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Stochastic modelling of the oral cancer proliferation and death in the presence of Thymoquinone as anticancer therapeutics

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Abstract

Oral cancer is one of the most commonly known cancer worldwide. Thymoquinone (TQ) an extract from *Nigella sativa*, has clinically been proven as an anticancer therapeutic agent for oral cancer due to its intrinsic pharmacological characteristics. Understanding the mechanisms of oral cancer

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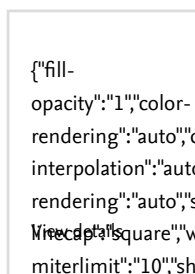
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proliferation and death in the presence of TQ is crucial so that the insight of the interaction of cancer cells and TQ can be discovered. Cancer cells in the presence of TQ is subjected to the uncontrolled factors of the environmental noise. Deterministic model is inadequate to explain this behaviour. Herein, a stochastic model is proposed to illustrate the dynamics of HSC-3 oral cancer cell lines in the presence of TQ. The deterministic model is perturbed with the noisy behaviour which then leads to the stochastic model. The model is simulated by using a four-stage stochastic Runge-Kutta (SRK4) method and the kinetic parameters are estimated by using the maximum likelihood estimation (MLE) method. The prediction quality of the model is measured by using root mean square error (RMSE). The low values of RMSE show the best-fit of the stochastic model. © Published under licence by IOP Publishing Ltd.

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