



THE PRESENT STATUS OF RADIUM

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Radium is a metallic element very highly active chemically, difficult to isolate in its metallic state and after isolation, to keep pure. It is commonly produced in form of its soluble salts such as radium bromide and chloride, in which form it is used in emanation plants for the making of Radon or capillary tubes of radium gas for implantation into malignant growths, or in an insoluble powder of carbonate or sulphate of radium which is used in form of plaques or tubes for local applications. It has the property of spontaneously and continuously emitting radiations, part of which are capable of penetrating most of ordinary matter—even dense plates of metal.

The penetrability of a substance to radium rays depends chiefly upon its specific gravity; the greater gravity the less penetrable by radium. It has the property of setting up secondary radiations in many minerals. There is a continuous transformation of its own atomic elements during which rays are emitted, known as the Alpha, Beta and Gamma radiations. It is estimated that the radio-activity of a piece of radium will have exhausted not more than one-half of itself in the course of 1700 years.

Its discovery followed three years after the discovery of x-ray by Roentgen and was not an accidental one, as somewhat characterized the x-ray. It had long been known that certain metallic ores such as thorium, polonium and uranium under certain conditions would give off a so-called phosphorescence—emit a faint glow of light.

Soon after the discovery of x-ray in 1889 by Roentgen, Becquerel, Professor Curie and his assistant, Madame Curie, and others began to analyze these peculiar radio-active metals. In the meantime a ton of uranium ore had been generously donated by the American Government to the Physics Department of the University of Paris for research purposes. After long, arduous days and nights Madame Curie finally succeeded, by repeated and continuous reduction of uranium salts, to extract a more powerful radio-active element than had yet been discovered. She reasoned that this must be the “radix” or the “root” of all radio-active substances and, therefore, named this new element “radium.”

Radium remained an element with which scientists merely played and performed experiments until 1901 when Becquerel accidentally received a marked skin re-action on his body after having carried some of the metal in his waistcoat pocket for a few hours. This at once suggested possible therapeutic properties and henceforward, radium became more and more of increasing value to the medical rather than to the industrial world.

Two years after its discovery, Becquerel and Geisel working together greatly enhanced its value as a therapeutic agent by separating its radiations into three distinct types of rays having different wave lengths, somewhat similar, though possessing different physical and biochemical properties. To these rays they gave the name of Alpha, Beta and Gamma, in order of their wave length and frequency.

In succeeding months Professor Curie repeated by experiment on his own body the skin re-action which had previously occurred by accident upon the skin of Becquerel. This led Danloss to try out radium in the Saint Louis Hospital on several different skin diseases, some of which re-acted favorably. This stimulated further therapeutic experiments in various hospitals and private clinics.

Radium is still used to a limited degree in the chemical and industrial world, such as in the production of helium gas and the disintegration of certain chemicals into their various parts, and commercially by the addition of small amounts of radium to delicate paints for painting of luminous dials for clocks, watches, aeroplanes, etc. Recently, however, there has been so much unfavorable publicity of the serious injuries to some of the employees in one of the pioneer watch factories of New Jersey by their frequent painting of their paint brushes between their lips, that there is danger that such use may be prohibited by legislation except under certain regulations.

Like every other powerful physical or chemical discovery since the time of man, radium has suffered many handicaps in medicine while passing through its experimental period by falling into the hands of daring, enthusiastic, would-be radiologists. Such abuses of radium have been paralleled only by the reckless, venturesome, unqualified—and, in many cases, the unjustified—surgery of a few years ago. It is gratifying, however, that notwithstanding the lamentable accidents in its handling and its disappointments as a curative agent in many diseases, radium has, nevertheless, evolved for itself a place in medicine that cannot be replaced by any other known agent. Like other new remedies it has been tried in nearly all so-called incurable diseases as well as curable ones though summarizing the whole, its specific curative values thus far can perhaps be satisfactorily demonstrated in less than a dozen diseases, among such diseases are the neoplasms, both malignant or benign.

A brief discussion of its chemical, biochemical and histological effects upon human tissues will enable us to better understand its curative value. Such effects are furthermore influenced by the kind of screening or filters used, for radium is never used for local applications except as it is filtered through metals—aluminum, brass, lead, gold, gauze or distance screening.

It has been repeatedly demonstrated that both normal and pathological cells, as well as the constituents of the blood stream, will undergo marked changes when exposed to radium. Different types of body cells have dif-

ferent degrees of radio sensitiveness. Endothelial cells, such as line the walls of the vascular system, glandular structures and certain pathologic cells are highly radio sensitive. The recently produced Canti Cancer Film has very much clarified and corroborated certain controversies of radiologists as regards both normal and pathological cell re-actions to radium.

Briefly stated: (1)—Minute amounts of radiation stimulate cellular activity while large amounts inhibit and destroy.

(2)—Cells which are undifferentiated biologically and physiologically immature are most easily influenced by radium.

(3)—Bacteria are not directly affected by the Gamma Rays though may be entirely destroyed in the test tube by large amounts of Alpha and Beta radiation.

THE USE OF RADIUM IN DISEASES

Diseases which are most favorably influenced by radium may be enumerated briefly under two heads; namely: certain superficial lesions which are of a benign nature, such as granulomas, keloids, vascular nævi, (so-called "birthmarks") certain other benign glandular or other tissue infiltrations and hyperplasias. Second, malignant neoplasms classified as sarcomas and carcinomas.

Radium has become the remedy of choice for keloids where there is a predisposition in certain individuals for such growths to appear within the scars. It is also the remedy of choice in certain cavernous, elevated and largely vascular naevi which are ordinarily known as "birthmarks." It is a most valuable aid in the reduction of glandular enlargements which characterizes Hodgkin's, leukemia and lymphosarcomas. Perhaps its most valuable field of service, however, still is found in its almost marvelous reduction of—and in many cases absolute cures of—sarcomas and carcinomas. It is the remedy of choice in most cases of superficial skin cancers, especially where the cosmetic appearance of the individual is concerned and is also a most valuable aid to surgery in the treatment of the deeper malignant growths, whether of a carcinomatous or sarcomatous nature.

Due warning, however, must be given that an understanding of the morphology of the growth to be treated is necessary as well as the technique of application before beginning the treatment of any case.

Ofttimes the difference between success and failure lies in a proper calculation of radiation and screening necessary to give the pathological tissues a maximum or lethal dosage without injury to the normal. Therefore the application of radium should never be undertaken excepting under the direction and supervision of a physician specially trained and experienced in its use as a remedy in diseases.