150 - RADIATION: THE TENSION BETWEEN THE IONIZING RADIATION AND THE BIOLOGICAL EFFECT

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INTRODUCTION

This article intends to argue on the existing tension between the ionizing radiation and its effect on the human or biological body.

In the quality of explanation, according to Garcia's point of view (2002), ionizing is the radiation due to the transmission of energy of a system for other through electromagnetic waves, for instance, X-rays and radiation alpha. For your shift, the radiation exists no-ionizing, as the radiation originating from of the light and of the radiant heat. This last one is believed that, to provoke damages to the human being it depends on the intensity and of the time of exhibition. But, most of the time it is considered as natural radiation.

This study appeared of the experience of professional life. At first, being technician of average level in medical radiology acting in radiological laboratory. At second, being technician in nursing, also, working actively in hospitals. Finally, being trainee of Nursing in superior education level.

On the other hand, varied justifications would be to study the radiation. However, the main one is to try to understand the effect that the radiations of the X-rays type when they interact with the human cell. This radiation, seen as energy, is, of certain form, transferred to the cellular substance depending on the time of exposition of the person to the drawn out radiations of form (or not), that originate injuries or illnesses in the human body.

However, the pathologies are considered, depending on the case, a deepened search more of its real signification, or its causes derived from the radiations of rays "X", whose attendance and understanding for the professionals of Nursing are, still, incipient, or same, absent.

In this perspective, is opportune to recognize that the radiation, also, proceeding from the radiological equipment of the ionizing type provokes ionization of the atoms, that affect the cells, in an affectation sequence that harms the alive body all.

The human biological level, these effect can provoke alterations and, exactly the cellular death. Therefore, decurrent from this type of radiation, the human body, visa as a system receive the radiations and suffer influences that can bring serious consequences for its agencies, weaveeed, therefore, for its functioning.

Our practical medical radiological professional and of Nursing, in allows them to search the understanding on the influence that the ionizing radiation provokes in the human organism, of its importance of this knowledge for the professional of Nursing. Therefore, in this to know professional doubts appear on the treatment of health that can be given to the patients acometidos for males of the radiation, or same, in preventive terms, its knowledge is justified. It was of that it appeared the question: How the ionizing radiation affects the alive being? They elapse of this problematic objective o to understand on the possible effect of the radiation on the alive being, mainly of the human being, using itself as strategy the qualitative research.

Based in these decurrent comments and of the experience of the researcher, was opted to the theoretical, present finding in academic literature, on the radiations as recital source.

For this, one searchs to understand on the question of the radiation and the effect of it in molecules of a body, weaveeed agency or that, as Rey (1999) is due to positive or negative formation of ions that, when going of existing meeting of bio-molecules in the formation of agencies or fabrics of the human body provokes a harmful effect in these components.

THEORETICAL RECITAL

It is known that the human being is composed of a system of agencies, fabrics and these, in turn, are formed by the union of cells.

With respect to the cellular formation, it can be said that basic the functional unit of the human body is the cell, and about 75 trillions of cells they form the human body (GUYTON, 2002).

The cell possesses nucleus where the "lines of direction" are contained so that the cell produces one another one, equal it. The function of the nucleus, however, is not limited to the important cellular reproductive phenomenon. All the life in the cell has in it its center of command.

For understanding of this cellular particular knowledge she is necessary to know another important element in the formation of the structure of the substance or in the formation of the alive being as the atom.

Regarding to the atom, English chemistry William Prout (cited in BONTRAGER, 1997), around the year of 1816, brought the idea on the structure of the substance, still valid in current days.

For the author, the atom has three particles: protons, of positive electric load; e electrons, of negative electric load; e neutrons, without electric load. In its normal state, an atom always possesses protons and neutrons, but the atom can be composed of only one proton and an electron.

In this aspect, or of the fact to appear the element whose atom possesses minor mass, this was used as unit, as it suggested the author in its studies on the atom. It was decurrent of the studies on the atoms that the knowledge generated on the radiations that, according to Okuno.

"Electric and magnetic electromagnetic Waves are constituted De Campos rocking and if they propagate with empty constant speed nc. Waves of radio, luminous waves (light), rays infra-red ray, rays ultraviolet, rays X e rays gamma is examples of electromagnetic radiation" (1982, p. 357).

Already for Heneine (1999), rays X are electron products when they suffer acceleration from its speed or when they shock themselves against obstacles, liberating a species of energy known with the name of ray X.

In this exactly direction, can be seen by the following example: the electron of the hydrogen atom, turns around the proton in orbits individualized assets, normally, covers shortest, whose diameter is of about 1 Â (one angstrom).

But when the atom is submitted the shocks of enough intensity, it can happen that the electron is launched for a bigger orbit, where remains little time very, coming back toward usual orbit.

