EARLY EVALUATION OF THE BODY’S INFLAMMATORY REACTION TO NEW CERAMIC BIOMATERIALS FOR BONE TISSUE ENGINEERING

Raúl Rosales-Ibáñez1, Arely González1, José Alberto Galindo-González1, Joanna Kolmas2, Katarzyna Szurkowska2, Luis Rodríguez-Lorenzo3,4

1Laboratorio Académico de Ingeniería Tisular y Medicina Traslacional FESI-UNAM. 2Medical University of Warsaw Faculty of Pharmacy, Department of Inorganic and Analytical Chemistry. 3Grupo de Biomateriales. ICTP-CSIC, calle Juan de la Cierva 3, CP 28006 Madrid – Spain. 4CIBER-BBN, C. Monforte de Lemos 3-5, Pabellón 11, 28029-Madrid, Spain.

The development of better partner materials for stem cells has become an important topic in bone tissue engineering. However, few papers are published with an early evaluation of the inflammatory reaction caused by biomaterials. The foreign body reaction composed of macrophages and giant cells is the end-stage response of the inflammatory and wound healing responses following the implantation of a material. The study of inflammation is important for understanding the reaction to biomaterials by the human body, in particular, the interaction between biomaterials and the immune system. During the inflammation process, macrophages activated by biomaterials can release chemotactic factors, adhesion molecules, chemokines and cytokines. A Wistar rat model has been selected for this project. After shaving and disinfection of both legs, a lateral skin incision was made according to the axis of the femur. An intramuscular pocket was created in the quadriceps muscle using blunt dissection, femur was exposed, 4 or 5 mm cortical bone defect was created with drill bit with continuous irrigation with cold saline. About 30 μg of 5 ceramic materials were put into the bone defect. A pocket without an implant served as a sham. Animals were sacrificed 24 and 48 h and 14 days.

In this research all implant sites, including the tissues surrounding implants, were collected and processed for light microscopy. They were fixed in 4% neutral buffered formalin, dehydrated, embedded in paraffin blocks, sectioned (5 μm), for histopathological and immunocytochemistry examination.

The results of histology staining confirmed that the implanted biomaterials were closely connected to the bone defect and that no rejection had taken place in some ceramic biomaterials. The incorporation of biological components as well as stem cells opens up challenges. We considering the stem cells perhaps could regulate the environment and reduce the body reactions and permitted the recruit of immune cells for degradations of the biomaterial in the body and improve the tissue/material interfaces.

Keywords: Inflammation, biomaterials, bone tissue engineering

References:


Presenting author’s email: dr.raul.rosales@gmail.com