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Modern Physics & Nuclear Physics 2019: Effect of nuclear radiations on atoms in solids and on cells in humans - Salah Arafa - University in Cairo

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We are constantly exposed to radiations from a variety of naturally occurring and human-produced sources. These radiations can affect atoms in solids as well as cells in living organisms. The paper discusses how radiation can ionize atoms, molecules or break chemical bonds, which damages the molecules and causes malfunctions in cell processes. Radiation can also create reactive hydroxyl radicals that damage biological molecules and disrupt physiological processes. It can cause somatic or genetic damage and is most harmful to rapidly reproducing cells. Types of radiation differ in their ability to penetrate material and damage tissue with alpha particles the least penetrating but potentially most damaging and gamma rays the most penetrating. The paper shows that there exist various devices and dosimeters which are used to detect and measure radiation and monitor radiation exposure which can cause a wide range of health effects from minor to severe and including death.

All radioactive particles and waves from the entire electromagnetic spectrum to alpha, beta, and gamma particles, possess the ability to eject electrons from atoms and molecules to create ions, chemical reactions and damage. We can minimize the effects of radiation by shielding with dense materials such as lead, moving away from the source, and limiting time of exposure. There are numerous sorts of radiation, yet the two most normal are electromagnetic radiation and ionizing radiation. Ionizing radiation alludes to radioactive particles, for example, alpha and beta particles, or electromagnetic waves, for example, gamma or bright beams, which have adequate vitality to confine electrons off of iotas to make particles, subsequently the name "ionizing radiation". Electromagnetic radiation, which now and again can be put as a subcategory of ionizing radiation, manages waves or photons from the electromagnetic range. Dissimilar to ionizing radiation, electromagnetic radiation manages electric and attractive field motions, for example, with X-beams, radio waves, or gamma beams.

Radioactive rot of iotas makes three radioactive particles, alpha, beta, and gamma. Of the three, alpha particles are known to have the most "ionizing power," a term portraying the quantity of particle sets created per centimetre through a material, trailed by beta, at that point gamma. In any case, a typical misguided judgment is that the higher ionizing power a molecule has, the additionally harming it is to issue. Electromagnetic waves can likewise ionize; consequently the explanation electromagnetic radiation is regularly positioned as a component of ionizing radiation. The primary impact radiation has on issue is its capacity to ionize molecules to become particles, a wonder known as ionization, which is fundamentally the same as the photoelectric impact. Radioactive particles or electromagnetic waves with adequate vitality slam into electrons on the molecule to thump electrons off the iota. The electron launched out of the iota is known as the essential electron. At the point when the essential electrons hold vitality, a molecule launching the essential electron may make it discharge another electron, either on their own iota or on another particle. This is known as auxiliary ionization.

However, ionization doesn't need to totally discharge an electron off the particle. It can raise the vitality of the electron rather, raising the electron vitality to a higher vitality state. At the point when the electron returns to its ordinary vitality level, it transmits vitality as radiation, as a rule in the types of bright beams or radio waves. Radiation can be both characteristic and engineered. Falsely initiated radioactivity uses essential and optional ionizations so as to transmit X-beams. Most X-beam discharge is because of the siege of electrons on a metal objective. On the off chance that the electrons have adequate vitality, the inward shell electrons of the molecule drop out, and higher-levelled electrons fill in the gap left by the past electrons. Thusly, parcels of vitality are discharged in the types of X-beam photons. Different types of ionizing radiation can deliver UV and gamma beams along these lines. This sort of radiation is known as "ionizing radiation".