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MULTIPLICITY OF SOLUTIONS FOR BOUNDARY VALUE PROBLEMS ARISING IN MATHEMATICAL MODELS OF ENZYME-CATALYZED REACTIONS [1]

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Let us consider the boundary value problem which arises in mathematical modelling of enzyme-catalysed biochemical reaction in spherical particle with radius $r \in [0, R]$

$$\frac{d^2c}{dr^2} + \frac{2}{r}\frac{dc}{dr} = f(c);$$

$$\frac{dc}{dt}(0) = 0, \quad \alpha c(R) + \beta\frac{dc}{dt}(R) = \gamma,$$

where $f(c)$ is the reaction rate at product concentration c, determined by chosen reaction kinetics, but $\alpha, \beta, \gamma \in R$.

In paper [1] was shown that in realizable non Michael-Menten kinetics with

$$f(c) = \frac{c}{k_1 + k_2 c + k_3 c^2}$$

this boundary value problem with appropriate constants k_1, k_2, k_3 could be with multiple solutions.

Now we consider mentioned boundary value problem with sigmoid reaction kinetics

$$f(c) = \frac{c^n}{k_1 + c^n}$$

focusing to the both cases: $n > 1$ (positive cooperativity of enzymes) and $n < 1$ (negative cooperativity of enzymes).

REFERENCES

[1] J.Cepītis. Unique and multiple solutions of the boundary value problem modelling biochemical reactions in the spherical particle. *Proc.Latvian Acad.Sci.*, **B** 4(549)):72–74, 1993.

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