**Partner Search Form
Horizon Europe
Health**

HNN3.0
HEALTH-NCP-NET

Date	13	06	2025	Deadline	16	09	2025

CONTACT

Organisation	Barcelona Supercomputing Center (BSC)	**Department**	CASE – Physical and Numerical Modelling
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Country	Spain		

Organisation type

Research organisation type	☒ Research Organisation ☐ University ☐ Company ☐ Other	**Is your company a Small and Medium Sized Enterprise (SME*)?** **Number of employees:**	☐ YES ☒ NO

Your enterprise is an SME if:
- it is engaged in **economic activity**
- it has **less than 250 employees**
- it has either an **annual turnover not exceeding €50M**, **or an balance sheet total not exceeding €43M**
- it is **autonomous**
For the definition of SMEs, look at: http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en

Short introduction of key areas of institute's research:
Barcelona Supercomputing Center-Centro Nacional de Supercomputación (BSC-CNS) is the national supercomputing centre in Spain. We specialise in high performance computing (HPC) and manage MareNostrum, one of the most powerful supercomputers in Europe. The center manages the Spanish Supercomputing Network, was among the founders of the PRACE infrastructure and is now a hosting entity for EuroHPC JU.
BSC has been successful in attracting talent, and our research focuses on five fields: Computer Sciences, Life Sciences, Earth Sciences, Computer Applications in Science and Engineering (CASE) and Computational Social Sciences and Humanities.
Within the CASE department we work to develop scientific and engineering software to efficiently exploit super-computing capabilities in biomedical, geophysics, atmospheric, energy, social and economic simulations.
The Physical and Numerical Modelling (PNM) group focuses on the development of high-performance computational models to tackle complex biophysical processes in biomedical and environmental systems. A major research line involves simulating the respiratory system to investigate airflow patterns and particle dynamics across patient-specific airway geometries. Leveraging the massively parallel Alya code, the group performs large-scale simulations of inhalation processes, including drug delivery and pollutant exposure. Recently, the group has initiated a new line of research focused on modelling the interaction between bacteriophages, bacteria, and mucus in the context of airway infections, aiming to determining the efficacy phage therapy at a mechanistic level. The group's research sits at the intersection of fluid dynamics, numerical methods, and high-performance computing, working in collaboration with clinical and experimental experts.

Former participation in an FP European project?	☒ YES ☐ NO
Project title / Acronym:	BSC is a seasoned organisation in FP participation, with over 160 active European projects running in 2024. Remarkable names in the Physical and Numerical Modelling group related to the biomedical field include CompBioMed (1 and 2) and SILICOFCM. Another project coordinated from the group is currently in the Grant Agreement Preparation phase (topic HORIZON-MISS-2024-CIT-01-02), in which our contribution is to work in the development of a digital twin lung in which we can observe the fate of pollution particles.
Activities performed:	In brief, the biomedical projects in the Physical and Numerical Modelling focus on simulating human anatomy (based on patient specific geometries and clinical data) and solving multi-physics problems within that framework (e.g., fluid-particle, which could be air-mucus-virion), by exploiting the supercomputing capacities of our centre providing a digital twin model.

Expertise / Commitment offered

Description of your expertise:	Our expertise lies in the computational modelling of complex biological systems, with a particular focus on the respiratory system. We develop and apply high-fidelity numerical methods to simulate airflow and particle transport through upper and lower airways, accounting for phenomena such as turbulence, Brownian motion, and particle-wall interaction. Our work integrates fluid dynamics and particle-based models within high-performance computing frameworks to investigate drug/therapy administration and particle deposition with patient-specific precision providing a digital twin model. More recently, we have been investigating the biophysical interaction of bacteriophages and bacteria in mucus environments, modelling their transport, binding, and aggregation using coupled Langevin and flow equations. This allows for a better understanding of biofilm dynamics and the potential of phage therapy in respiratory infections.
Keywords specifying your expertise:	Digital twin in-silico based simulations, Computational Fluid Dynamics (CFD), Particle Transport, Respiratory System Simulation, Drug Delivery, High-Performance Computing (HPC), Finite Element Method (FEM), Multi-scale Multi-physics Simulation

Commitment offered:	☒ Research ☐ Demonstration ☐ Training ☐ Technology ☐ Dissemination ☐ Other:
Interested in participation in project types:	☒ Research & Innovation Action ☐ Innovation Action ☐ EIC Pathfinder

Work Programme research areas: indicate your interest

Infectious diseases in the respiratory system, and phage therapy.

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Call topic(s):
HORIZON-HLTH-2025-01-DISEASE-01 - Testing safety and efficacy of phage therapy for the treatment of antibiotic-resistant bacterial infections

Do you have other partners for this topic (which partners/country)?	

Profile of partner sought

Role	☐ technology development	☐ research	☐ training
	☐ dissemination	☐ demonstration	☐ other _____

Country /region	☐

Expertise required	

I agree with the publication of my contact data: ☒ YES   ☐ NO