血管マトリクス生物学（柳沢 裕美）
Vascular matrix biology (YANAGISAWA Hiromi)

YANAGISAWA Hiromi, M.D. Ph.D. , Professor
Director of Life Science Center for Survival Dynamics, TARA
E-mail address:hkyanagisawa@tara.tsukuba.ac.jp

YAMASHIRO Yoshito, Ph.D., Assistant Professor
E-mail address: yamayoshito@tara.tsukuba.ac.jp
KIMURA Kenichi, Ph.D., Assistant Professor
Email address: kkimura@tara.tsukuba.ac.jp

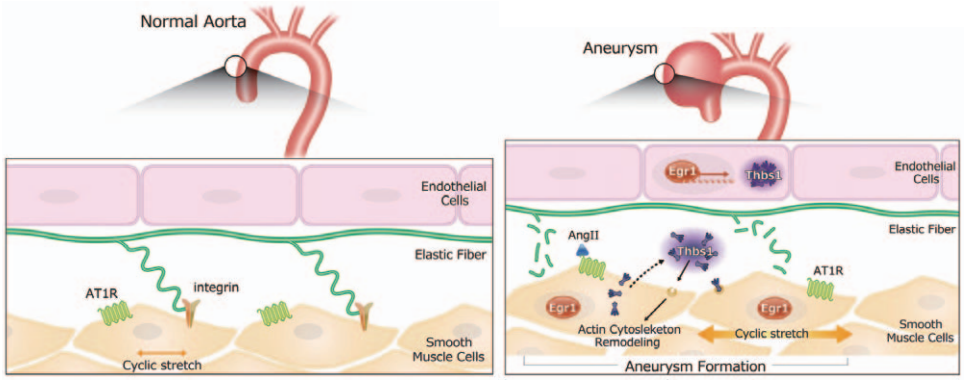
URL: https://www.saggymousehkytsukuba.com/

血管メカノトランスダクション機構の解明と疾患への応用

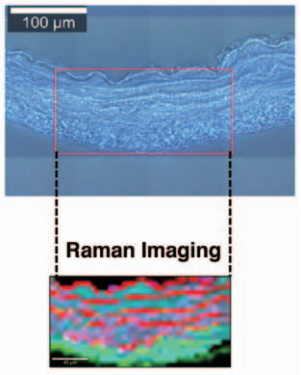
血管は心拍出による機械的刺激に常に晒されています。ではいかに機械的刺激が、血管細胞（内皮細胞、平滑筋細胞、線維芽細胞）に伝搬され、生化学シグナルに変換されるのでしょうか？解剖学的に異なる血管や、老化や炎症で性状が変化した血管では、シグナル伝達はどのように変わるのでしょうか？私たちは、大動脈瘤や大動脈解離、血管内膜肥厚、加齢性動脈硬化などのモデルマウスを作製し、ストレッチアッセイ・ライブイメージング・ゲノムエディティングなどの技術を組み合わせ、メカノトランスダクション機構の解明とその破綻によっておこる疾患の診断や治療標的の探求に取り組んでいます。バイオエンジニアリング・ラマンイメージング・バイオマテリアル・心臓血管外科などの研究室との共同研究も進めています。

Elucidating the molecular mechanism of mechanotransduction in blood vessels and its application to vascular diseases

Blood vessels are constantly exposed to the mechanical stress caused by the cyclic pumping of the heart. However: 1) how vascular cells (endothelial cells, smooth muscle cells, and fibroblasts) sense stress and convert it to biochemical signals, 2) whether anatomically different vascular systems have distinct mechanotransduction pathways, 3) how damaged/aged extracellular matrix affects intracellular signaling pathways, are largely unknown. We utilize mouse models of cardiovascular diseases such as aortic aneurysm, aortic dissection, and mechanical injury and combine in vitro stretch assay, flow chamber, live imaging, and genome editing to elucidate the molecular mechanism of mechanotransduction in the vessel wall. We are currently collaborating with bioengineering, biomaterial, and clinical laboratories.



Molecular dissection of mechanotransduction in normal (left) and aneurysmal wall (right). The mechanosensitive transcription factor, Egr1, activates the angiotensin II signaling pathway and induces upregulation of Thbs1 in the aneurysm wall.



Label-free imaging of the aorta.