

# RESEARCH ACTIVITY SHEET

2025 PhD selections

## YOUR DETAILS

\* Name & Surname

Nicola Segata

\* Affiliation - Universita' di Trento, CIBIO

## PHD PROJECT DETAILS

\* Title of the proposed project

Microbiome signatures of early on-set colorectal cancer

\* Short description of the project (up to 300 words)

The research program is part of the project "PROSPECT " funded by Cancer Research UK, the National Cancer Institute, the Bowelbabe Fund for Cancer Research UK and Institut National Du Cancer through Cancer Grand Challenges. The overall aim of PROSPECT is to identify and understand the processes through which different biological and environmental factors cause early-onset cancers (EOCRC), and specifically the work packages led by prof. Nicola Segata are focusing on the role of the microbiome in such processes.

The researcher will investigate the microbiome associations with EOCRC and will develop computational approaches for the identification of the gut microbiome biomarkers in EOCRC; identify prospective EOCRC microbial biomarkers; and assess their transmissibility. This will be performed by developing new computational and statistical analyses,, and machine-learning investigations on newly collected samples from the project and samples from already public studies

\* Indicate the main research area for the project described above - Computational metagenomics and cancer

If needed indicate a second research area for the project described above -Biomolecular Science

\* Provide up to 3 key words for project:

microbiome,metagenomics, cancer

## YOUR LABORATORY ACTIVITIES DETAILS

\* Main topic/s of the lab

Computational metagenomics, microbiome studies

\* Short description of the lab activity (up to 500 words)

Next generation computational metagenomic tools. The potential of metagenomics is only partially expressed due to computational challenges. We are working on novel methods to profile microbiomes at increased resolution (e.g. strains) and perform large-scale comparative genomics on uncharacterized microbes.

Integrative and machine learning meta'omic approaches. We develop new machine learning tools to cope with the variability and dimensionality of microbiome profiles and provide clinically relevant signatures by integrating complementary meta'omic approaches (e.g. metatranscriptomics or metaproteomics).

Microbiome-pathogen interaction in human infections. The role of the microbiome in the acquisition and development of infections is largely unknown. By coupling longitudinal pathogen/microbiome sequencing we aim to understand how the microbiome can modulate the virulence profile and antibiotic resistance of human infections.

Microbiome transmission. We study how microbes can be transmitted between different environments with specific focus on how members of the microbiome are vertically transmitted from mothers to infants at birth and horizontally between family members or individuals sharing the same environment.

\* Recent bibliography (max 5 references)

1. Aitor Blanco-Míguez,... Nicola Segata. Extending and improving metagenomic taxonomic profiling with uncharacterized species using MetaPhlAn 4. *Nature Biotechnology*, 41:1633–1644, 2023.
2. Lee, K., Thomas, ... Segata, N. (2022). Cross-cohort gut microbiome associations with immune checkpoint inhibitor response in advanced melanoma. *Nature Medicine*, 28, 534–544.
3. Thomas, A.M., Fidelle, M., Routy, B. et al. Gut OncoMicrobiome Signatures (GOMS) as next-generation biomarkers for cancer immunotherapy. *Nat Rev Clin Oncol* 20, 583–603 (2023). <https://doi.org/10.1038/s41571-023-00785-8>
4. Piccinno, G., Thompson, K,N, ..., Huttenhower, C., Naccarati, A., Budinska, E., Segata N. The gut microbiome in colorectal cancer: a cross-stage strain-level pooled analysis of 3,741 individuals from 18 cohorts. *Accepted Nature Medicine*

\* Group composition: total members, and roles distribution (PhD, postdoc, technician, etc.)

25 members: 10 PhD students, 11 postdocs, 3 pre-doc , 2 research assistants

Institutional page link

<https://www.unitn.it/en>

Lab website link, if any

<http://segatalab.cibio.unitn.it/index.html>

Social media links, if any

If you prepare a video to promote your lab/project, please include the link below