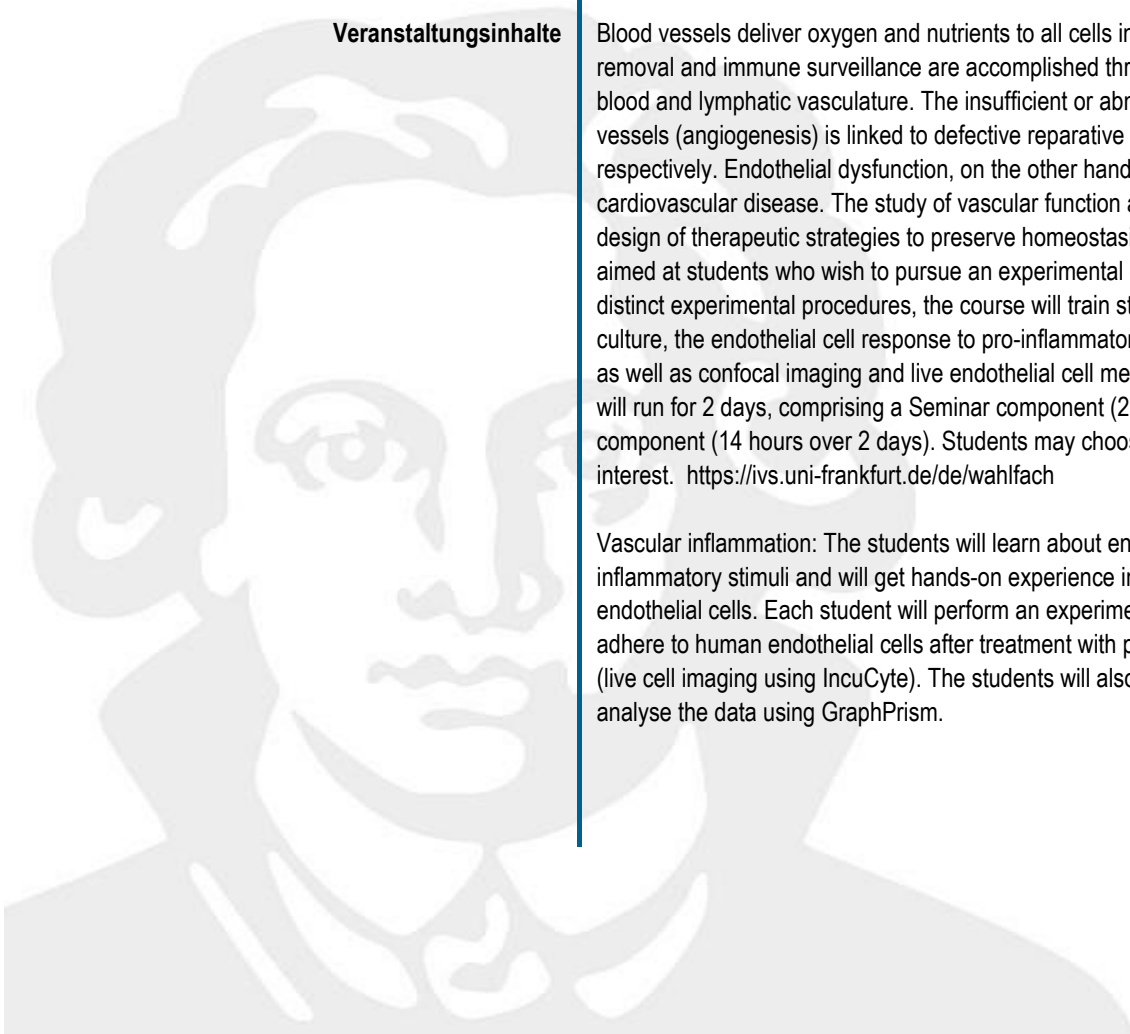


Wahlfachtitel	Vascular disease and therapy
Lehrperson(en)	Prof. Dr. Ingrid Fleming, Dr. Mauro Siragusa, Dr. Guillermo Luxán
Empfohlen ab klinischem Semester	ab 1. Klin. Semester
Kursort	Cardio-Pulmonary Institute (CPI), Haus 25B, Theodor-Stern-Kai 7, 60590 FFM und online
Gruppengröße	16 Teilnehmer
Eingangsvoraussetzungen	This elective course is aimed at students who wish to pursue an experimental doctoral thesis The language of the course is English.
Lernziele	By providing 4 distinct experimental procedures, the course will train students on endothelial cell culture, the endothelial cell response to pro-inflammatory and pro-angiogenic stimuli as well as confocal imaging and live endothelial cell metabolic mapping.
Veranstaltungsinhalte	<p>Blood vessels deliver oxygen and nutrients to all cells in the body, while waste removal and immune surveillance are accomplished through the cooperation of the blood and lymphatic vasculature. The insufficient or abnormal formation of new vessels (angiogenesis) is linked to defective reparative neovascularization or cancer, respectively. Endothelial dysfunction, on the other hand, is a hallmark of cardiovascular disease. The study of vascular function and heterogeneity enables the design of therapeutic strategies to preserve homeostasis. This elective course is aimed at students who wish to pursue an experimental doctoral thesis. By providing 4 distinct experimental procedures, the course will train students on endothelial cell culture, the endothelial cell response to pro-inflammatory and pro-angiogenic stimuli as well as confocal imaging and live endothelial cell metabolic mapping. The Elective will run for 2 days, comprising a Seminar component (2 hours) and a Practical component (14 hours over 2 days). Students may choose any subcategory of interest. https://ivs.uni-frankfurt.de/de/wahlfach</p> <p>Vascular inflammation: The students will learn about endothelial cell activation by pro-inflammatory stimuli and will get hands-on experience in the handling of human endothelial cells. Each student will perform an experiment where human monocytes adhere to human endothelial cells after treatment with pro-inflammatory cytokines (live cell imaging using IncuCyte). The students will also learn to summarize and analyse the data using GraphPrism.</p>



Veranstaltungsinhalte

