BIOCOMPATIBILITY OF NEW THERMOREVERSIBLE POLOXAMER 407-BASED HYDROGELS

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Introduction: Poloxamer 407 is a hydrophilic non-ionic surfactant of the more general class of copolymers known as poloxamers. These smart polymers are sensitive to the temperature and therefore, change their microstructural features in response to changes in temperature. They are the most studied, most used and safest polymers in drug administration systems and biomaterials. They present in their structure a very sensitive balance between hydrophobic and the hydrophilic groups and a small change in temperature can create new adjustments. A poloxamer molecule can be modified using ATRP (Atom Transfer Radical Polymerization). This method allows the synthesis of polymers with precisely controlled functionalities, topologies, and compositions. This research examines the biocompatibility of novel polymers modified using the ATRP method.

Methods: Polymeric hydrogels were implanted in dorsal subcutaneous pockets in rats. At 10 and 30 days, animals were sacrificed and the gels and surrounding tissues were removed. Sectioning, paraffin embedding, and Trichrome Masson staining were performed.

Results: Using the ATRP method we obtained two Poloxamer 407 polymers with hydrophobic glycidyl methacrylate and hydrophilic N-acryloyl-6-aminohexanoic acid. Analyses of local tissue response were carried out 10 to 30 days after the subcutaneous implantation of Poloxomer 407 and its derivatives with hydrophobic glycidyl methacrylate and hydrophilic N-acryloyl-6-aminohexanoic acid in laboratory rats. Histological analyses showed no symptoms of acute inflammatory reaction or rejection. A loose fibrous capsule formed on the skin surface after 10 days. There were evidence of isolated lymphocyte cells and an increase in blood flow through the vessels. The results obtained indicate that local tissue reaction due to the implanted hydrogels was highly insignificant.

Conclusion: The results indicate that the polymer hydrogels obtained are biocompatible and can be used for new wound dressing development.