Mathematical Methods and Models in Biosciences
June 15–20, 2025, Sofia, Bulgaria
https://biomath.math.bas.bg/biomath/index.php/bmcs

A nonconservative kinetic model for the medical treatment of autoimmune response

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A nonconservative kinetic framework is developed for modeling immune system dysregulation. The model describes a population of stochastically interacting agents subject to an external action, which has a specific analytical form in view of biomedical applications. Within this setting, some results are obtains concerning local-in-time existence, uniqueness, positivity, and boundedness of the solution to the associated problem. The model is then extended to investigate treatment strategies in the context of autoimmune responses, distinguishing between the autonomous and non-autonomous cases, corresponding respectively to the absence and administration of drugs. The autonomous case allows for an analytical stability analysis, while the non-autonomous case is addressed qualitatively. Numerical simulations are presented for both configurations.

References

[1] M. Menale, R. Travaglini, A nonconservative kinetic model under the action of an external force field for modeling the medical treatment of autoimmune response, *Communications in Nonlinear Science and Numerical Simulation*, 137:108126, 2024.