

RECRUITING AND TRAINING PHYSICIANS-SCIENTISTS TO EMPOWER TRANSLATIONAL RESEARCH
A MULTILEVEL TRANSDISCIPLINARY APPROACH FOCUSED ON METHODOLOGY, ETHICS AND INTEGRITY IN
BIOMEDICAL RESEARCH - 2018-2023



FONDAZIONE
MONDINO
Istituto Neurologico Nazionale
e Centro Scientifico IIRCCS

RESEARCH TRAINING PROGRAM

I. General Information

Title of the research project:

Antibiotic resistome from the One-Health perspective: understanding antimicrobial resistance: metagenomic analysis of air contaminants and molecular study of the resistome

Name and address of the department:

Department of Medicine and Surgery, via Guicciardini 9, Varese (VA)

Student's supervisor:

Prof. Giovanni Porta

II. Description of the project

(max 1500 characters, spaces included)

The outbreak of the COVID-19 pandemic has highlighted the importance of controlling air-driven pathogens. In addition, multi-resistance is becoming a hard-to-face reality in hospitals, causing several problems in managing bacterial infections and forcing toward the discovery of new weapons against bacteria.

The project aims to analyze with a molecular approach culture independent the presence of microorganism and their antibiotic resistance.

The first aim is to monitor microbial air contamination in daily used and medical settings and to analyze DNA through a metagenomic approach, that allows us to identify species and the presence of genes conferring resistance to antibiotics and/or virulence factors. In parallel, we will evaluate the possibility to apply a system, named 'Crossfield', in these setting as an antimicrobial approach that does not require antibiotic.

We will sample air through a commercial air sampler, that allows microbes to adhere to a Petri dish containing an unselective media. Colonies grown will be counted and DNA will be extracted using commercial kits.

We will prepare NGS libraries for metagenomic analysis, while 16S analysis will be performed in parallel through the amplification via PCR of the entire 16S gene followed by Third Generation Sequencing (long run sequencing). Bioinformatic analysis of data obtained will be performed through online user-friendly platforms that do not require peculiar programming capabilities. The Department started working on this project in 2022.

Type of research project:

Basic science Clinical research without lab work Clinical research with lab work

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III. Student's involvement

- The student will mainly observe YES NO
- The student will observe the experiments but will be involved in data analysis YES NO
- The student will take active part in experiments ("lab work") **YES** NO
- The student will take active part in clinical examination (clinical research) YES NO
- The student will be allowed to work with patients YES NO

What are the tasks expected to be accomplished by the student?

(max 500 characters, spaces included)

Student will learn how to plan experiments, handle bacterial cultures, perform standard lab techniques such as nucleic acid extraction, PCR, agarose electrophoresis, media preparation, will observe library preparation and sequencing and will help in data analysis.

What is expected from/what will be the general outcome of the student?

To prepare a poster / presentation / scientific report / abstract

The student's name will be mentioned in a future publication

Opportunity to present together with the supervisor the results on a conference

No specific outcome is expected

IV. Requirements

What skills are required from the student?

(max 500 characters, spaces included)

Ability to work in team, collaboration and communication skills, knowledge of scientific English.

Is there any special knowledge or a certain level of studies needed?

Subjects passed:

Biology and Genetics first year Medical school

Previous experience with:

Certificate of:

None

Are there any legal limitatons in the student's involvement in the project? YES NO

If yes, what are the limitations?

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For the use of students considering participating in the project, further information can be found from the following references:

(please add specific references, max 3)

1. Dae-Wi Kim e Chang-Jun Cha. Antibiotic resistome from the One-Health perspective: understanding and controlling antimicrobial resistance transmission. *Experimental and Molecular Medicine* 2021
2. Kihyun Lee; Dae-Wi Kim; Chang-Jun Cha. Overview of bioinformatic methods for analysis of antibiotic resistome from genome and metagenome data. *Journal of Microbiology* 2021
3. Zonghui Jian; Li Zeng; Taoije Xu; Shuai Sun; Shixiong Yan; Lan Yang; Ying Huang; Junjing Jia; Tengfei Dou. Antibiotic resistance genes in bacteria: occurrence, spread and control. *Journal of Basic Microbiology* 2021

V. Schedule

Duration of the project:

1 month 2 months **3 months**

There are approximately 3 hours of work per day.

Available months:

January February **March** **April** **May** June
 July August September October November December

How many students can you accept to the project at the same time? 1

Special remarks:

(e.g., students should bring a stethoscope and a white coat, any vaccinations required, etc.)
Student should bring a white coat.

NOTE: a scientific report is required at the end of the program