MATHEMATICAL MODELING ON THYROID CANCER TREATMENT USING ODE WITH ALLEE EFFECT

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The continuous increase in the number of papillary thyroid cancer (PTC) cases is a global trend [1]. The most commonly used treatments for extinction of these tumors are thyroid gland removal surgery and therapeutic application of radioactive iodine I-131 (RAI) [2]. Interleukin 6 (IL-6) is studied in PTCs due to the presence of high concentrations of this cytokine in malignant tumors [3]. Models of ordinary differential equations (ODE) are common in the study of cancer biology, in which various types and subtypes of malignancies are addressed [4]. In this work we propose an Allee effect ODE model to study PTC treatment with RAI, the following variables are assumed: the activity of RAI, the number of tumor cells during treatment, and IL-6 and thyrogobulin concentrations. The aim of the study is to evaluate different therapeutic doses of RAI in treatment considering a positive influence of IL-6 on tumor proliferation. Results obtained through numerical simulations and linear stability analysis indicate minimal doses of RAI capable of causing tumor extinction when certain immune system-related biological conditions or other factors are considered. Furthermore, the scenarios obtained show that small doses, even leading to tumor extinction, allow delays in the total elimination of malignant cells.

References

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