APPLICABILITY OF MULTI-STAGE MODEL ON CANCER INDUCTION RISK EVALUATION

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Cancer is the most common cause of deaths in Japan and is major cause for concern in many countries. Hence various measures to fight cancer induction have been taken on a global scale. According to literature survey, cancer is induced when stem cell changes the malignant cell through one or more mutations. Various experiments and numerical simulations have been carried out with respect to mutations. The present study was focusing on the number of mutation times and the purpose of this study was to facilitate the risk assessment by speculating the number of mutation times from the aspect of mathematical models.

According to the theory of mathematical model, the probability of cancer induction is expressed as a function of time (age) and the two parameters are forming the linear-relationship. The slope of the linear curve shows the number of mutation times. This fact can lead to speculating the number of mutation times of the cell. In our experiment we used the 50 years' statistical data of Japanese dying of major cancer and speculated the average mutation times of major cancer for Japanese. As a result, for example, the lung cells mutated 6 times in order to cause lung cancer where as the stomach cells mutated 5 times in order to cause stomach cancer.

Next we built the generalized-MVK (Moolgavkar-Venzon-Knudson) model by using mutation times mentioned above and compared the generalized-MVK model with the MVK 2-stage model to evaluate the fitting accuracy. As a result, the generalized-MVK model showed better fitting accuracy than the MVK 2-stage model. Therefore we concluded that, the derived mathematical model, and the calculated mutation times could facilitate the risk assessment better.