HEALTH EFFECTS OF LOW LEVEL RADIATION

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In 1982, Prof. Emeritus Thomas D. Luckey asserted "Radiation Hormesis" on the Journal of Health Physics, explaining fundamental bio-positive effects with more than 200 references. He also published two books on the Radiation Hormesis. On the last chapter of the second book published in 1992, he summarized his opinion by a figure showing the hundred times of natural background radiation is optimal and the thousand times of natural background radiation is acceptable, on the health effects of low LET ionizing radiation (gamma ray or X ray) by low dose rate exposures. If this were to be true, our common sense of the radiation management was extremely erroneous. We thought we were responsible to find the truth. Radiation Hormesis research in Japan steered by CRIEPI to find the truth on the claim of Prof. Emeritus T. D. Luckey has brought out extremely interesting scientific information on the health effects of low level radiation.

The scientific data of animal tests we obtained and statistical results actually brought by Radon Therapy on human patients showed us the bright understanding of health effects of low level radiation. Here, I would present many animal test results and epidemiological survey data we obtained through our research activities cooperating with more than ten Universities in Japan, which are categorized as follows.

1. Rejuvenation and suppression of aging by increasing cell membrane permeability and enzyme syntheses.
2. Suppression of cancer by enhancement of immune system based on gene activation.
3. Avoidance and Therapy of obstinate diseases by enhancing damage control system and hormone formation.
4. Pain relief and stress moderation by hormone formation in brain and central nervous system.
5. Adaptive response by activation of gene expression on DNA repair and cell Apoptosis.

The recent progress of molecular biology, nuclear medicine, and measurement technology of comprehensive cell activities helped us to obtain such a profound understandings and findings.

I would envisage main topics as follows from our low level radiation research.

(1) Increase of survivals after the treatment of Non-Hodgkin's lymphoma by adding repeated 10 cGy whole body low doses.
   (Sakamoto, Tohoku Univ.)
(2) A-bomb survivor received the low dose of 5 to 70 cGy showed lower risk level than non-exposed people.
   (Okumura, Nagasaki Univ.)
(3) Many years Epidemiology on Misasa Radon spring villagers showed clearly lower cancer risk than the risk level of other people.
   (Mifune, Okayama Univ., Kondoh, Osaka Univ., Tanooka, National Cancer Center)
(4) Enhancement of the activity of tumor suppression gene p53 given by low dose or low dose rate such as Space travel may produce the elevated states of DNA repair and cell Apoptosis.
   (Ohnishi, Nara Medical Univ.)
(5) Adaptive response showed two windows 5 to 10 cGy effective by two months and 30 to 50 cGy effective by two weeks.
   (Yonezawa, Osaka Pref. Univ.)
(6) Stress moderation or pain relief shown by animal tests.
   (Miyachi, Yamada, Toho Univ.)
(7) Increase of cell membrane permeability, SOD, and Glutathione Peroxidase showed rejuvenation or suppression of aging.
   (Yamaoka, Okayama Univ.)
(8) Increase of hormone such as Insulin, Endorphin, Enkephalin, Histamin, and Adrenaline brought a good confirmation of Radon Therapy.
   (Yamaoka, Okayama Univ.)

Collaboration with the specialists of Radon Therapy Hospitals such as Bad Gastein in Austria brought us an apparent evidence with human epidemiological data supported by recent technology of the measurements on the comprehensive physical data. Ionizing radiation fundamentally produces great numbers of electrons, ions, and free radicals causing elevated conditions of bio-chemical reaction, which makes positive activities for the clear results on all of homeostatic
activities enhancement.

Living materials exist on the homeostatic potentiality which directs our physical activities to obtain better condition against all kinds of degradation occurring due to the environment. This is adaptive response itself. Certain optimum dose rates for various bio-positive effects shall be found in future through really comprehensive animal tests in all kinds of responses categorized above for the actually positive applications of low level radiation to human being. Not only dose rate optimization but also various combinations with other factors such as circumstantial temperature and meals shall be determined, through long term investigation to obtain the real quality of lives.

In next century, optimized dose rate applications are to be utilized to obtain excellent enzyme syntheses, optimum hormone formations, optimized activation of gene expressions for DNA repairs and cell Apoptosis.

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**References**


