

PNRR Missione 4, Componente 2, Investimento 1.4 “Potenziamento strutture di ricerca e creazione di "campioni nazionali di R&S" su alcune Key Enabling Technologies”

Iniziativa finanziata dall'Unione europea — NextGenerationEU.

National Center for Gene Therapy and Drugs based on RNA Technology

Sviluppo di terapia genica e farmaci con tecnologia a RNA

Codice progetto MUR: **CN00000041** – CUP UNINA: **E63C22000940007**

Doctorate of National Interest

RNA THERAPEUTICS AND GENE THERAPY

SELECT ONE OF THE FOLLOWING RESEARCH AREA:

- ☐ **Mechanisms of Diseases and Drug Target Identification**
- ☒ **Design and Delivery of New Gene Therapy and RNA-Based Medicines**
- ☐ **Validation and Safety in Preclinical and Clinical Studies**

LOCATION OF THE RESEARCH ACTIVITY (INSTITUTION/DEPARTMENT):

Istituto Italiano di Tecnologia, CABHC@CRIB

TUTOR:

Prof. Paolo Antonio Netti

PROPOSED RESEARCH ACTIVITIES (max 300 words):

The PhD project will focus on the design and fabrication of microneedles specialized for the encapsulation of active mRNA meant for vaccination. Strategies to provide mRNA stability during the fabrication and during the delivery will be developed and implemented in the first period. To this aim a microparticles-based microneedles approach will be primarily followed where mRNA will be encapsulated in biodegradable polymer microparticles (MPs) according to consolidated protocols and then microneedles will be produced by the assembly of such MPs. A fundamental activity of the PhD will be the validation of the entire tool by using in vitro and ex vivo models. Validation will regard the ability to implant microneedles in skin models which include the stratum corneum, the ability to release mRNA in an active form by using mRNA models able to promote cell production of fluorescent proteins such as GFP and/or Luciferase in case of successful transfection. In case of not completely satisfying results, naked mRNA will be replaced with a complexed form of the same nucleic acid. The effect of different kinetic releases will be also investigated as one aim of the PhD project by playing with MPs material and with MPs porosity. After the preliminary assessment in vitro, the optimized product will be also assessed in vivo in collaboration with PNRR project partners dealing with in vivo tests. Once optimized the delivery platform, a functional mRNA coming from the company partners of the PNRR project will be encapsulated with the same strategy developed for the model mRNA and it will be made available for testing in vivo the vaccination ability. During the PhD the student will also deal with microfabrication in clean room laboratories and with sterilization aspects.