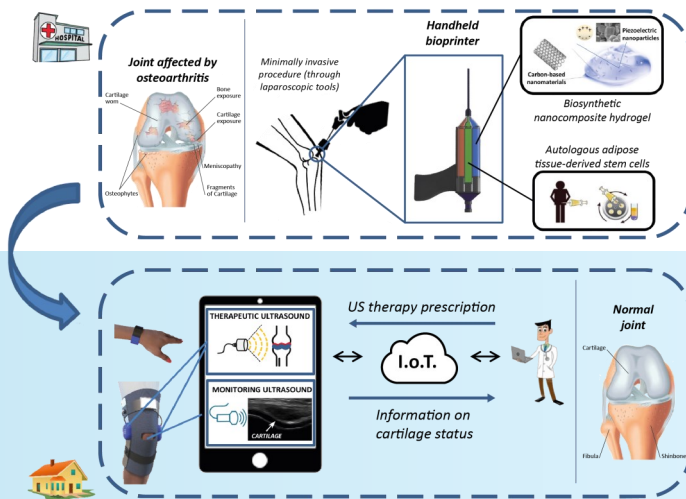


ADMAIORA will target an innovative paradigm that may revolutionize OA treatment. Within the project time-frame (4 years), the ambition is to achieve a 60% reduction of degeneration in OA models, with respect to control (untreated) ones after 4 weeks, and a 90% reduction after 3 months. The Consortium will evolve and merge technologies, that already showed a high potential as experimental proof of concepts in various biomedical fields, and into a unique paradigm to accomplish this ambitious objective. The ADMAIORA technologies will be assessed up to the preclinical level.

The **ADMAIORA Consortium** will develop biosynthetic hydrogels integrated with piezoelectric nanoparticles enabling responsiveness to remote wireless ultrasound waves, and carbon-based nanomaterials conferring higher mechanical and lubrication properties. Stem cells derived from adipose tissue, which already demonstrated anti-inflammatory and regenerative properties, will be included in the nanocomposite hydrogel. Materials and cells will be delivered in situ by an innovative handheld 3D bioprinter, integrated in an arthroscopic tool. A custom brace will be designed and equipped with ultrasound probes for both monitoring the joint status and stimulating the implanted nanocomposite hydrogel. A dedicated App will allow a direct connection between patient and physician in an Internet of Things framework.



The Consortium



Project Coordination

Scuola Superiore Sant'Anna - The BioRobotics Institute, Italy

Leonardo Ricotti (Coordinator)

Partners

- **Istituto Ortopedico Rizzoli, Italy** - Principal Investigator (PI): Gina Lisignoli
- **Bar-Ilan University, Israel** - PI: Gilbert Daniel Nessim
- **PlasmaChem GMBH, Germany** - PI: Carsten Jost
- **Image Guided Therapy SA, France** - PI: Erik Dumont
- **Vimex Sp. z.o.o., Poland** - PI: Tomasz Gapinski
- **H&D Wireless AB, Sweden** - PI: Pär Bergsten

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Horizon 2020
European Union funding
for Research & Innovation

