BOOK REVIEW

Synergistic Interaction and Cell Responses to Environmental Factors
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One of the authors (Prof. V.G. Petin) is my old acquaintance. That is why my review is based on my knowledge of his work; as well as the book.

One of the aims of this Monograph is to determine whether the synergistic interaction of ionizing radiation and hyperthermia and other factors are connected with the impairment of the recovery capacity per se or to the production of irreversible damages which cannot be repaired. A quantitative approach describing the recovery process was presented and firstly applied to estimate the recovery constant, i.e. the probability of recovery per time unit, and the irreversible component after the combined thermo-radiation action. It was shown that the probability of cell recovery was independent of conditions of the thermo-radiation action while the irreversible component gradually increased as a function of thermal load.

Hopefully, the mathematical approach described in this Monograph may be helpful to search agents selectively acting on the probability of recovery and the yield of irreversible radiation damage. It can be expected that their combination could be perspective in cancer research.

On this fundamental new founding, a new semi-empirical model of synergistic interaction is advanced. According to this model, the synergy is determined by the interaction of sublesions induced by both agents. The model predicts the dependence of synergistic interaction on the ratio of damage produced by each agents used in combination, the greatest synergy and condition under which it can be obtained.

It was demonstrated the unusual dependence of synergy on the intensity of ionizing radiation, UV light, microwaves and ultrasound after their application with heat. The essence of this dependence can be reduced to the following facts. The synergy can be observed only within a certain temperature range. Inside this range an optimal temperature can be observed. The decrease in the intensity of the applied physical factors necessitates the shift of the exposure temperature to lower temperature to preserve the most effective synergy.

Some new experimental data of photoreactivation after combined action of ionizing radiation and visible light are presented. It is concluded that photoreactivable damage induced by ionizing radiation might be UV-like damage produced by Čerenkov light emitted by charged particles when their velocity exceeds the phase velocity of light in the medium. A simple mathematical model for biological estimation of UV light dose concomitant to ionizing radiation was suggested.

In addition to the value for fundamental radiobiology and synergetic, works of Professor V.G. Petin and his team seem to me, as a doctor of medicine, more valuable for practical medicine, because knowing the laws of synergistic interaction may be a powerful instrument, increasing the effectiveness of the combined treatment of diseases, especially cancer. Presented in the monograph regularities show the way and the method by which it is possible to identify the most pronounced a synergistic effect. And that is what is required for example for planning and forecasting of combined methods of treatment, such as combined radiation and hyperthermia, poly-chemotherapy and radiotherapy, radio and
photodynamic therapy of cancer. Unfortunately, regularities of synergies are not commonly used in clinical practice. I hope that this monograph stimulates clinical studies to search for more effective methods in the combined treatment of diseases.

Review provided by Dr. Y.N. Anokhin, MD - Head of Nuclear Medicine Department, National Research Nuclear University, Obninsk, Russia