Modelling of de novo biosynthesis of purines and pyrimidines in E. coli cells

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A model of *de novo* biosynthesis of pyrimidine nucleotides in E. coli cells has been developed (Fig. 1). The ranges of values at which the model demonstrates an experimental steady state have been determined.

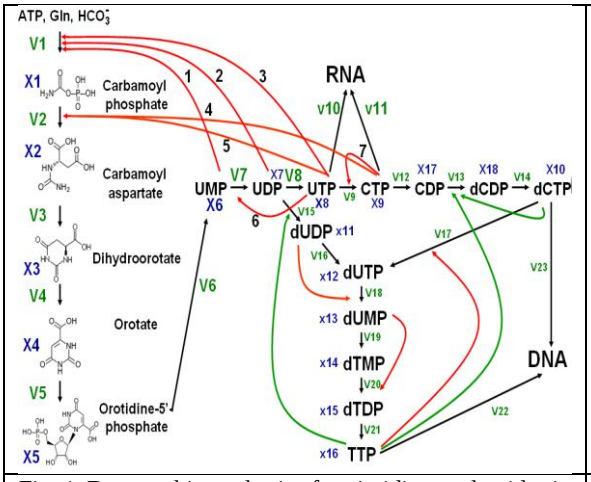

Fig. 1. De novo biosynthesis of pyrimidine nucleotides in *E. coli*. Black arrows indicate enzymatic reactions occurring under aerobic conditions. Red arrows indicate inhibition of enzyme activity, and green ones, activation. Vj (j=1,…,23) are enzymatic reaction rates, and Xj (j=1,…,18) are variables in the model: concentrations of low-molecular-weight compounds. Structural formulae and full names are indicated for five substances, and common abbreviations, for others.

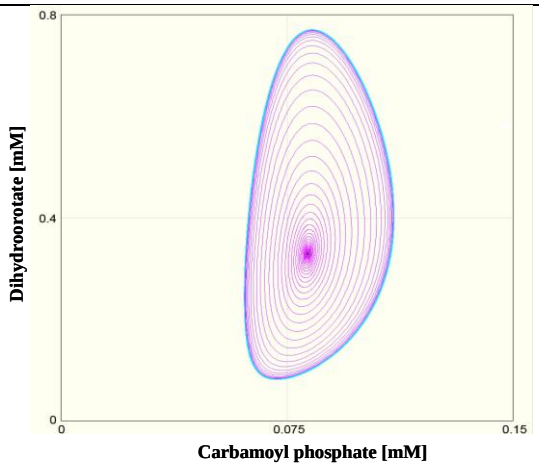

Fig. 2. Phase portrait of the behaviour of the pyrimidine biosynthesis model. The early phase of the evolution of the Cauchy problem solution starting from a point close to the stationary point (black dot) is shown with a magenta curve. The late phase of the solution evolution is shown in blue. The attractor to which the solution is attracted is shown in cyan.

The instability of the steady state and the presence of an oscillatory attractor have been established (Fig.2). The biological interpretation of the results is considered.

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