

Theme Issue Editorial Focus

Signaling in endothelial cells: 10 years Department of Vascular Biology and Thrombosis Research at the Medical University Vienna

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The Department of Vascular Biology and Thrombosis Research was established as an independent Department at the former Medical Faculty of the University of Vienna on April 15th, 1996 as one of the first Vascular Biology departments worldwide. It originated from the “Clinical Experimental Physiology”, a division at the former Department of Medical Physiology, having its major research focus on the physiology and pathophysiology of the fibrinolytic system at a biochemical and cellular level. In the course of the formation of the Department of Vascular Biology, a former research group of the Sandoz Research Institute joined the newly formed Department. This group originally focused on transplantation research and the involvement of endothelial cells in transplant rejection with a predominant molecular biology driven approach.

The mission of the new Department was to pursue basic research in the area of vascular biology and thrombosis research on the cellular, molecular and systemic levels. Research is focused on the analysis of reactions of blood vessel components during patho-physiologically and clinically relevant processes such as wound healing, tumor angiogenesis, atherosclerosis / restenosis. Based on the understanding of such processes it is a further aim of the Department to develop strategies for diagnosis and treatment of such diseases including new drugs and novel therapeutics. Another important aspect of the Department is to train and educate medical and PhD students, post-doctoral trainees and scientists in vascular biology and to raise public awareness for the clinical significance of this area of research.

Currently, the Department has approximately 60 members and is organized into seven research groups and two core facilities, each headed by a principle investigator. During the past 10 years about 70% of members of the Department were paid by public or private grants and approximately 40% of scientists came from outside Austria. In addition, 25 foreign guest scientists joined the Department for their sabbatical leave further

strengthening the tight network of international collaborations around the world.

Members of the Department are critically involved in teaching medical physiology and vascular biology courses at the undergraduate and graduate levels at the Medical University of Vienna and for Life Science students of the University of Vienna. The Department was the first within the former Vienna Medical Curriculum to introduce courses in “Problem Oriented Learning” in Physiology already in the early 1990s, and the experience from these courses had major impact on the medical education.

Research at the Department is focused on the broad field of vascular biology and thrombosis research. Historically, the roots of the “Medical Branch” of the Department are in the field of plasma proteins, specifically related to the fibrinolytic system: “Angiokinese” was the first name given for tPA isolated from vascular perfusates (1); first purification of tPA to homogeneity (2); first purification of an active plasminogen activator inhibitor (3); first description of “signaling” by the urokinase receptor system (4). In 1985 a core facility to generate monoclonal antibodies was established, and the Department was among the first worldwide to obtain monoclonal antibodies against components of the fibrinolytic system. Using these antibodies, test systems were established, and clinical studies were performed analyzing the fibrinolytic system in patients. At the same time the original biochemical research approach was expanded to studies of vascular cells and the regulation of fibrinolysis in these cellular systems.

Another core facility related to “Transgene Technology” was the first within a University facility in Austria which generated a knock-out mouse, in this case for protein C inhibitor (5). Furthermore, core facilities for morphometry and imaging exist to assist researchers with advanced technologies such as confocal laser microscopy allowing FRET analysis, deconvolution microscopy and time-lapsed microscopy.

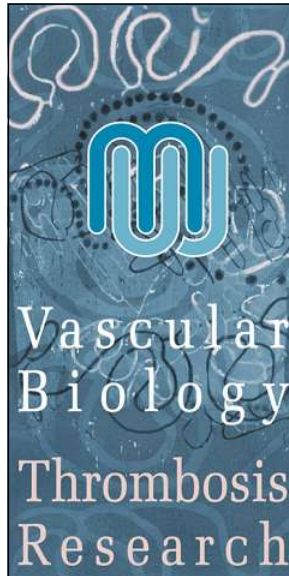
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In several surveys about the scientific output and impact of biomedical research in Austria, the Department ranked among the three top institutions. During the past 10 years, more than 450 peer-reviewed papers were published with the correspondence address of the Department.

Another primary research interest of the Department is the better understanding of pathomechanisms in vascular diseases. This is pursued at the molecular level by investigations on transcriptional regulation and signal transduction, using different cellular model systems as well as by exploring knock-out or transgenic animal models of e. g. angiogenesis, atherosclerosis and restenosis. Using these approaches, several new molecules and effector mechanism were discovered, including XIAP (6, 7), IKKIP (8) and Nur-77 (9). To approach human diseases on a molecular genetics level, novel genes and gene mutations were uncovered using yeast screens as well as gene chip analyses.



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In this theme issue of *Thrombosis and Haemostasis*, reviews from the seven research groups of the Department were collected, focussing on: Urokinase receptor interactions and signaling: A vascular biologist's view (10); protein C inhibitor, a serpin with functions in and outside vascular biology (11); inflammatory profile of oxidized phospholipids (12); signal transduction induced in endothelial cells by growth factor receptors involved in angiogenesis (13); resolution of inflammation by intracellular feedback loops in the endothelium (14); ubiquitylation within signaling pathways (15); fluorescent proteins and FRET as tools in signaling research (16).

We believe that these examples are a very valuable demonstration of the current research profile of our Department. It should be emphasized that an educational system fostering topic-specific research and teaching represents a prosperous approach to reach top quality in medical research and personal development.

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