

XI Regional Congress of IRPA  
(International Radiation Protection  
Association). Austrian-Hungarian-  
Yugoslav Radiation Protection Meeting  
"Recent Developments and Trends in  
Radiation Protection."  
Vienna 1983

DO BIOPOSITIVE EFFECTS OF IONIZING RADIATIONS EXIST?

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Abstract

The claim that radiations, e.g. in spas, can have biopositive actions on humans is unproven and unplausible. It also conflicts with the contents of the standard handbooks and with national legislation everywhere. Further, stimulation of plants by radiation is badly reproducible. But even if existing it need not be beneficial to the plant itself ("selfpositive").

Zusammenfassung

Die Behauptung, daß Strahlen, z.B. in Badeorten, biopositiv wirken können, ist unbewiesen und unplausibel. Sie widerspricht auch dem Inhalt der offiziellen Handbücher und der Gesetzgebung über Strahlenschutz. Die Stimulierung von Pflanzen durch Strahlen ist schlecht reproduzierbar. Aber auch wenn sie existiert, muß sie nicht für die Pflanze selbst vorteilhaft ("selbstpositiv") sein.



In this contribution I shall deny that the existence of biopositive effects of ionizing radiations has been proved. It will also be shown that quite apart from the implausibility of such effects it would methodologically be quite difficult to prove their existence (Broda 1973, 1977, 1981, 1983).

In the promotional literature emanating from spas favourable effects of a stay there are often ascribed to ionizing radiation, mostly from radon and its decay products. These claims have influenced some provincial legislation (Landesgesetzgebung) in Austria where it has been laid down which spas are entitled to call themselves proudly Radonheilbad. Also in the official "Heilquellen- und Kurortebuch" (1975) of our Republic beneficial effects of radioactivity, notably in Badgastein, are mentioned. A recent, crass, example, is a long article about Gastein in the daily newspaper belonging to the Republic of Austria (m.t. 1982) where the biopositive effects of the radiations are taken for granted. Similar beliefs in biopositive effects of rays are held in other countries (Kuzin 1977; Luckey 1980, 1982; Hickey et al. 1981, 1983; Andreyev, 1981).

These beliefs are in striking contradiction to the contents of national and international scientific handbooks, including the BEIR III (1980) and the UNSCEAR (1982) reports to which many of the world's most eminent experts contributed. Nowhere are beneficial effects mentioned. Rather, it is discussed in which way the frequency of stochastic damage (mutation, cancer induction) should be extrapolated even to lowest doses. Nor are beneficial effects mentioned, as far as I know, in national legislation anywhere. On the contrary, all radiation exposures must be as low as is reasonably achievable (ALARA principle). If biopositive effects really existed it would surely be better if legislators arranged for certain minimum exposure of all humans?

(Be it emphasized in brackets that we exclude the case where exposure of particular cells that are thereby damaged benefits an organism as a whole, notably in tumour treatment. Nor do we want to refer to useful mutations, of course far rarer than harmful mutations. We are dealing here only with the alleged benefit obtained in the generalized irradiation of organisms.)



From the start, the existence of biopositive effects is not plausible. Ionizing rays have energies far exceeding the energies involved in cell metabolism. Therefore it cannot be expected that the rays improve structure or function of cells hit. Rather they are highly destructive. While this can hardly be denied, it was claimed that decomposition products, fragments, of destroyed cells could stimulate other, healthy, cells. Yet a process of this kind has never been demonstrated. Because of the implausibility of the biopositive action the burden of proof must be put clearly on the shoulders of the proponents.

The promotional literature from spas is full of success stories. Now it is not questioned here that a time spent in a spa, radioactive or not, can improve the condition of the patient. The problem is, however, whether the improvement is due to radiation, or to any of the many other factors acting on the person. To the best of my knowledge, no experiments with suitable controls exist either with humans (difficult or impossible to carry out) or with animals (which ought to have been done long ago).

A striking case is that of the healing gallery (Heilstollen) in Böckstein near Badgastein, a disused gold mine, into which patients are introduced by rail for a stay of some hours. Here it has been claimed but never been shown that the alleged good effects are due to the concentrated radon (average 3 nCi/litre) rather than to other factors, e.g. the high temperature and humidity ("sauna climate"). Thus there is no information on that point in the bulky monograph on the gallery (Scheminzky 1965). Clearly, however, the workers in the gallery are exposed to lung doses enormously larger than permitted by general radiation protection legislation, and much increased frequency of lung cancer must therefore be expected (Pohl and Pohl-Rüling, 1980; Uzunov et al. 1981). Owing to a loophole in the law the gallery can continue. How the owners of the profitable business face their moral responsibility is another question.

Luckey (1980) has in his book more than a thousand references on biopositive action. Yet the evidence is not conclusive. Often controls are lacking, and results have not been reproduced, as admitted by Luckey. This does not prevent him from suggesting (p. 46) that ionizing radiation is essential for life, and - elsewhere (Luckey, 1981) - that the high

literacy rate in the Indian province of Kerala is due to its rocks rich in thorium.

An additional problem is the following. For the sake of argument we assume that structure or function of some part of an organism or of some in vitro system are affected reproducibly by the rays, and that good controls exist. This still does not prove that the effects are biopositive. In evolution organisms were optimized. Therefore it is unlikely, and would certainly have to be demonstrated, that the given change in structure and function is an advantage to the organism.

Even if in a patient one succeeded in bringing back some function to the norm value by irradiation, it would still remain open whether this would be an advantage for the patient. For the proof of a beneficial effect more would be needed, namely, evidence that the patient's vitality, length of survival, etc. has been improved. Clearly suitable tests with experimental animals must be devised.

It has been argued (Uzunov 1979) that in some situations application of radon to patients carries considerable danger of cancer induction. But even where, because of the smallness of exposure, this is not so, the claims of benefit, unsupported by hard evidence, imply contempt of the public. From the standpoint of science, it is a scandal.

Many experiments refer to plants. One of the earliest, and most famous, examples of an alleged biopositive action ("stimulation") is owed to the great plant physiologist Hans Molisch (1914) of Vienna. He found acceleration of the development, e.g. of branches of lilac, by exposure to radon. Yet, assuming validity of this report, biopositive action has still not been proved. It may be an advantage for the market gardener to sell his plants before the competitors. But there is no proof that the plant itself has benefited. Thus experiments of this kind do not really answer the question of biopositive effects.

This consideration also applies, of course, to the practice, fairly widespread in some countries, of irradiating the seeds or shoots of agricultural crop plants. Possibly development is speeded up and/or grain yields are increased, etc. So the practice may be justified from an economic point of view provided results are reproducible. But again a



success would not prove the existence of effects that are biopositive from the standpoint of the plants themselves. Such effects might be termed "selfpositive" ("selbstpositiv").

Quite apart from this our main problem wonderment may be expressed that the question of crop stimulation by rays has not yet been conclusively settled one way or the other. One should think that this cheap way of helping farmers should have a smashing success. Irradiation would have been introduced long ago generally if the claimed stimulation could be relied upon. Yet the results are badly reproducible. The large fluctuations observed remain unexplained. Serious research in this field is needed, with evaluation of results by sound statistical methods.

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