RGC Reference CUHK2/CRF/12G
please insert ref. above

The Research Grants Council of Hong Kong
Collaborative Research Fund Group Research Projects
Completion Report

(*for completed projects only*)

Part A: The Project and Investigator(s)

1. Project Title

Physical exercise promotes vascular health: impact of mechano-transduction and novel endothelium-derived regulators

2. Investigator(s) and Academic Department/Units Involved *(please highlight approved changes in the composition of the project team and quote the date when RGC granted approval of such changes)*

Research Team	Name/Post	Unit/Department/Institution	Average number of hours per week spent on this project in the current reporting period
Project Coordinator	HUANG Yu Professor	School of Biomedical Sciences, Chinese University of Hong Kong	10
Co-Principal investigator(s)	XU Aimin, Professor KWAN Kin Ming Associate Professor CAI Zongwei Professor	Pharmacology & Pharmacy, University of Hong Kong School of Life Sciences, Chinese University of Hong Kong Chemistry, Hong Kong Baptist University	6 6 4
Collaborators/ Others	Prof CHIEN Shu Prof CHIU JJ Prof WANG Nanping	University of California, San Diego, USA National Health Research Institutes, Taiwan Institute of Cardiovascular Sciences, Peking University	

3. Project Duration

	Original	Revised	Date of RGC Approval *(must be quoted*)
Project Start Date	1 June 2013		
Project Completion Date	31 May 2016		
Duration (*in month*)	36		
Deadline for Submission of Completion Report	31 May 2017		

Part B: The Final Report

5. Project Objectives

5.1 Objectives as per original application

1. To investigate the impact of physical exercise on vascular function in diabetes and obesity mediated by metabolic improvement
2. To examine the impact of major mechano-sensitive transcription factors in endothelial cells induced by exercise on vascular function in diabetic and obese mice
3. To investigate the regulation of bone morphogenic protein-4 (BMP4)-Smad1/5 in mediating endothelial dysfunction in diabetic and obese mice by exercise training

5.2 Revised objectives

Date of approval from the RGC: _____

Reasons for the change: _____
_____

6. Research Outcome

6.1 Major findings and research outcome
(maximum 1 page; please make reference to Part C where necessary)

Due to one-page limit, we only highlighted a few major findings from several important publications

1. We demonstrate that physical running exercise profoundly improve endothelial function by augmenting endothelium-dependent relaxation in conduit aortas and flow-mediated dilatation in resistance mesenteric arteries and by restoring insulin-induced relaxation in small blood vessels in diabetic mice. AMPK-dependent PPARδ-mediated inhibition of ER stress contributes to the vascular benefits of exercise and provides potentially effective targets for treating diabetic vasculopathy. This study was published in ***Diabetes*** (2017 Feb;66(2):519-528). In addition, we published similar cellular response to the first-choice anti-diabetic drug metformin in obese and diabetic mice (***Arteriosclerosis, Thrombosis and Vascular Biology*** 2014,34(4):830-836). ER stress is known to link to obesity, insulin resistance and diabetes. These new findings suggest that metformin may be potentially useful to protect endothelial function in people who have difficulty in carrying out physical exercise.
2. Exercise increases the rate of blood flow and impact of unidirectional laminar shear stress on the vascular wall. We have recently provided novel evidence demonstrating that endothelial YAP/TAZ (the effector of Hippo pathway) activity can be regulated by different patterns of shear stress. YAP/TAZ inhibition suppresses inflammation and retards atherogenesis. Atheroprone-disturbed flow increases whereas atheroprotective unidirectional shear stress inhibits YAP/TAZ activity. Our new results indicate that integrin-$G\alpha_{13}$-RhoA-YAP pathway holds promise as a novel drug target against atherosclerosis. This novel study was published in Nature (***Nature*** 540:579-581. Commented in Nature News and Views, ***Nature*** 540:531-532).
3. We also published a paper in ***Molecular BioSystems*** [11(9):2588-2596] in which we present the effect of physical activity on biochemical changes in diabetic *db/db* mice using an untargeted metabolomics study based on liquid chromatography coupled with high resolution mass spectrometry. These findings indicated that diabetic mice might be more susceptible to exercise for energy expenditure. Physical exercise could mitigate insulin resistance in type-2 diabetes through improving FAO and that uridine in blood might be an important indicator to reflect insulin sensitivity promoted by exercise training in diabetic mice.
4. We have found that the up-regulation of BMP4 and phosphorylation of Smad1/5 in the aortic arch (a pro-atherogenic region) of *db/db* mice are reduced after exercise. The PC have recently published two papers on the effect of BMP4 to impair endothelial function in ***Free Radical Biology and Medicine*** (2014) and ***Arteriosclerosis, Thrombosis and Vascular Biology*** (2016). We have generated different mouse lines (Smad4 conditional null allele mouse line, Smad1/5 double conditional null allele mouse line, and Tie2-CreERT2 transgenic mouse line) to generate endothelial cell-specific loss of function of Smad4 (*Tie2-CreERT2/Smad4*) and Smad1/5 (*Tie2-CreERT2/Smad1/5*) mice. We have obtained a substantial amount of results showing that *Tie2-CreERT2/Smad4* mice are protective against endothelial dysfunction in angiotensin II-induced hypertension and high-fat diet-induced obesity. We are preparing a manuscript for submission which will highlight the pathological importance of BMP4/Smad signaling cascade in endothelial dysfunction and this pathway can be weakened by physical exercise.

