Finanziato dall'Unione europea NextGenerationEU

Ministero dell'Università e della Ricerca

Italiadomani — PIANO NAZIONALE DI RIPRESA E RESILIENZA

Università degli Studi di Messina

FINI - Future challenges in management of recurrent/resistant Infection: development of antimicrobial Nanoparticulate systems and physical-chemical investigation of their Interactions with biofilm-associated infection

(PNRR - Missione 4, Componente 2, Investimento 1.1 - Bando Prin 2022 – Decreto Direttoriale n. 104 del 02-02-2022)

CUP: **J53D23008880006**

Codice Identificativo: **2022325YFW**

https://portale2.unime.it/prin2022fini/

GOALS

Main goal: *design the correct therapeutic systems based on innovative antimicrobial nanoparticles (NPs) able to eradicate the biofilm-associated infections, so permitting a specific antimicrobial therapy without cytotoxicity and side effects.*

Result 1*: develop nanotechnological platforms, with specific surface properties and sizes, addressed to reduce the formation of BPB in various models of human eukaryotic cells and explanted organs, to inhibit biofilm production and development and/or breaking/dissolving the mature biofilm.*

Result 2*: clarify the mechanism of biofilm eradication, by an exhaustive physicochemical and morphological characterization of the biofilm produced by selected pathogen microorganisms before and after the treatment with these nanosystems, in order to evaluate their specific interaction with biofilm components.*

PROJECT DETAILS

Duration: **24 months**

Principal Investigator: **Prof. Valentina VENUTI** (University of Messina)

