

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



RESEARCH TRAINING PROGRAM

I. General Information

Title of the research project:

Modulators of intrinsic contractions of lymphatic vessels and lymph flow

Name and address of the department:

Dept. of Medicine and Surgery – DMC Via Monte Generoso, 71 I-21100 Varese

Student's supervisor:

Andrea Moriondo

II. Description of the project

Background

Lymphatic vessels play an important role in maintaining tissue fluid homeostasis by an active drainage of fluid, solutes and even cells from the interstitial and serosal spaces of the body to the venous blood stream. This task can be accomplished by two mechanisms which are able to induce contractions of the functional units of collecting lymphatics (lymphangions) that allow a negative hydraulic pressure gradient to develop between interstitial space and intraluminal space. The first mechanism, extrinsic, is due to the mechanical stresses that surrounding tissues can exert upon lymphatics, whereas the second one, intrinsic, is due to rhythmic contractions of a layer of lymphatic muscle cells surrounding the lymphatic endothelial layer.

What is the aim of the project?

The aim of the project is to study the effect of local environmental (such as temperature, osmolarity, mechanical stress) and biochemical (modulators, neurotransmitters, inflammatory agents, specific agonists and antagonists of ionic channels) stimuli on the intrinsic contractility of the lymphatic vessels and lymph flow.

What techniques and methods are used?

Tissue explants, fluorescence videomicroscopy, microvessel hydraulic pressure measurements, video analysis and mechanical modeling, microsurgery.

When did the department start working on this project?

The Human Physiology Laboratory started working on this topic around 2002

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?

Students will observe and assist staff during experiments, might be involved in some parts of them depending upon individual skills, will take part in data analysis and routine laboratory work (solutions, scheduling, experimental planning)

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?

Successful students are required to have a strong background in cardiovascular physiology, and be interested in microsurgery, vascular physiology, Computer-assisted data analysis and even data modeling.

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

Subjects passed:
Human Physiology, Anatomy, Physics.

Previous experience with:

Certificate of:

None

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Are there any legal limitatons in the student's involvement in the project? YES NO
If yes, what are the limitations?

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- Solari *et al.* "Acute Exposure of Collecting Lymphatic Vessels to Low-Density Lipoproteins Increases Both Contraction Frequency and Lymph Flow: An In Vivo Mechanical Insight" *Lymphat Res Biol.* 2019 Sep 17. doi: 10.1089/lrb.2019.0040
- 2- Solari *et al.* "Fluid Osmolarity Acutely and Differentially Modulates Lymphatic Vessels Intrinsic" *Front Physiol.* 2018 Jul 5;9:871. doi: 10.3389/fphys.2018.00871.
- 3- Solari *et al.* "Temperature-dependent modulation of regional lymphatic contraction frequency and flow" *Am J Physiol Heart Circ Physiol.* 2017 Nov 1;313(5):H879-H889. doi:10.1152/ajpheart.00267.2017.

V. Schedule

Duration of the project:

1 month 2 months 3 months

There are approximately 4-6 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.)
Students should bring their white coats, other individual dispositive (gloves, goggles, masks) will be provided by the lab

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