6.2 Potential for further development of the research and the proposed course of action *(maximum half a page)*

We have recently initiated collaborations with cardiologists and endocrinologists at Prince of Wales Hospital to search for potential prognostic circulating biomarkers based on our recent findings published in Nature (December 2016) to predict the risk of atherosclerosis in patients with diabetes, dyslipidemia and coronary artery disease. We are currently working on a screening system aiming to identify any FAD-approved drugs that can target Yap/Taz for drug repurposing. With the successful of renewal of the collaborative joint scheme that is to start in June 2017, we will continue to investigate the impact of physical exercise on the development of atherosclerosis, energy metabolism in adipose tissues and liver and to identify signaling molecules that are responsible for crosstalk between blood vessels and other metabolic organs. This new CRF will enable us to generate necessary animal models and to use Omics techniques in order to uncover new molecular and cellular mechanisms underlying the health benefits of increased physical activity. This will help us to identify new therapeutic targets that mimics exercise benefit and new cardiovascular and diabetic risk factors and biomarkers and to develop an integrative collaboration platform for studying vascular and metabolic benefits. We will disseminate some of significant findings and publish our studies from time to time in the next three years.

6.3 Research collaboration achieved *(please give details on the achievement and its relevant impact)*

1. The PC has held frequent discussion meetings with Co-investigators on the progress
   of the projects; four meetings with Aimin Xu, six meetings with KM Kwan (with record), two meetings with Zongwei Cai during past 15 months at three collaborating institutions.
2. The PC's team held a half of day report and discussion meeting with Prof. Shu Chien, the Chairman of International Advisory Committee of this CRF grant at School of Biomedical Sciences, Chinese University of Hong Kong on 9 October 2013.
3. Some student members of PC's team had discussion meeting with the international collaborators Dr. Nanping Wang and Dr. JJ Chiu on 10 October 2013.
4. The PC's team held a research discussion with PC's collaborators Dr Wing Tak Wong, Assistant Professor and Dr. Xiaoyu Tian (from Houston Methodist Research Institute, Houston, Texas, USA) at School of Biomedical Sciences, Chinese University of Hong Kong on 19 Oct 2013.
5. We held a half day discussion meeting on research progress at School of Biomedical Science, Chinese University of Hong Kong on 9 October 2014 (the brief minutes is enclosed) and the following are the participants of this meeting: four PC and Co-Is, Dr. Yu Huang's team: Li Wang (Postdoc fellow), Jiang-Yun Luo (Ph.D student), Anna Cheang (Postdoc fellow), Dan Qu (PhD student), HUANG Yuhong (PhD student), Jian Liu (Postdoc fellow); Dr. KM Kwan's team: KK Tong (Postdoc fellow), Pak Lun Baggio Liu (M.Phil student) Dr. Aimin Xu's team: Leiluo Peter Geng (Ph.D. student); Dr. Zongwei Cai's team: Li Xiang (Postdoc fellow), Xiaona Li (Ph.D student), Jing Fang (Ph.D student), Juntong Wei (Research Assistant).