The reaction of the shock provokes or generates the "pull" of the electron liberating an energy. This energy caused or developed for this movement usually is known as radiation. Obviously the energy, by itself, does not produce effect or is causes of males to the beings livings creature, for the the opposite, can be life sources. However, the way to manipulate them or the purpose for which it is used is that it can bring negative or positive consequences.

SEARCHING THE EFFECT BIOLOGICAL OF THE RADIATION

The man is displayed to some sources of radiation, however, many of these radiations does not have harmful influence to the human being, saved when for exposition in soon time.

In the specific case of this study, the radiation that interests is the one that provokes injury in the human being. In accordance with Brazilian Son (2000, P. 30), "the power of penetration of the most penetrating radiations (...) is rays X and the rays gamma (...)". Thus, the harmful influences to the cells and, consequently, the human body, are decurrent of the ionizing radiations when submitted to the expositions for reason of therapeutic treatments or diagnostic.

The exposition, for its turn, can be a way that takes the penetration and contributes, depending on the degree of intensity and time of exposition they, for the appearance of effect on the human being.

In accordance with the Garcia's (2002), the ionizing radiations can act harmfully in molecules if, the amount of absorbed dose of radiation directly will be absorbed by the molecules that are essential in the some cellular metabolisms. In this in case that damages provoked by the radiation can appear.

It is opportune to emphasize on the ionizing radiations, when crossing weaveeed biological, provoke existing molecule ionization in the cells. This ionization can lead abnormal the chemical reactions and to the destruction of the cell or alteration of its functions.

When the effect of the radiations are studied, are indispensable if to distinguish the somatic effect, that if reveal in the proper radiated individuals, and the genetic effect, that eventually will go to disclose themselves in the descent of the radiated people.

In the man, the process of production of spermatozoa is extremely vulnerable the action of the radiations for involving a cellular ancestry in been constant of proliferation.

In all the stages of the process, cells can die. In the case of a located exposition, the man can present temporary fall in the production of spermatozoa that lasts while the surviving primordial cells recompose the destroyed ancestry.

The sterilization of the man for action of the radiations is possible, however, it implies in drawn out expositions or doses extremely high. Basically, he can yourself be said that in the interaction of the radiation with the fabric, the effect of the ionizing radiations in an individual depend on the absorbed dose, the frequency of exposition and the form of exposition - entire or located body.

The effect of the ionizing radiation can appear of high doses in a short space of time, being able to come to feel the effect many years later. The exposition of small doses, in a long period of time, normally is the case of people who work with equipment that emits radiations, when displayed as, in the case, the radiologists or other people that manipulate radioactive materials, being able to bring genetic and somatic consequences.

With respect to the research effected by Okuno and others (1982) on the set free energy and its power of ionization and the movement of atoms and the separations of its components and molecules, as resulted of this everything, the consequent formation of ions and radicals that if become free and reacting.

It is this reaction that can attack molecules, mainly the molecule of DNA (acid deoxyribonucleic) of the cellular nucleus, provoking damages to them. In saying of the authors, exactly that the cell continues living the DNA molecule does not have conditions to subdivide itself and to create new cells.

The authors consider that the beings livings creature, although not to be sensible to the radiations, them are extremely vulnerable to the high doses of radiations, whose effect appear in long stated period. Moreover, these effect have genetic and somatic influence.

How much to the genetic effect, they say respect to the mutations in the reproductive cells (when of the exposition of the reproductive agencies to the radiations) come to affect future generations (effect of long stated period). Case of the effect to be apparently cured, but appears years later.

With respect to the somatic effect, if they relate to the consequences that do not bring damages to the coming generations, but to the proper individual.

In what it refers to the acute consequences of somatic order, its symptoms can be visible when it appears fever, nauseas, vomits, appetite loss and of weight, fall of hair and intense diarrhea among others. Normally these symptoms are decurrent of act of receiving of high doses of radiations (above of 1 Sv) that they appear in a short space of time, for example, in hours, days or weeks after the exposition of the individual.

Therefore, amongst the somatic effect in long stated period, perhaps the most feared it is the carcinogenic effect. Experiences carried through in laboratories with animals had shown the possibility to induce in them the most varied types of tumors, depend on the employed radiation and part on the displayed body.

Available human data show that it has a relation between exposition to the radiation and leukemia, cancer of skin, thyroid, the bones and so on.

Thanks to the information accumulated throughout the years, mainly the gotten ones for the radiologists and on the effect of rays X, make possible to make some considerações.

FINAL CONSIDERATIONS

The attempt to understand the ionizing radiation and its effect in the human being takes in direction to the possible illnesses caused for the radiations of the type rays X and rays gamma.

