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Optimal pollution control for a waterborne pathogen model

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Abstract

In this talk, a waterborne pathogen model is studied due to an increase in the number of deaths caused by water-related illnesses in the world [1]. The model is constructed by dividing the population into three groups, namely, susceptible, infected and recovered compartments. Here, we include the effect of stressors, since pollution can be caused by lack of clean water and hygienic conditions. Indeed, 5% of health care facilities in low and middle-income countries do not have water and soap, and half of the world's population is predicted to live in water-stressed zones by 2025 [2]. We extend a model with a time fractional derivative to include non-local effects of pollution [3]. We investigate some suitable policies to reduce the reproduction number associated with the model. Specifically, the decay rate of pathogens and the stress related parameters are optimized in order to minimize the number of infected individuals and reduce the pathogen population in size. At the end, we present some numerical results to find out the most appropriate control policies and the impact of the fractional order derivative.

Key Words: Optimal control, Waterborne pathogen model, Stability, Stress.

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