MUR Contribution: € **77.290,00** - Total: € **101.997,00**

RESEARCH GROUP

2 Research units involved in the project

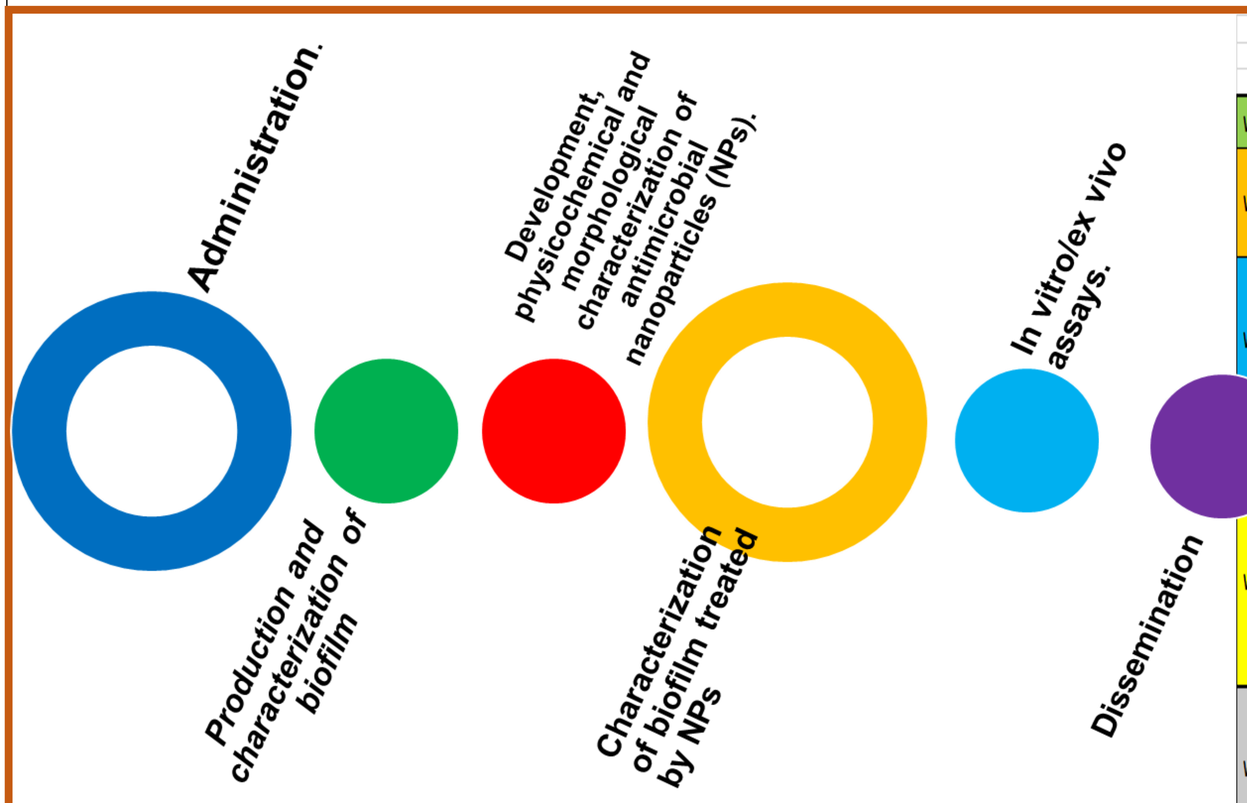
Università degli Studi di Messina

Università di Catania

Università degli Studi di Messina (RU1-UniME)	*Università degli Studi di Catania (RU2-UniCT)*
❑ **VENUTI** Valentina (P.I.)	❑ **PISTARA'** Venerando
❑ **CARIDI** Francesco	❑ **SALMERI** Mario
❑ **PALADINI** Giuseppe	
❑ **TOMMASINI** Silvana	
❑ **VENTURA** Cinzia Anna	

The two research units (RUs), involved in the FINI project, constitute a "scientific" network with complementary experiences, including the entire production process of the proposed NPs, ranging from the design, to the organic synthesis, from the characterization, up to the in vitro test and the ex-vivo models.

WORKING PACKAGES (WPS)



	Activity	RUs	Role	Duration (months) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
WP1 - Leader:RU1-UniME	Administration	RU1-UniME/RU2-UniCT	i) Overall project management, financial management, steering group/consortium meetings and formal reporting	
WP2 - Leader: RU2-UniCT	Production and characterization of biofilm	RU2-UniCT	i) Production of biofilm	
			ii) Characterization by TEM, SEM, SEM-EDX	
		RU1-UniME	i) Characterization by IR and Raman	
			ii) 3D imaging through NT	
WP3 - Leader: RU1-UniME	Development, physicochemical and morphological characterization of antimicrobial nanoparticles (NPs)	RU1-UniME	i) Realization of CS-NPs and PLGA-NPs	
			ii) Characterization of all NPs by UV-Vis, HPLC, IR, Raman	
			iii) 2D correlation analysis (2D-COS) of IR data, collected vs. T	
			iv) Characterization by ENS and INS	
		RU2-UniCT	i) Realization of AM-CDs based NPs and Au-NPs	
			ii) Characterization of all NPs by NMR, SEM and TEM	
er: RU1-UniME	Characterization of biofilm treated by NPs	RU1-UniME	i) Characterization by IR and Raman	
		RU2-UniCT	i) Characterization by SEM	
WP5 - Leader: RU2- UniCT	In vitro / ex vivo assays	RU2-UniCT	i) Evaluation of anti-bacterial and anti-biofilm activity of the antimicrobial loaded-NPs against drug-resistant bacterial strains, by in vitro assay	
			ii) Similar ex vivo studies	
			iii) Assessment of the cytotoxicity exerted by the NPs and of the occurrence of apoptosis and/or of oxidative stress	
			iv) Evaluation of anti-inflammatory potential of the NPs on infected cell lines and on infected corneal tissues	
WP6 - Leader: RU1-UniME	Dissemination	RU1-UniME/RU2-UniCT	i) Brochure/flyer, educational material, posters	
			ii) Web-site	
			iii) Scientific publications	
			iv) Strategic planning of communication, meetings among the partners, final plenary meeting	
			v) Seminars, ex-cathedra and e-learning program	

EXPECTED BENEFITS