In this direction, however, other knowledge is necessary, for example, the functioning of the cellular system, as functional basic unit in the composition of the system of the human body.

The knowledge on the atomic system and the consequent production of energy or radiation.

E in this systemic interaction, the absorbed doses function as main causers of possible injuries to the human beings. Mainly, when the reproductive agencies are displayed by long periods or absorption of high doses of radiation, being able in such a way to bring somatic consequences (to the proper individual - short term) as genetic (injuries that compromise to the formation of the future generations - of long stated period).

In this study, in reason of the varieties of illnesses or injuries provoked for the radiation of the ionizing type, they are the originary ones of the type of radiation, of the reached depth, the area or volume of the displayed body, the total dose received and the time of irradiation, that they more concretely direct in direction to the possible preventive therapies.

REFERÊNCIAS

BONTRAGER, K. L. **Tratado de técnica radiological e Base anatômica**. (trad.) Aline Vecchi. Rio de Janeiro, RJ: Guanabara Koogan, 1997.

BRASILEIRO FILHO, G. **Bogliolo, Patologia**. 6ª ed. Rio de Janeiro: Guanabara Koogam, 1999.

HENEINE, I. F. **Biofísica básica**. 1ª ed. São Paulo: Atheneu, 1999.

GARCIA, E. A. C. **Biofísica**. 1ª ed. São Paulo: Savier, 2002.

GUYTON, H. **Tratado de Fisiologia**. 10ª ed. Rio de Janeiro: Guanabara Koogam, 2002.

OKUNO, E; CHOW, C. e CALDAS, I, L. **Física para ciências biológicas e biomédicas**. São Paulo: Harbra, 1982.

REY, L. **Dicionário de termos técnicos de medicina e saúde**. 1ª ed. Rio de Janeiro: Guanabara Koogam, 1999.

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RADIATION: THE TENSION BETWEEN THE IONIZING RADIATION AND THE BIOLOGICAL EFFECT

ABSTRACT: Ionizing radiation is due to the transmission of energy of a system for another by means of electromagnetic waves. The reaction of the shock provokes or generates the jump of the electron liberating an energy as Rays X and Gamma rays. In reason of the several diseases or lesions provoked by the radiation of the type ionizing, they are the original of the radiation type, of the reached depth, of the area or volume of the exposed body, of the received total dose and of the time of irradiation, that address more concretely in direction to the possible preventive therapies. It is opportune to stress on the ionizing radiations, when crossing woven biological, they provoke ionization of existent molecules in the cells. That ionization can drive to abnormal chemical reactions and the destruction of the cell or alteration of its functions. In the systemic interaction, the absorbed doses work as main causers of possible lesions to the human beings. Mainly, when the organs reproducers are exposed for long periods or for absorption of discharges radiation doses, could bring consequences so much somatic (to the own individual-short period) as genetics (lesions that commit to the formation of the future generations-of long period). Therefore, they appear damages provoked by the radiation that they can nucleus, provoking them damages, whose effects appear in short and long period. In synthesis the effects in an individual depend on the absorbed dose, of the frequency and in the exhibition way-whole or located body. Finally, the ionizing radiations can act harmfully in the molecules if, the amount of absorbed of radiation dose be absorbed directly by the molecules that are essential in the several cellular metabolisms. **KEY WORDS**: Radiation ionizing, effects, human beings.

RAYONNEMENT: LA TENSION ENTRE LA RADIATION IONISANTE ET L'EFFET BIOLOGIQUE

RÉSUMÉ : Ioniser radiation est dû à la transmission d'énergie d'un système pour un autre au moyen de vagues électromagnétiques. La réaction du choc provoque ou produit le saut de l'électron qui libère une énergie comme Rayons X et rayons du Gamma. Dans raison des plusieurs maladies ou lésions provoquée par la radiation du type ioniser, ils sont l'original du type de la radiation, de la profondeur atteinte, de la région ou volume du corps exposé, de la dose totale reçue et du temps d'irradiation qui adresse dans direction aux thérapies préventives possibles plus concrètement. C'est opportun d'accentuer sur les ionisant radiations, quand traverser tissé biologique, ils provoquent ionisation de molécules existantes dans les cellules. Cette ionisation peut conduire à réactions chimiques anormales et la destruction de la cellule ou modification de ses fonctions. Dans l'interaction systémique, le travail des doses absorbé comme causador principal de lésions possibles aux êtres humains. Principalement, quand les reproducers des organes sont exposés pour les longues périodes ou pour absorption de radiation des décharges dose, pourrait apporter des conséquences si beaucoup de somatique (à la propre individu - courte période) comme génétique (lésions qui s'engagent à la formation des générations futures de longue période). Par conséquent, ils paraissent des dégâts provoqués par la radiation que les conservent le noyau, en les provoquant dégâts dont les effets paraissent dans courte et longue période. Dans synthèse les effets dans un individu dépendent de la dose absorbée, de la fréquence et dans l'exposition chemin - entier ou a localisé le corps. Finalement, les ionisant radiations peuvent agir dans les molécules nuisiblement si, le montant d'absorbé de dose de la radiation soit absorbé par les molécules qui sont essentiel dans les plusieurs métabolismes cellulaires directement.
CLEF DE MOTS : Radiation ionisante, effet, êtres humains.

