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Radiation Processing of Biomaterials as a Sustainable Solution for the Universal Health System

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The sustainable development goal 3 – “ensuring healthy lives and promoting well-being for all at all ages” – cannot be met without the development of affordable advanced technologies. However the focus of the health industry is the development of extremely sophisticated solution at the highest possible cost. The increase in the total health care cost as percentage of GDP from 1960 to 2010 increased from 5% to 17% of the GDP for the USA. For most European countries the increase was from 4% to 9% (1). The expenses on retail drugs per capita in the USA were estimated at 100 USD in 1960 and jump to 1100 in 2020.

We developed at IPEN a hydrogel wound dressing with silver nanoparticles using simultaneous crosslinking and sterilization, based on the classical process developed by prof. Janusz Rosiak. However, a new simultaneous step was added for the hydrogel with silver nanoparticles, ie. the reduction of the silver ions accomplished by reducing species of water radiolysis (H^+ , eaq^-). This so called one pot process allowed the production of large sheets of hydrogel by a fraction of a USD. These dressing were transparent to allow the inspection of the wound, soft and flexible to reduce or eliminate the pain and mechanically strong to allow easy manipulation by the nurses. The use of simultaneous processes, i.e., synthesis and sterilization in simultaneous way is undoubtedly a solution to reduce the cost of production. These dressing specially prepared were used recently to treat wounded animals rescued from the big flood that hit the south of Brazil as shown in figure 1.

Figure 1. Rescued horse with immersion syndrome and hydrogel specially developed for those animals.