グローバル COE 特別セミナー

代謝生理化学セミナー

(平成 20 年度)

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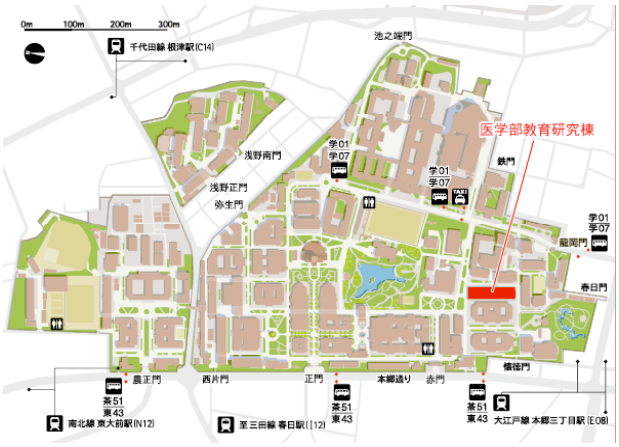
演題：

Cardiovascular Development, Function and Disease: Chemistry to Physics

日時：2008 年 11 月 21 日（金）17：30～18：30

場所：東京大学医学系研究科
医学部教育研究棟 13F　第８セミナー室



＊事前参加登録不要、参加費無料。皆様の御来聴をお待ち致しております。

要旨：（別紙）

世話人：　院医・代謝生理化学　栗原裕基（内　23495）

要旨：

During the last century, the life processes have been mainly viewed as a “chemical machine”. This mainstream view has been represented by the huge leap made by biochemistry, molecular biology and genetics since the beginning of 20th century until now. However, in the last 10 - 15 years, another approach, that is mostly based on physical and mechanical principles, to describe the processes of life has emerged. This latter approach is, at the moment, mostly reflected by system biology, synthetic biology, bioengineering and nanobiotechnology. In the past, my laboratory has revealed several molecular (i.e. chemical) components that play important roles in the development, physiological function, and diseases of the cardiovascular system. Most recently, we have also begun to understand developmental and functional processes of the cardiovascular system based on the physical and mechanical principles. In my talk, I would like to discuss both chemical (i.e., biochemistry, molecular biology, genetics) and physical/mechanical approaches that we are employing to understand the dynamic nature of the life processes, mostly using the cardiovascular system as a model system.

The cardiovascular system is the first organ to develop during embryogenesis. It is also one of the most vital organ in the body. In the past fifteen years, my laboratory has used extensive molecular, genetic and cell biological tools to reveal central molecular players for the development of the vascular system. In the first part of my talk, I will summarize such discoveries, in particular the roles of Tie receptors and angiopoietins in vascular development, and the roles of VEGF and angiopoietin signaling in the regulation of arterial and venous differentiation. I will also discuss our most recent studies on the mechanisms underlying the blood vessel formation using a various novel imaging tools, as well as by using the principles of mechanical physics and stochastic fluctuation models. In the second part of my talk, I will discuss our most recent effort to establish the mechanical model for the physiological function of the heart based on the principles of fluid-dynamics, and also to identify molecules that play essential roles in the pumping of the heart. The third part of my talk will focus on our most recent discovery of a critical biochemical signaling pathway in the ischemia induced myocardial infarction, one of the most prevalent and fatal diseases in human society. At the end of my talk, I would like to discuss how I envision our approaches based on both chemical and physical principles may impact the future advancement of life science and medicine.