Fig1.) are the same for this simple example.

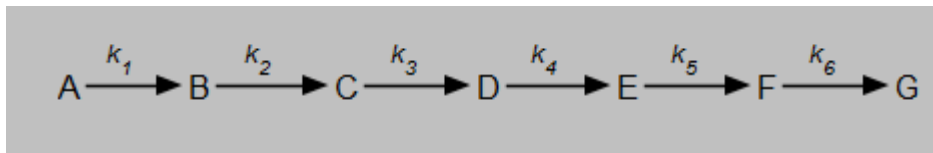


Fig.1 A chain reaction

A signal by molecules A is transmitted to B, and that of B is transmitted to C, and so on by rate constants  $k_{1-6}$ . The same value of 0.1 /s was used to all rate constants. Simulation conditions are as follows: calculation time = 0-100 s; calculation step = 1 ms; output step = 0.1 s. Results are shown in Fig.2, where the first molecule A and the last one G decreases and increases monotonically, respectively, while C and E, intermediate molecules, have one peak in their time courses.



Fig.2 Simulation results of chain reaction

Signal transmission to downstream proteins in a cell is far more complex including 2<sup>nd</sup> order and Michaelis-Menten enzymatic reactions. It will be interesting to find what is happening if reactions in Fig.1 are changed to 2<sup>nd</sup> order or equilibrium reactions.