04
VASCULAR MEDICINE
(Basic Research)

Principal Investigators

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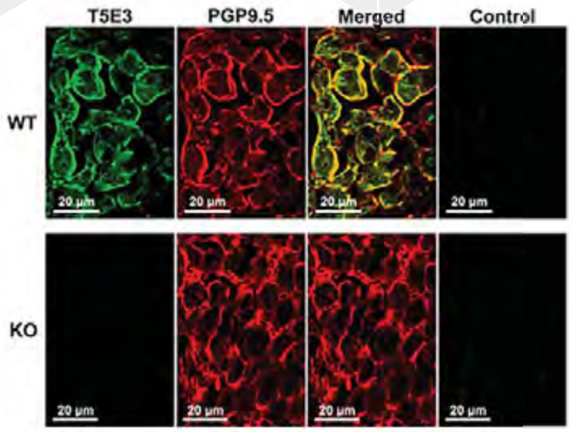
Team

Vascular Medicine (Basic)

Research Progress Summary

The research team led by Professor Xiaoqiang Yao has found an important functional role of TRPC5-containing channel in mechanosensation of baroreceptor neurons. Knockdown or knockout of TRPC5 results in an impairment in mechanosensation of baroreceptor neurons. In animal experiments, knockdown or knockout of TRPC5 reduces the pressure-induced action potential firings, attenuates baroreflex control of heart rate and causes unstable blood pressure. In summary, the team identified a novel protein (TRPC5) that is involved in baroreceptor mechanosensation.

Recent studies done by Professor Yu Huang's team provide novel evidence in support of a crucial role of oxidative stress in vascular dysfunction in hypertension and diabetes. The team highlighted the pathological importance of several pro-inflammatory factors in mediating vascular dysfunction and revealed that angiotensin 1-7, ACE2, bilirubin, tea polyphenols and sitagliptin (dipeptidyl peptidase inhibitor) are effective in reducing oxidative stress in either diabetes or hypertension. Limiting oxidative stress through inhibiting the production of reactive oxygen species is effective in restoring the impaired endothelial function in diabetes and hypertension. In addition, the team also identified a new signalling pathway in endothelial cells involved in the pathogenesis of atherosclerosis.



This Figure shows the expression of TRPC5 proteins in the nodose ganglion neurons of wild-type mice in the tissue sections prepared from mouse nodose ganglions. In contrast, TRPC5 expression was absent in the nodose ganglion neurons of TRPC5 knockout mice. T5E3 is a TRPC5-specific antibody. PGP9.5 is a neuronal marker. WT stands for wild-type mice. KO stands for TRPC5 knockout mice.

Recognitions

Grants and Consultancy

Full Name of PI	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Xiaoqiang Yao	TM9SF4 as a Novel K+ Channel and Its Role in Autophagy	Research Grant Council – General Research Fund	01/01/2017	31/12/2019	1,000,387
Yu Huang	Targeting TFEB to Reverse Endothelial Dysfunction in Diabetic Mice through Inhibition of Autophagy	Research Grants Council – General Research Fund	2017	2019	1,317,102
Yu Huang	Molecular Mechanisms of Red Wine Resveratrol against Metabolic Vascular Dysfunction	Food and Health Bureau – Health and Medical Research Fund	2016	2018	1,199,696
Yu Huang	Identifying the Eepigenomic Fingerprint of Coronary Heart Disease in Chinese Adults with Type 2 Diabetes	Natural Science Foundation of China (NSFC) – National Health and Medical Science Council Joint Research Scheme	2016	2020	RMB 3,500,000

Publications

A. Journal Papers

1. Lau OC, Shen B, Wong CO, Tjong YW, Lo CY, Wang HC, Huang Y, Yung WH, Chen YC, Fung ML, Rudd JA, Yao X. TRPC5 channels participate in pressure-sensing in aortic baroreceptors. *Nature Communications*. 2016; 7:11947.
2. Lau EO, Lo CY, Yao Y, Mak AF, Jiang LW, Huang Y, Yao X. Aortic baroreceptors display higher mechanosensitivity than carotid baroreceptors. *Frontiers in Physiology*. 2016; 7:384.
3. Wang L, Luo JY, Li B, Tian XY, Chen LJ, Huang Y, Liu J, Deng D, Lau CW, Wan S, Ai D, Mak KL, Tong KK, Kwan KM, Wang N, Chiu JJ, Zhu Y, Huang Y. Integrin-YAP/TAZ-JNK cascade mediates atheroprotective effect of unidirectional shear flow. *Nature*. 2016; 540(7634):579-82.
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10. Li H, Yao W, Liu Z, Xu A, Huang Y, Ma XL, Irwin MG, Xia Z. Hyperglycemia abrogates ischemic postconditioning cardioprotection by impairing adipoR1/caveolin-3/STAT3 signaling. *Diabetes*. 2016; 65(4):942-55.
11. Tian XY, Ma S, Huang Y, Wong WT. A revisit of the renin-angiotensin system in cardiovascular biology. *Trends in Cardiovascular Medicine*. 2016; 26(3):229-31. (Editorial Commentary)
12. Ma S, Tian XY, Zhang Y, Mu C, Shen H, Bismuth J, Pownall HJ, Huang Y, Wong WT. E-selectin-targeting delivery of microRNAs by microparticles ameliorates endothelial inflammation and atherosclerosis. *Scientific Reports*. 2016; 6:22910.
13. He L, Liu Q, Hu T, Huang X, Zhang H, Tian X, Yan Y, Wang L, Huang Y, Miquerol L, Wythe JD, Zhou B. Genetic lineage tracing discloses arteriogenesis as the main mechanism for collateral growth in the mouse heart. *Cardiovascular Research*. 2016; 109(3):419-30.
14. Hu W, Zhang Y, Wang L, Lau CW, Xu J, Luo JY, Gou L, Yao XY, Chen ZY, Ma RC, Tian XY, Huang Y. Bone morphogenic protein 4-Smad induced upregulation of platelet-derived growth factor AA impairs endothelial function. *Arteriosclerosis, Thrombosis and Vascular Biology*. 2016; 36(3):553-60.
15. Miernisha A, Bi CW, Cheng LK, Xing JG, Liu J, Maiwulanjiang M, Aisa HA, Dong TT, Lin H, Huang Y, Tsim KW. Badiranji Buya Keli, a Traditional Uyghur medicine, induces vasodilation in rat artery: signaling mediated by nitric oxide production in endothelial cells. *Phytotherapy Research*. 2016; 30(1):16-24.
16. Sun Y, Lau CW, Jia Y, Li Y, Wang W, Ran J, Li F, Huang Y, Zhou H, Yang B. Functional inhibition of urea transporter UT-B enhances endothelial-dependent vasodilation and lowers blood pressure via L-arginine-endothelial nitric oxide synthase-nitric oxide pathway. *Scientific Reports*. 2016; 6:18697.