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A NEW REDUCED SYSTEM OF MICHAELIS-MENTEN ENZYME REACTION MODEL

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Michaelis-Menten enzyme reaction model is a system consisting of four non-linear, simultaneous, ordinary, differential equations that model catalytic activities of reaction mechanisms of various enzymes. The four differential equations connect concentrations of substrate, enzyme, intermediate complex made by enzyme and substrate, and product with rates of changes of all former measures as a function of time. It has many applications in biology and biochemistry in understanding fundamental tasks in cells. Since it cannot be solved analytically, there are many numerical methods developed to solve such systems. Recently, Van Gorder et al. obtained a series approximation to the enzyme reaction model by transforming the non-linear coupled ordinary differential equations into one equation with the use of a transformation. Based on this work, the original Michaelis-Menten enzyme reaction model has been reduced into three new non-linear differential equations, each depending on only one dependent variable with respect to time. Finally, the spread of the concentrations was investigated numerically using Mathematica, and the results were illustrated graphically. Since the newly derived system has individual equations for concentrations of enzyme, intermediate complex made by enzyme and substrate, and the product distinctly, it is beneficial in studying each measure as a function of time separately.

Keywords: Autonomous differential equations, Michaelis-Menten enzyme reaction model, Non-linear differential equations