6. The PC's team and Co-PI Dr. ZW Cai's team had four reciprocal visits between 2013-2016) and Dr. Cai's PhD student Ms. Li Xiang also worked some time in C's lab.
7. The PC and his team members visited the international collaborator Dr. Jeng-Jiann Chiu's laboratory in National Health Research Institutes, Taiwan in 2013
8. We have a number of joint publications with all co-PIs and international collaborators in journals such as Nature, Circulation, Diabetes, Hypertension, Arteriosclerosis, Thrombosis and Vascular Biology, Antioxidants & Redox Signaling.
9. Through joint efforts, the same team led by the PC received CRF late 2016 to continue on the vascular and metabolic benefits of physical activity for another three years.
10. Besides, the PC established closer links with several labs in mainland China throughout the three-year funding period.

7. The Layman's Summary

(describe in layman's language the nature, significance and value of the research project, in no more than 200 words)

Cardiovascular disease (CVD), a leading cause of mortality and disability in Hong Kong, is attributed primarily to high prevalence of obesity and diabetes. Endothelial cell dysfunction is the key initiator in development of arteriosclerosis, thrombosis, and their complications. Current drug therapies only partially alleviate diabetic symptoms but cannot reverse the disease progression. Physical activity produces multiple benefits against CVD. With support of this Collaborative Research Scheme, we demonstrated a new mechanism underlying physical exercise-induced vascular protection in diabetic mice. PPARδ-mediated inhibition of endoplasmic reticulum stress in endothelial cells contributes to vascular benefits of exercise and this study provide effective targets for treating diabetic vasculopathy (***Diabetes*** 2017;66:519-528). Exercise increases blood flow or shear stress to vessel wall, a key mechanism for exercise-induced benefits. Different shear stress patterns impact on gene expressions involved in atherosclerosis, vascular inflammation, and remodeling. We uncovered a novel cellular signaling in endothelial cells, the integrin-$G\alpha_{13}$-RhoA-YAP pathway in development of atherosclerosis and this pathway holds promise as a novel drug target against atherogenesis (***Nature*** 2016;540:579-581). This study is the first of its type in Hong Kong to address vascular benefits of physical exercise and these findings shall arouse public awareness over the importance of physical activity in health.

CRF 8G (Revised Sep 15)

Part C: Research Output

8. Peer-reviewed journal publication(s) arising directly from this research project

(Please attach a copy of the publication and/or the letter of acceptance if not yet submitted in the previous progress report(s). All listed publications must acknowledge RGC's funding support by quoting the specific grant reference.)

The Latest Status of Publications				Author(s) *(denote the corresponding author with an asterisk*)*	Title and Journal/Book *(with the volume, pages and other necessary publishing details specified)*	Submitted to RGC *(indicate the year ending of the relevant progress report)*	Attached to this report *(Yes or No)*	Acknowledged the support of RGC *(Yes or No)*	Accessible from the institutional repository *(Yes or No)*
Year of publication	Year of Acceptance (For paper accepted but not yet published)	Under Review	Under Preparation (optional)						
2017				Cheang WS, Wong WT, Zhao L, Xu J, Wang L, Lau CW, Chen ZY, Ma RCW, Xu A, Wang N, Tian XY & ***Huang Y**	PPARδ Is required for exercise to attenuate endoplasmic reticulum stress and endothelial dysfunction in diabetic mice. ***Diabetes*** 66(2):519-528.	Yes May 2017	yes	yes	yes
2016				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*** 540:579-581. Commented in Nature News and Views, ***Nature*** 540:531-532.	Yes May 2017	yes	yes	yes
2016				Zhang H, Liu J, Qu D, Wang L, Luo JY, Lau CW, Liu P, Gao Z, Tipoe, GL, Lee HK, Ng CF, Ma RCW, Yao X & ***Huang Y**	Inhibition of miR-200c restores endothelial function in diabetic mice through suppression of COX-2. ***Diabetes*** 65(5):1196-1207 with	Yes May 2017	yes	yes	yes

