Undifferentiated adult human mesenchymal stem cells (*ah*MSCs) response on a novel graphene coated – Nurse´s A phase bioceramic

Dr Ruben Rabadan-Ros, PhD, Catholic University of Saint Anthony. Guadalupe (30120), Murcia, Spain.

Belén Gil-Muñoz, Mesa del Castillo Hospital. Murcia (30010), Spain.

Clara Meseguer-Ortiz, Morales Meseguer Universitary Hospital. Murcia (30008), Spain.

Dra Piedad N de Aza, PhD, Bioengineering Institute, Miguel Hernández University. Elche (03202), Alicante, Spain.

Dr Luis Meseguer-Olmo, PhD, Catholic University of Saint Anthony. Guadalupe, (30120), Murcia, Spain.

Abstract

It is well known that Si-Ca-P bioceramics are promising bioactive materials for bone tissue engineering, particularly for bone repair[1]. Recently, it has been reported that graphene can be used as an additive to improve the properties of composites due to its biocompatibility and it has been proposed for a number of biomedical applications[2].

Graphene has remarkable mechanical properties, which makes it potentially a good reinforcement in ceramic composites. It also has unique electrical and thermal properties, which makes it an attractive filler for producing multifunctional ceramics for a wide range of applications[3].

It has been shown that graphene oxide (Go) and reduced graphene oxide (r-Go) can promote biological interactions due to its many surface functional groups and serve as a carrier for drugs and other biomolecules[3]. In addition, Go regulates the proliferation and differentiation of cultured mesenchymal stem cells[4,5].

In this work, we have optimized the graphene coating of a Si-Ca-P bioceramic, obtaining scaffolds totally covered by a thin layer of graphene oxide and reduced graphene oxide. *In vitro* assays with adult human mesenchymal stem cells (*ah*MSCs) showed that A-Go stimulates cellular proliferation more than A-Gr the first days of culture. This could support the theory of other researchers that indicates that Go mainly stimulates cell proliferation, while r-Go favors cell differentiation.

Image

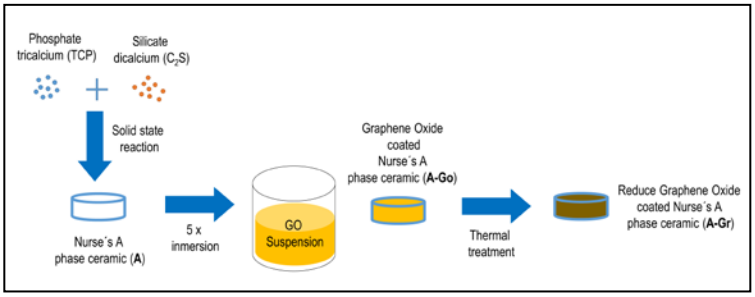


Figure 1. Synthesis of graphene coated Nurse´s A phase

Recent Publications

1. Chevalier, J., & Gremillard, L. (2009). Ceramics for medical applications: A picture for the next 20 years. Journal of the European Ceramic Society, 29(7), 1245-1255.

2. Gao, C. et al (2014). Current progress in bioactive ceramic scaffolds for bone repair and regeneration. *International journal of molecular sciences*, *15*(3), 4714-4732.

3. Porwal, H., Grasso, S., & Reece, M. J. (2013). Review of graphene–ceramic matrix composites. *Advances in Applied Ceramics*, *112*(8), 443-454.

4. Chen, G. Y. et al. (2012). A graphene-based platform for induced pluripotent stem cells culture and differentiation. *Biomaterials*, *33*(2), 418-427.

5. Bressan, E. et al. (2014). Graphene based scaffolds effects on stem cells commitment. Journal of translational medicine, 12(1), 296.



Biography

Dr. Ruben Rabadan (PhD) is a post-doctoral researcher who has his expertise in Tissue Repair, and passion in improving the health by the study of Organ and Tisse Regeneration. In his short career, he has focused in bone, ligament and cartilage regeneration, and he has helped to develop scaffolds based on the C_2S-TCP *phase diagram* and combinating bioceramics with fibroin, specially testing their biocompatibility and osteointegration by in *vitro* and *in vivo* studies.

Email: rubenrabadanros@gmail.com

Notes/Comments: Abstract for E-poster