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PRESENT STATUS AND FUTURE OF HYDROGEL DRESSINGS PROCESSED BY LOW ENERGY EB

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The first hydrogel for wound dressing processed by radiation left the laboratories in Poland in 1986 by the hands of its inventor Janusz M. Rosiak and soon, after formal tests, arrived in the local market (1992). It was a technological breakthrough due to its product characteristics as pain reliever and enhanced healing properties besides its clever production process combining sterilization and crosslinking in a simultaneous operation (Rosiak a, 1989; Rosiak b, 1995).

IAEA invited professor Rosiak to supported the transference of his technology for many laboratories around the world. The laboratories of developing countries, which face all kinds of restrictions, were seduced by the simplicity of the process and low cost of its raw materials. This was the seed of the flourishing activities in hydrogel dressings in Brazil and other developing countries.

The so-called "Rosiak membrane" have been applied in many european countries for the healing of burn wounds, ulcers, cosmetology purposes and so on. In the opinion of some physicians, the main therapeutic features of them are their ability to stop the pain and their capacity of absorption of exudates, besides many other properties as transparency, permeation of oxygen, cooling effect of water evaporation and so on.

The pain relief property is controlled by a delicate balance of softness and proper consistency to be used as dressings as previously showed (Lugao a, 2000, Miranda a, 2000).The network features command the amount of exudates absorbed by the dressing and the permeability of drugs by the net. Although, its excellent healing properties confirmed by clinical use, its handling properties are still difficult (Lugao b, 1998, Miranda b, 1999).

The methodology of membrane preparation is as follow: - all polymers were medical grade: poli(N-vinil2-pirrolidona)/PVP-K90, from PLASDONE; agar/Agar Technical N° 3, from OXOID; poly(ethylene-glycol)/ATPEG-300, from OXITENO. PVP concentration were 2, 5, 8, 10, 12 e 16%. PEG and Agar concentrations were 3 and 0.8% respectively. The samples were prepared by mixing of a solution of PVP and PEG with Agar heated to 100°C. Membranes with 3mm thickness were prepared by pouring the hot solution in molds of about 100cm^2, waiting proper time to gelification of agar, packed in PE bags and hot sealed. The samples were irradiated by a electron beam electrostatic type from "Radiation Dynamics", model "Dynamitron", maximum energy of 1,5MeV and maximum current of 15mA, at doses of 20, 25, 30 e 35 kGy. Highly concentrated samples: It was used the same procedure, the only difference was the drying step to concentrate to the required level, as the PVP is not easily soluble over 16% concentration. Agar and PEG were kept at 0.8% and 3%, respectively for all samples. Tensile Strength and Elongation at break: It follows ABNT NBR 6241/80. They were performed for all samples 7 days after irradiation to allow a uniformization of bubbles distribution. Gel Fraction: the samples were boiled in water for 36 hs and dried in oven at 36°C to Constant mass.

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Network characterization: network size was evaluated using a procedure described in a previous paper (Miranda a, 2000). Swelling: samples were kept in water for 216 hs. Water intake was measures at each hour during the first 24 hs and at each 24 hs afterwards. Degrees of hydration were measures gravimetrically. Morphological studies were conducted with the Scanning Electron Microscopy model JMS 840-A, from Jeol Ltd.

The best combination of mechanical properties is achieved at PVP concentration of 8% and dose of 20 kGy, as higher PVP concentration imparts a small incremental benefit on elongation property. On the other hand, tensile strength improves constantly with PVP concentration, but this improvement goes together with a sensible decrease in softness and consequently decreases in pain reduction properties. So 8% would be the upper value of PVP concentration. The dose for optimizing the elongation is 20kGy.

In spite of this previous work on general properties improvement and the simplicity of process combined with very low cost raw materials it is clear the need to decrease as much as possible the cost of production in other to produce a membrane that is really affordable by Brazilian population. In order to cope with this important target a new concept of layered membrane produced by multiple exposure to low energy electro beam will be introduced.

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