Angiogenesis: The students will learn about endothelial cell proliferation and will get hands-on experience in the handling of human endothelial cells and their acute responses to growth factors. Each student will perform an experiment where human endothelial cells proliferate in response to injury (live cell imaging using IncuCyte) and evaluate the EdU incorporation with confocal microscopy. The students will also learn to summarize and analyse the data using Imaris 9.2 and GraphPrism.

Cardiovascular imaging: Seeing is believing The students will learn how to perform confocal fluorescent imaging in heart sections and distinguish different cell types by morphology and specific lineage markers (i.e. cardiomyocytes, endothelial cells and pericytes/ smooth muscle cells). Samples will include healthy and diseased hearts. Each student will perform immunofluorescence stainings, confocal imaging with a Leica Stellaris microscope and data evaluation with Volocity and GraphPad Prism softwares.

Endothelial cell metabolic heterogeneity: Although endothelial cells of lymphatic capillaries have many properties in common with the endothelium of blood vessels, they also have distinct structural and energetic characteristics reflecting their specific functions. Such a metabolic heterogeneity is responsible for each specific cell subtype to support their energetic demands and regulate lineage-related transcription. While blood endothelial cells exhibit a preference for glucose consumption, lymphatic endothelial cells import primarily fatty acids. In this setting, students will visualize the difference of the key metabolites imported in a growing monolayer of blood or lymphatic endothelial cells. Each student will trace the uptake of glucose and palmitate with selective fluorescent probes and results will be visualized by live cell fluorescence activated cell sorting approach. Students will also get familiar with the FlowJo software.

Studienleistungen

At the end of the elective course, each student will write an experimental protocol (max 3 pages). Grades will be cumulatively based on protocol and presentation. No missing hours are allowed.

Art der Prüfung

At the end of the elective course, each student will write an experimental protocol (max 3 pages). Grades will be cumulatively based on protocol and presentation. No missing hours are allowed.

**Weitere Hinweise
Literaturhinweise**

1. Luxán G., Dimmeler S. The vasculature: a therapeutic target in heart failure. DOI: 10.1093/cvr/cvab047; 2. Li X., Sun X., Carmeliet P. Hallmarks of endothelial cell metabolism in health and disease. doi.org/10.1016/j.cmet.2019.08.011; 3. Augustin H., Koh GY. Organotypic vasculature: From descriptive heterogeneity to functional pathophysiology. DOI: 10.1126/science.aal2379