



Some aspects of mathematical modelling of cell cycle

Ryszard Rudnicki¹, Katarzyna Pichór²

¹Institute of Mathematics,
Polish Academy of Sciences, Poland
rudnicki@us.edu.pl

²Institute of Mathematics,
University of Silesia, Katowice, Poland
katarzyna.pichor@us.edu.pl

Modelling of cell cycle is one of the fundamental subject of mathematical biology because it could help to solve such problems as synchronization of cell division in cancer therapy and allows to understand dynamics of growth of cellular populations (e.g. tissues). There are many different models of cell cycles. In this talk we consider an age-size structured cell population model based on the cell cycle length [1]. The model is described by a first order partial differential equation with initial-boundary conditions. Using the theory of semigroups of positive operators we establish new criteria for an asynchronous exponential growth of solutions to such equations. We discuss the question of exponential size growth of cells. We study in detail a constant size growth model and a model with target size division. We also present versions of the model when the population is heterogeneous. The discussion on model generalizations will be a good excuse to present some new challenges in the study of asymptotic behaviour of semigroups of operators.

Keywords: cell cycle, size-age structured model, semigroup of operators, asynchronous exponential growth

MSC2020: 47D06, 35F15, 45K05, 92D25, 92C37

References

- [1] K. Pichór, R. Rudnicki, Cell cycle length and long-time behaviour of an age-size model, *Mathematical Methods in the Applied Sciences*, 45(10):5797-5820, 2022.