					Commentary Diabetes 65(5):1152-1154.				
2016				Hu W, Zhang Y, Wang L, Lau CW, Xu J, Luo JY, Gou L, Yao XY, Chen ZY, Ma RCW, 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*** 36(3):553-560.	Yes May 2017	yes	yes	yes
2016				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. 2016 Mar 9;6:22910. doi: 10.1038/srep22910	Yes May 2017	Yes	yes	yes
2015				Liu J, Wang L, Tian XY, Liu L, Wong WT, Zhang Y, Han Q, Ho HM, Wang N, Wong SL, Chen ZY, Yu J, Ng CF, Yao X, ***Huang Y**	Unconjugated bilirubin mediates heme oxygenase-1-induced vascular benefits in diabetic mice ***Diabetes*** 64(5):1564-1577 with commentary 64(5):1506-1508.	Yes 31 Jan 2016	No	yes	yes
2015				Zhang Y, Liu J, Luo JY, Tian XY, Cheang WS, Xu J, Lau CW, Wang L,	Upregulation of angiotensin (1-7)-mediated signaling	Yes 31 Jan 2016	No	yes	yes

				Wong WT, Wong CM, Lan HY, Yao XQ, Raizada MK & ***Huang Y**	preserves endothelial function through reducing oxidative stress in diabetes. ***Antioxidants & Redox Signaling*** 23(11):880-892 with Cover Image of the Issue.				
2015				Luo JY, Zhang Y, Wang L & ***Huang Y**	Regulators and effectors of BMP signaling in the cardiovascular system. ***The Journal of Physiology*** 593(14):2995-3011	Yes 31 Jan 2016	No	yes	yes
2015				Cheang WS, **Tian XY**, **Wong WT**, ***Huang Y**	Peroxisome proliferator-activated receptors in cardiovascular diseases: experimental benefits and clinical challenges. ***British Journal of Pharmacology*** 172(23):5512-5522.	Yes 31 Jan 2016	No	yes	yes
2015				Xiang L, Cheang WS, Wang L, Lin S, Li Y, ***Huang Y** & ***Cao Z**	Plasma metabolic signatures reveal regulatory effect of exercise training in db/db mice. ***Molecular BioSystems*** 11(9):2588-2596	Yes 31 Jan 2016	No	yes	yes
2014				Liu L, Liu J, **Tian XY**, **Wong WT**, Lau CW, **Xu A**, Xu G, Ng CF, Yao X, Gao Y, ***Huang Y**	Uncoupling protein-2 mediates DPP-4 inhibitor-induced restoration of	Yes 30 Sept 2014	No	yes	yes

					endothelial function in hypertension through reducing oxidative *stress* ***Antioxid Redox Signal*** 21(11):1571-81				
2014				Gao Z, Zhang H, Liu J, Lau CW, Liu P, Chen ZY, Lee HK, Tipoe GL, Ho HM, Yao X, ***Huang Y**	Cyclooxygenase-2-dependent oxidative stress mediates palmitate-induced impairment of endothelium-dependent relaxations in mouse arteries ***Biochem Pharmacol*** 91(4):474-82	Yes 30 Sept 2014	No	yes	yes
2014				Wong CM, Zhang Y, ***Huang Y**	Bone morphogenic protein-4 induced oxidant signaling via protein carbonylation for endothelial dysfunction ***Free Radic Biol Med*** 75:178-90	Yes 30 Sept 2014	No	yes	yes
2014				Liu L, Liu J, Tian XY, Wong WT, Lau CW, Xu A, Xu G, Ng CF, Yao X, Gao Y, ***Huang Y**	Uncoupling protein-2 mediates DPP-4 inhibitor-induced restoration of endothelial function in hypertension through reducing oxidative *stress* ***Antioxid Redox Signal*** 21(11):1571-81	Yes 30 Sept 2014	No	yes	yes

