A model of maxilla resection to test new hybrid implants: macroporous titanium and tissue engineering elements

Santos-Ruiz L[1], Monopoli D[2], Yáñez JI[3], Mentado B[2], Ruiz F[3], Argárate N[4], Granados F[3], Arrabal PM[1], Belmonte RM[1], **Becerra J[1] ***

1) Dpt. Cell Biology, Genetics & Physiology; Faculty of Science; University of Málaga, Spain. Networking Research Centre on Bioengineering, Biomaterials and Nanomedicine (CIBER-BBN). Andalusian Centre for Nanomedicine and Biotechnology (BIONAND).

2) Instituto Tecnológico de Canarias, Spain

3) Unidad de Cirugía Maxilofacial HRU Carlos Haya, Málaga, Spain

4) TECNALIA, San Sebastián, Spain

* Corresponding author: José Becerra. Dep. Biología Celular. Fac. Ciencias. Campus de Teatinos, 29071-Málaga. Spain (becerra@uma.es)

Maxillary bone loss is commonly found in humans, due to bone ageing, tooth loss, periodontal disease and, more severely, to trauma, radiotherapy and tumor resection. Maxillofacial reconstructive surgery is a still unmet clinical demand. Available therapies include grafting of autologous or heterologous bone tissue and/or the implantation of metallic plates, but these treatments are still unable to resume form and function. The emergence of 3D-printing technology applied to metal alloys now allows the manufacturing of customized, patient-tailored prosthetic implants. However, poor bone quality at the implant site due to ageing or disease still hamper proper osseointegration. By combining Electron Beam Melting (EBM) metal sintering and tissue engineering, we are developing hybrid maxillofacial implants, where a metal framework of Ti6Al4V alloy confers both an appropriate shape and mechanical stability, while stem cells and osteogenic molecules stimulate bone growth into the metal framework, thus promoting osseointegration. We hereby present the in vitro work driving to the development of our hybrid maxillofacial prostheses, as well as the setting up of an in vivo model

of complete maxilla full resection, created in order to test the prostheses in a preclinical study.

Acknowledgements. Partially supported by the Spanish Network on Cell Therapy (Red TerCel), BIO2012-34960 (MINECO) and P11-CVI- 7245 (Junta de Andalucia). CIBER-BBN is an initiative funded by the VI National R&D&I Plan 2008–2011, Iniciativa Ingenio 2010, Consolider Program, CIBER Actions and financed by the Instituto de Salud Carlos III with assistance from the European Regional Development Fund