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

TITLE OF THE RESEARCH PROJECT
Multifunctional Nanocarriers in RNA Therapeutics: Delivery and Theranostic Applications

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): Department of Pharmacy, University of Salerno

TUTOR: Prof. Pasquale Del Gaudio

PROPOSED RESEARCH ACTIVITIES (max 300 words):

The research aims to advance the field of gene therapy and RNA-based medicines by focusing on innovative design of nanometric delivery systems. The primary objective is to develop novel delivery systems able to enhance the specificity, efficiency, and safety of nucleic acid based therapeutics. Activities will involve:

1. **Design of Novel Delivery Systems:** Leveraging nanotechnology, we aim to select new starting materials among synthetic or semisynthetic polymers incorporating metal oxides to engineer advanced delivery vectors that can overcome the biological barriers hindering efficient RNA delivery, with a focus on advanced theranostic approaches, specific targeting, and controlled release mechanism.
2. **Full characterization of the delivery system:** Identification of critical material attributes, characterization of nanostructured vector by means of advanced techniques in nanofabrication, biophysical and spectroscopic techniques, and advanced and superhigh resolution bioimaging.

3. **In Vitro Testing:** Newly developed delivery systems will be evaluated in vitro using selected cell lines. This phase will assess the transfection efficiency, cellular uptake, and cytotoxicity of the vectors. Techniques like flow cytometry, confocal microscopy, and RT-qPCR will be utilized to analyze gene expression and RNA integration.
4. **Data Analysis and Dissemination:** Data generated will be rigorously analyzed and results will be disseminated through publications in peer-reviewed journals and presentations at international conferences.