

## **A Mathematical Carcinogenesis Model for Space Radiation**

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We develop a mathematical  $n$ -stage carcinogenesis model with parameters characterizing different biological processes arising when a stem cell population is continuously irradiated with high-LET HZE radiation. This multi-step model is mathematically described by a set of non-linear differential equations, and assumes  $n$  possible mutations before a normal cell becomes a cancerous cell.

Exact closed form and numerical solutions for  $n=1$  and  $n=2$  mutations, and a given dose rate, are explicitly written down and plotted for comparison. It is also discussed the link between the proposed carcinogenesis model and the standard Target theory. Finally, we solve the proposed carcinogenesis model where is more plausible to occur, i.e., in an interplanetary travel from Earth to Mars where Earth's magnetic shield and atmosphere can not longer shield us from Galactic Cosmic Rays and Special Particle Events.

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