

RADIOSTERILIZATION FOR TISSUE BANKS

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In Latin America, the industrial level ionizing radiation sterilization is used for more than three decades, ever since, foods and medical, pharmaceutical and cosmetics products are treated. Later, this activity extended to the sterilization of human tissues for graft and this activity was reinforced in some countries by the technical cooperation and financial support of the International Agency of Atomic Energy - IAEA. Brazil was incorporated to this project in 1998 through the "Hospital das Clinicas" of Sao Paulo City, where the Tissue Bank was installed and the Institute for Energetic and Nuclear Researches, where the tissues are being irradiated. Most of the tissues transplanted, such as, skin, bone, amnion and other not viable tissues, can be treated with ionizing radiation to minimize the immunogenicity, to kill bacteria and to reduce the contagious diseases transferring risk. Besides implanting the irradiation services routine to the tissue banks of the country, the researchers developed irradiation devices for human tissues, implant dosimetry procedures for irradiation processes control, implant the quality warranty program for tissue irradiation, optimize type and dose to be supplied according to the preservation process of which the tissue was submitted, collaborate with the implementation of quality systems of the Tissue Banks and experimental and clinical applications of irradiated tissues.



FIGURE 1 - Skin grafts packaged for radiation sterilization.

In the last few years, preserved tissue allografts, such as bone and skin, have been used in reconstructive surgery in many clinical disciplines, like orthopedic and plastic surgery. The risk of transmission of infectious diseases by allografts, however, is a constant concern. To this end, many steps should be taken, including tissue sterilization.

Of the available sterilization techniques, the application of ionizing radiation deserves to be considered for its efficiency. Its deployment, nevertheless, is still contested since there is few data on its effects upon the tissue allograft.

The skin glycerol preservation has a bacteriostatic effect after certain time. On the other hand, skin sterilization by ionizing radiation may reduce the quarantine period for transplantation in patients and their safety is considered excellent. At the CTR department, we established procedures (FIG.1) using two sources of ionizing radiation for sterilization of human skin allograft, and to evaluate the skin after gamma and electron beam irradiation. Skin samples were submitted to doses of 25 kGy and 50 kGy. We evaluated the impact of the irradiation on the mechanical properties through the analysis of stress-strain (FIG.2) and they were also accomplished by morphology and ultra-structure (FIG.3) studies.



FIGURE 2 - Skin body test fixed in claws to test of tensile strength (Instron Machine)

Also in the current work, we have started de standardization of the tests that will be used for the characterization of irradiated bones. Initially, two types of analysis have been chosen: biomechanical and histological.

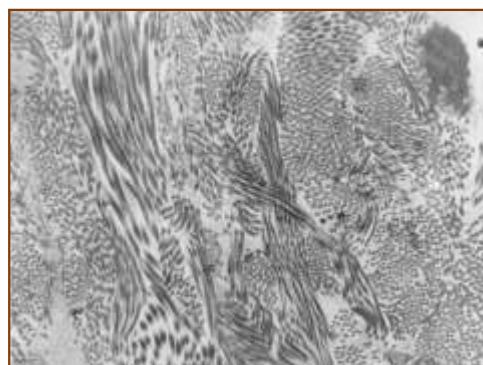


FIGURE 3 - Ultra structural micrograph of irradiated skin.

We are also developing a computer system of management of risks and corrective actions in radiosterilization process.