



**M u h a m m a d   N a d e e m  
H a f e e z**

Born in Lahore – Pakistan

M.Phil Molecular Biology – Centre of Excellence in Molecular Biology (CEMB) Lahore, Pakistan

2017 – 2018, Research Assistant – Centre of Excellence in Molecular Biology (CEMB).

2016 – 2017, Visiting Research student – Swedish Agriculture University (SLU), Sweden



**Celia Christian**

CHIM / 09      Farmaceutico  
Applicativo

Research field: Liposomes,  
nanoparticles, Supramolecular  
Nanomedicine



**Helder A. Santos**

Associate professor in nanotechnology; Co-founder Capsarnedix Oy; Director of programme in drug research; Division of Pharmaceutical Technology and preclinical and analysis (University of Finland)



**Giuseppe Oppedisano**

Technology Transfer Manager

**Angelo Marra**

CEO and co-founder of the company

**Company mission:**

accelerate the up taking of nanotechnologies in the pharmaceutical, cosmetic and nutraceutical fields enhancing product efficiency and efficacy through the development of innovative tailored nanosystems that intelligently enable the delivery of adding value to both final customers and industrial players.

## Development of bio-scaffolds built from functional biomaterials integrated with therapeutic nanoparticles for the co-delivery of bioactive compounds and their application for tendon regeneration

### ➤ General objectives of the project :

The aim of this work is the development of synthetic bio-scaffolds through two different techniques, i.e. electro-spinning and microfluidic, using different synthetic and functional biomaterials and the integration in the resulting biological scaffolds of therapeutic nanoparticles co-delivering bioactive compounds. Nanoparticles are made up of synthetic and natural macromolecules as well as membranes originated from tenocyte membranes and are used for co-delivering grow factors promoting the tendon regeneration, anti-inflammatory drugs and stimulating compounds. The properties of therapeutic nanoparticles are suitable for their integration in bio-scaffolds that maintain a structure similar to endogenous and natural tendon structure. Bio-scaffolds, obtained using the two different techniques herein reported, have a composition, that is compatible with natural tendon, and the same mechanical and functional properties. The performance, in terms of integration and tendon regeneration, of bio-scaffolds, obtained from functional biomaterials integrated with therapeutic nanoparticles, is tested using tenocyte models and provide results for pre-clinical tests.

### ➤ Industrial impact of the project:

Based on this evidence, the Red Biotech companies enforce the impact and the relative translation of proposed innovative products and provide the regulatory documents and advanced characterization for commercialization, scale-up and technology transfer, thus offering a potential therapeutic treatment for patients.

The Research products will be enhanced through dissemination and technology transfer activities:

- 1) scientific publications, poster and oral presentations in national and international conferences, communication of results in public and social events, dissemination of results in the European research night's; drafting and public discussion of the doctoral thesis;
- 2) patents, development of data base and smart digital applications, drafting of regulatory documents, development and/ or production of medical devices, built up of academic spin-off.



- Co-projecting: iDelivery is co-leader in the development of the Research activities and training of the PON Research and Innovation PhD programme. iDelivery supports the activities of the PhD students by developing the data base and documents for the technology transfer, commercialization and scale-up of bio-scaffolds based on functional biomaterials that are integrated with therapeutic nanoparticles co-delivering bioactive compounds. iDelivery also supports the advanced characterizations of this innovative medical devices as well as helps the development of smart digital technology application for the collection of bio-scaffolds and therapeutic nanoparticle data.
- Training: iDelivery trains the PhD student activities by providing basic and advanced know ledges for technology transfer, scale-up and commercialization of the products according to the guidelines of International regulatory agencies, such as European Agency of Medicine (EMA) and Food and Drug Administration (FDA).
- Research: iDelivery supports the research activities of the Academic institutions for the development of regulatory documents, data base analysis and advanced characterizations of bio-scaffolds based on functional biomaterials that are integrated with therapeutic nanoparticles co-delivering bioactive compounds. This collaboration results in the publications of Abstract communications at National and International conferences and shall result in the next mounts to the submission of a review and research paper in peer-reviewed international JCR journals.
- Technological transfer: iDelivery should like to develop, in collaboration with University of Chieti/ Teramo and University of Helsinki, a data base set of bio-scaffolds and therapeutic nanoparticles for tendon regeneration as well as collect the regulatory documents for providing the guidelines for their commercialization and scale-up. Furthermore, iDelivery should like to develop a smart digital application for the collection and analysis of scientific data of bio-scaffolds and therapeutic nanoparticles and it should like to generate the preliminary data for the submission of a patent and the built-up of an Academic spin-off.