RADIACIÓN: LA TENSIÓN ENTRE LA RADIACIÓN DE IONIZACIÓN Y EL EFECTO BIOLÓGICO

RESUMEN: Ionizando la radiación es debido a la transmisión de energía de un sistema para otro por medio de las olas electromagnéticas. La reacción del susto provoca o genera el salto del electrón que libera una energía como los Rayos X y rayos de la Gamma. En la razón de las varias enfermedades o lesiones provocada por la radiación del tipo ionizar, ellos son el original del tipo de la radiación, de la profundidad alcanzada, del área o volumen del cuerpo expuesto, de la dosis total recibida y del tiempo de irradiación que se dirige más concretamente en la dirección a las posibles terapias preventivas. Es oportuno enfatizar en las radiaciones ionizando, al cruzar tejido biológico, ellos provocan ionización de moléculas existentes en las células. Esa ionización puede manejar a las reacciones químicas anormales y la destrucción de la célula o alteración de sus funciones. En la interacción sistémica, el trabajo de dosis absorto como el causador principal de posibles lesiones a los seres humanos. Principalmente, cuando los reproductores de los órganos son expuestos para los periodo largos o para la absorción de radiación de las descargas dosifica, podría traer las consecuencias tanto somático (al propio periodo individual-corto) como las genéticas (lesiones que comprometen a la formación del futuro generación-de periodo largo). Por consiguiente, ellos aparecen daño y perjuicios provocados por la radiación que ellos enlatan el núcleo, mientras provocándolos daño y perjuicios cuyos efectos aparecen para abreviar y el periodo largo. En la síntesis los efectos en un individuo dependen de la dosis absorta, de la frecuencia y en la exhibición manera-entero o localizó el cuerpo. Finalmente, las radiaciones ionizando pueden actuar dañosamente en las moléculas si, la cantidad de absorto de dosis de la radiación se absorba directamente por las moléculas que son esencial en los varios metabolismos celulares.
PALABRAS de la LLAVE: Radiación de ionización, efecto, seres humanos.

RADIAÇÃO: A TENSÃO ENTRE A RADIAÇÃO IONIZANTE E O EFEITO BIOLÓGICO

RESUMO: Radiação ionizante é decorrente da transmissão de energia de um sistema para outro por meio de ondas eletromagnéticas, desta forma a reação do choque provoca ou gera o "pulo" do elétron liberando uma energia como Raio X e raios Gama. A partir dessa problemática o objetivo é compreender sobre os possíveis efeitos da radiação sobre o ser vivo. Utilizando-se como estratégia a pesquisa qualitativa, presente na literatura acadêmica, sobre as radiações como fonte de fundamentação. Em razão das diversas doenças ou lesões provocadas pela radiação do tipo ionizante, são as originárias do tipo de radiação, da profundidade atingida, da área ou volume do corpo exposto, da dose total recebida e do tempo de irradiação, que direcionam mais concretamente em direção às possíveis terapias preventivas. É oportuno frisar sobre as radiações ionizantes, ao atravessar tecidos biológicos, provocam ionização de moléculas existentes nas células. Essa ionização pode conduzir a reações químicas anormais e à destruição da célula ou alteração de suas funções. Na interação sistêmica, as doses absorvidas funcionam como principais causadoras de possíveis lesões aos seres humanos. Principalmente, quando os órgãos reprodutores são expostos por longos períodos ou por absorção de altas doses de radiação, podendo trazer conseqüências tanto somáticas (ao próprio indivíduo - curto prazo) como genéticas (lesões que comprometem à formação das gerações futuras - de longo prazo). Portanto, aparecem danos provocados pela radiação, que podem agredir moléculas, principalmente a molécula de DNA (ácido desoxirribonucléico) do núcleo celular, provocando-lhes prejuízos, cujos efeitos aparecem em curto e longo prazo. Em síntese os efeitos em um indivíduo dependem da dose absorvida, da freqüência e da forma de exposição - corpo inteiro ou localizado. Enfim, as radiações ionizantes podem agir danosamente nas moléculas se, a quantidade de dose absorvida de radiação for diretamente absorvida pelas moléculas que são essenciais nos vários metabolismos celulares.
PALAVRAS CHAVE: Radiação ionizante, efeitos, seres humanos.