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A NON-STANDARD DISCRETIZED *SIS* MODEL OF CO-INFECTION IN A HETEROGENEOUS POPULATION

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ABSTRACT

A discrete-time model of co-infection dynamics in a heterogeneous population is presented. In such a population we distinguish two subpopulations with different levels of individual susceptibility to any of the two diseases. As a discretization method we use a non-standard discretization scheme that preserves positivity of system's variables. The novelty of our works lies in assuming that each parameter describing a specific biological process has a different value for each subpopulation. This assumption makes the investigated population completely heterogeneous. We investigate a local stability analysis of a disease-free stationary state. Because of our system's complexity, we only give insight into local stability of equilibria that correspond to the presence of a single disease. For such states we provide conditions for their local stability, considering boundary cases. We conduct numerical simulations that suggest such postulated stability. Moreover, the simulations show that there should exist a locally stable state, which reflects the simultaneous presence of both diseases. The simulations also illustrate the concept of an infection rate, which helps compare the impact of both diseases on the dynamics of co-infection spread.

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REFERENCES

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