9. Recognized international conference(s) in which paper(s) related to this research project was/were delivered *(Please attach a copy of each conference abstract)*

Month/Year/ Place	Title	Conference Name	Submitted to RGC *(indicate the year ending of the relevant progress report)*	Attached to this report *(Yes or No)*	Acknowledged the support of RGC *(Yes or No)*	Accessible from the institutional repository *(Yes or No)*
1/2017/Harbin	*Physical exercise restores vascular function in obesity and diabetes*	中俄醫學研究中心代謝疾病研究所學術委員會會議暨第一屆冰城腫瘤-心臟病學會議. 哈爾濱, 13-16 Jan 2017	Yes	Yes	Yes	Yes
3/2017/ Ongakudo	*Targeting endothelium in hypertension and diabetes*	The 81st Annual Scientific Meeting of the Japanese Circulation Society, Ishikawa Ongakudo, Japan, 17-19 March 2017	Yes	Yes	Yes	Yes
4/2017/ Chongqing	*Targeting endoplasmic reticulum stress to restore endothelial function in obesity and diabetes*	Leading Edge Forum, 4th Yangtze River International Congress of Cardiology (第四屆長江國際心血管病學術會議). Chongqing, China, 13-15 April 2017	Yes	Yes	Yes	Yes
4/2017/ Wuhan	*Anti-atherosclerotic impact of laminar shear stress*	第四届心血管与代谢疾病论坛, Wuhan, China, 15-16 April 2017	Yes	Yes	Yes	Yes
3/2016/ Beijing	*BMP4: bony connection to vascular dysfunction*	Inaugural Symposium of Society of Matrix Biology（中國生理學會基質生物學專業委員會成立大會暨第一屆全國基質生物學會議）Beijing, 18-20 March 2016.	Yes	Yes	Yes	Yes

4/2016/ Guangzhou	*MicroRNAs and endothelial function*	the International Symposium of Cardiovascular Basic & Translational Medicine in 18th SC-ICC. Guangzhou, 9-10 April 2016.	Yes	Yes	Yes	Yes
5/2016/ Beijing	*Endothelial dysfunction and therapeutic intervention*	Inaugural Scientific Meeting of Chinese Society of Vascular Biology, Chinese Association of Pathophysiology, Beijing, 20-22 May 2016.	Yes	Yes	Yes	Yes
5/2016/Shanghai	*Physical exercise benefits vascular function in diabetes*	Oriental Congress of Cardiology, Shanghai, 27-29 May 2016	Yes	Yes	Yes	Yes
7-8/2016/ Calgary	*BMP4 as a mediator of endothelial dysfunction*	Canada-China Symposium – ATVB 2016, Calgary, Canada, 31 July – 2 August 2016	Yes	Yes	Yes	Yes
8/2016/ Beijing	*Physical exercise benefits vascular function in diabetic mice*	China Heart Congress 2016, Beijing, China, 11-14 August 2016	Yes	Yes	Yes	Yes
10/2016/ Hualien	*Vascular benefits of vitamin D*	7th Scientific Meeting of the Asian Society for Vascular Biology, Hualien, Taiwan, 26-29 October 2016	Yes	Yes	Yes	Yes
11/2016/ Rochester	*Bilirubin mediates HO-1-associated vascular benefits*	12th MOVD Symposium, Mayo Clinic, Rochester, MN, USA, 7-9 November 2016	Yes	Yes	Yes	Yes
3/2015/ Wuhan	*The beneficial axis of the renin-angiotensin system in protecting endothelial function in diabetes*	2nd Forum on Cardiovascular and Metabolic Diseases (心血管与代谢疾病论坛), Wuhan, China, 23-25 May 2015	Yes 31 Jan 2016	No	Yes	Yes

