PROJECT FACTSHEET

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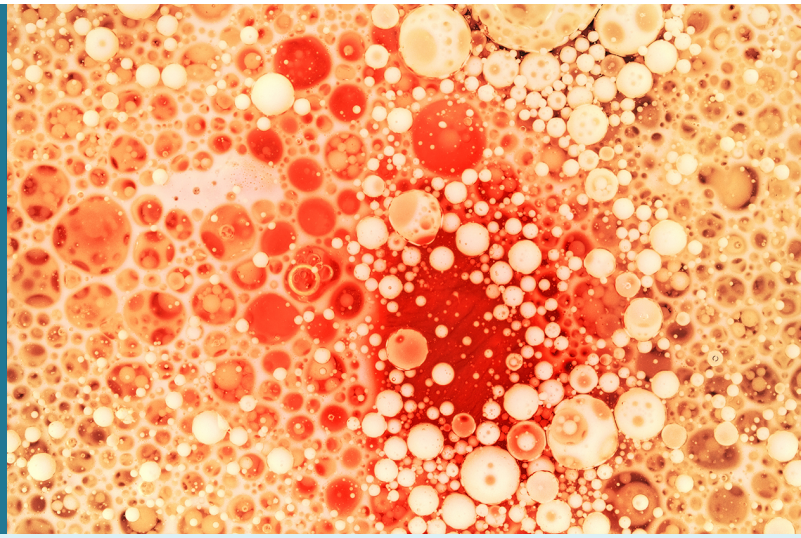
PNANO4BONE

PNANO4BONE, Nanocarriers and ionized gas applied together to scaffolds for bone regeneration



INSPIRATION

The use of smart scaffolds is the most promising way of making tissue regeneration better and cheaper. “Smart scaffolds” means 3D-matrices which contains bioactive molecules or/and nanoparticles to enhance (stem) cell proliferation and differentiation. However, cell proliferation on these artificial 3D-matrices is still too low and the duration of drug delivery is still too short for bone tissues. It is also very difficult to follow the tissue regeneration after the implantation of the scaffolds into the body.

INNOVATION

The main objective of the project is to solve the above mentioned drawbacks by embedding specifically designed nanovectors in existing or commercialized scaffolds. Novel engineered nanoparticles based on mesoporous silica and hydroxyapatite nanoparticles, activated by ionized gases, could lead to smarter scaffolds. The interaction of these nanovectors with ionized gas will allow promoting the living cell proliferation through the generation of low dose of specific reactive species. The inorganic core of the nanovectors will allow the drug release over weeks/months and the osteogenic differentiation of stem cells.

PNANO4BONE aims at developing and proposing kits of novel nanocarriers and ionized gas devices that could be combined to make existing smart scaffolds cheaper and more efficient for bone regeneration. The novel silica and hydroxyapatite nanoparticles will contain nanomaterials and bioactive molecules never combined together to solve the drawbacks cited above and to work synergistically with ionized gases. Innovation will also come from the functionalization of the nanovectors to control their interaction with the scaffold bulk/surface.

IMPACT

The probes loaded in the nanovectors will allow monitoring the regenerative process with non-invasive imaging technologies. If successful in the context of bone regeneration, this approach could be easily adapted to the regeneration of other tissues and lead to cheaper stem cell therapies. In vitro tests will allow the evaluation the best combinations of nanovectors and ionized gases to improve bone cell adhesion, proliferation and differentiation.
PNANO4BONE should provide an original solution to make tissue regeneration cheaper and better. The approach could be extended to all kinds of living tissues.

Partners
Medical University of Lublin- Chair of Biochemistry and Biotechnology, Pharmaceutical Faculty (PL) , Laboratory of Plasma Technology and Renewable Energy, Institute of Electrotechnics and Electrotechnology, Lublin University of Technology (PL) , Université Catholique de Louvain (BE) , Polytechnic University of Catalonia (ES) , CELLON S.A. (LU)

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