## Publications

- Role of Modern Technologies in Tissue Engineering (2020) (Qurban Ali, Sabeen Malik, Arif Malik, **Muhammad Nadeem Hafeez**, Said Salman) Archives of Neuroscience, DOI: 10.5812/ans.90394.
- An overview of enhancing drought tolerance in cotton through manipulating stress resistance genes. (2019) (**Hafeez M N**, Ahmad S, Mamoon-ur-Rashid, M Ali, A Alman, S Bakhsh, Mahpara, S Kamaran, Ramzan, Waseem M, Ali Q, Rashid B), Applied Ecology and Environmental Research, 17(3):7003-7025. ISSN .15891623(Print), ISSN .17850037(Online), DOI: [http://dx.doi.org/10.15666/aer/1703\\_70037025](http://dx.doi.org/10.15666/aer/1703_70037025)
- Conventional nanosized drug delivery systems for cancer applications (2020) (Cristian Vergallo,<sup>1</sup>, **Muhammad Nadeem Hafeez**,<sup>1</sup>, Dalila Iannotta, **Helder A. Santos**, Nicola D'Avanzo, Luciana Dini, Felisa Cilurzo, Massimo Fresta, Luisa Di Marzio, **Celia Christian\***) Book Chapter: Nanomedicine for Cancer Therapy; Editor Helder A. Santos, Flavia Fontaa, Springer International Publisher, Switzerland. Accepted for publication. <sup>1</sup>Authors contributed equally; \*Corresponding author.
- 1 Review and 1 research papers will be submitted in the next three months.



## Scientific meeting

- CELLULAR AND MOLECULAR PhD DAY, UNIVERSITY of TERAMO, Teramo (TE), Italy, 15, February, 2019;
- CHARACTERIZATION OF COLLOIDAL NANOCARRIERS – 19th ADVANCES COURSE IN PHARMACEUTICAL TECHNOLOGY; Soverato (CZ), Italy, 9-12, September, 2019;
- TECNOLOGIA FARMACEUTICA: POSSIBILE INTEGRAZIONE DI SAPERI – 2° CONVEGNO NAZIONALE SOCIETA' CHIMICA ITALIANA, DIVISIONE DI TECNOLOGIA FARMACEUTICA; ; Soverato (CZ), Italy, 9-12, September, 2019;
- A FOCUS ON TENDON FROM RESEARCH TO TRANSLATION – VII SCIENTIFIC WORKSHOP I.S.M.U.L.T., UNIVERSITY of TERAMO, Teramo (TE), Italy, 17 October, 2019;
- 1ST INTERNATIONAL NORTHERN-SOUTHERN EUROPE WORKSHOP IN NANOMEDICINE, UNIVERSITY “G: d’ANNUNZIO” CHIETI-PESCARA Chieti (CH), Italy, 15-17, January, 2020;
- CELLULAR AND MOLECULAR PhD DAY, CAST – UNIVERSITY “G: d’ANNUNZIO” CHIETI-PESCARA, Chieti (CH), Italy, 21, February, 2020.
- DEVELOPMENT OF BIOSCAFFOLD FOR TENDON REGENERATION. **Muhammed Nadeem Hafeez**; Luisa Di Marzio, **Christian Celia**, **Helder A. Santos**, Barbara Barboni, **Angelo Marra**,. CELLULAR AND MOLECULAR PhD DAY, CAST – UNIVERSITY “G: d’ANNUNZIO” CHIETI-PESCARA, Chieti (CH), Italy, 21, February, 2020.
- DELIVERY OF IMMUNE MODULATORS FOR TENDON REGENERATION VIA INNOVATIVE BIO-SCAFFOLD INTEGRATED WITH NANOPARTICLES. **Muhammed Nadeem Hafeez**; Luisa Di Marzio, **Christian Celia**, **Helder A. Santos**, Barbara Barboni. CELLULAR AND MOLECULAR PhD DAY, UNIVERSITY of TERAMO, Teramo (TE), Italy, 15, February, 2019.
- DEVELOPMENT OF SCAFFOLDS FOR TENDON REGENERATION. . **Muhammed Nadeem Hafeez**; Luisa Di Marzio, **Christian Celia**, **Helder A. Santos**, Barbara Barboni, **Angelo Marra**, Massimo Fresta. 1<sup>st</sup> International Northern-Southern Europe Workshop in Nanomedicine. Chieti (CH), Italy, 15-17 January, 2020.



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