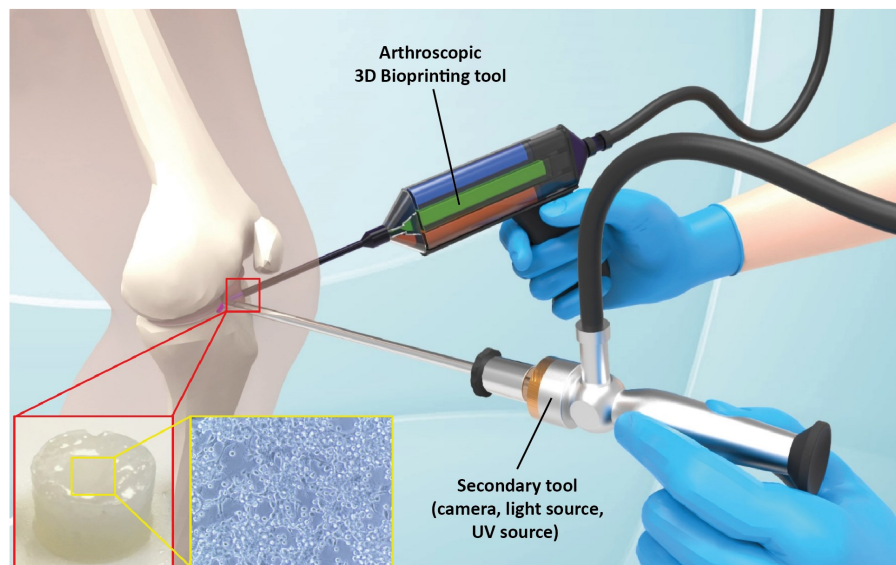


ADMAIORA



www.admaiora-project.com

ADMAIORA (ADvanced nanocomposite MAterials fOr in situ treatment and ultRASound-mediated management of osteoarthritis) is a research project funded under the Horizon 2020 EU Framework Programme (Call: H2020-NMBP-TR-IND-2018, Research and Innovation action), coordinated by The BioRobotics Institute of Scuola Superiore Sant'Anna (Pisa, Italy). The aim of the project is to explore alternative treatments for Osteoarthritis (OA), in order to improve patients' quality of life and their healthy and active lifespan in the long-term, as well as to reduce the healthcare costs for the society.



WHAT IS OSTEOARTHRITIS?

Osteoarthritis (OA) is one of the most common joint disorders worldwide, and currently affects ~ **40 million of EU citizens**. This disease involves the degeneration of cartilage and other joint structures, and causing pain and disability especially in middle-aged and elderly people. At present, it also implies enormous direct and indirect costs for the European healthcare systems.

Over the next decade, the number of people affected by OA is expected to double due to population ageing and increased rate of obesity (a risk factor for OA), resulting in a significant burden at the society level. According to the United Nations, by 2050, 130 million people will suffer from OA worldwide, of whom 40 million will be severely disabled by the disease. This represents an issue that is largely unsolved, at present.

THE PROJECT

ADMAIORA stands out from other OA treatments being a multi-approach therapy and aiming at a true disease-modifying and patient-specific action. ADMAIORA aims, in the long-term, at increasing the healthy and active lifespan of people affected by OA. This results will be achieved by considerably slowing down or even stopping the degeneration process, acting during OA at early stage. The efforts will be directed towards achieving the delay by several years or even avoiding surgical interventions for total joint replacement. To make this challenging objective a reality, the partners will work together to merge into a unique

workflow nanotechnologies, advanced materials, remotely physical stimulation, advanced manufacturing, wearable devices and cloud platforms. In particular, ADMAIORA will explore the potential of smart nanocomposite materials and stem cells, in synergy with external physical stimuli (based on low-intensity ultrasound), for stopping the degeneration of cartilage during OA at early stages. The ADMAIORA target is to demonstrate the ground-breaking potential of such a regenerative approach at a preclinical level.

ADMAIORA will achieve its ambitious target by tackling the following scientific and technological problems:

- Development of a biosynthetic hydrogel with smart functionalities provided by carbon-based and piezoelectric nanomaterials;
- Use of adipose-derived stem cells, to reduce inflammation and to regenerate hyaline cartilage;
- Development of a system for highly controlled ultrasound stimulation of nanocomposite materials and cells;
- Development of an innovative handheld 3D bioprinter, integrated in an arthroscopic tool;
- Development of a IoT solution that will allow a direct connection between patient, its knee and physician in an Internet of Things Cloud framework.

Project name: ADMAIORA

Grant number: 814413

Starting date: 1st January, 2019

Duration: 4 years

Funding: ~ 5,4 M€

Coordinator: Leonardo Ricotti

Partners: 7 from 6 countries

