THE TOTAL QUASI-STEADY-STATE APPROXIMATION FOR A COMPETITIVE SYSTEM

Minyoo KIM [1], Hyukpyo HONG [1] and Jae Kyoung KIM [1]

1) *Department of Mathematical Sciences, Korea Advanced Institute of Science and Technology, Daejeon 34141, KOREA*

Corresponding Author: Jae Kyoung KIM, jaekkim@kaist.ac.kr

ABSTRACT

In many studies on enzyme kinetics in drug metabolism, the partial equilibrium approximation (PEA) and the standard quasi-steady-state approximation (sQSSA) have been widely used without analytic validations. However, these methods are valid only for limited range of parameters, and for some drugs, values of the parameters are out of range. To overcome the limitation, the total QSSA (tQSSA), which is valid for a broader range of parameters, has been introduced. In particular, tQSSA for the competitive system can be applied by solving a cubic equation. However, the condition of the parameters to choose the biological meaningful solution among the three roots has not been shown. We propose an explicit condition of the parameters. Moreover, we present the numerical simulation results that show the tQSSA with the condition provide a better fitting to full system than the PEA and the sQSSA.