09/2015/ Hangzhou	*Bilirubin is vaso-protective*	9th Qianjiang International Conference on Cardiovascular Diseases, Hangzhou, China, 3-6 September 2015	Yes 31 Jan 2016	No	Yes	Yes
10/2015/ Beijing	*BMP4 as an important pathological mediator of endothelial dysfunction in hypertension and diabetes*	ATVB-CAAC Joint Symposium on Major Advance of Vascular Research, Beijing China, 29 October 2015	Yes 31 Jan 2016	No	Yes	Yes
10/2015/ Beijing	*Glucagon-like peptide elevator benefits vascular function in hypertension*	Great Wall International Congress of Cardiology (第二十六届长城国际心脏病学会议), Beijing, China 30-31 October	Yes 31 Jan 2016	No	Yes	Yes
11/2015/ Tianjin	*Unconjugated bilirubin mediates heme oxygenase-1-induced vascular benefits in diabetic db/db mice*	10th National Congress of Chinese Association of Pathophysiology (中国病理生理学会第十届全国代表大会暨学术会议), Tianjin, China, 6-9 November 2015.	Yes 31 Jan 2016	No	Yes	Yes
11/2015/ Hong Kong	*New targets on endothelial dysfunction*	The 7th AASD Scientific Meeting and Annual Scientific Meeting of the Hong Kong Society of Endocrinology, Metabolism and Reproduction (AASD 2015), Hong Kong 21-22 November 2015	Yes 31 Jan 2016	No	Yes	Yes
12/2015/ Nanjing	*Vascular benefits of ACE2-Ang(1-7) in diabetic mice*	2nd Cardiovascular Forum on Basic Sciences and Translational Medicine (第 2 届南京心血管基础与转化医学高峰论坛), Nanjing, China, 2-4 December 2015.	Yes 31 Jan 2016	No	Yes	Yes

04/2014/ Guangzhou	*Vasoprotective axis of the renin-angiotensin system benefits endothelial function*	Symposium of Cardiovascular Basic & Translational Medicine, 16th South China International Congress of Cardiology, Guangzhou, China, 9-12 April 2014.	Yes 30 Sept 2014	No	yes	yes
05/2014/ Shanghai	*Uncoupling protein 2 and vaso-protection in diabetes and hypertension*	Hypertension Forum, the 8th Oriental Congress of Cardiology (OCC), Shanghai, China, 28-30 May 2014	Yes 30 Sept 2014	No	yes	yes
08/2014/ Harbin	*PPARδ activation is vasoprotective*	2014 Joint Scientific Congress of International Society of Hypertension Research and Chinese Society of Cardiovascular Pathophysiology, Harbin, 14-18 August 2014.	Yes 30 Sept 2014	No	yes	yes
08/2014/ Kuala Lumpur	*GLP-1 receptor-mediated protection of endothelial function*	Pharmacology & Physiology International Scientific Congress 2014, Kuala Lumpur, Malaysia, 22-24 August 2014	Yes 30 Sept 2014	No	yes	yes
09/2014/ Hong Kong	*Physical activity benefits endothelial function in mouse model of metabolic disease*	16th Diabetes and Cardiovascular Risk Factors - East Meets West Symposium will be held in conjunction with the 9th Congress of the Asian-Pacific Society of Atherosclerosis and Vascular Diseases, Hong Kong, 25 -28 September, 2014	Yes 30 Sept 2014	No	yes	yes

10/2014/Wuhan	*COX-2-derived $PGF_{2\alpha}$ acts as an endothelium-derived contracting factor*	2014 International Symposium on Polyunsaturated Fatty Acid and Metabolism. Wuhan, China, 24-27 October 2014	Yes 30 Sept 2014	No	yes	yes
11/2014/Hong Kong	*GLP-1-elevating agents benefit endothelial function*	Annual Scientific Meeting of Institute of Cardiovascular Science and Medicine, Hong Kong, 1 November 2014. Keynote lecture	Yes 31 Jan 2016	No	yes	yes
12/2014/Shenzhen	*PPARs receptor agonists and vascular benefits*	Scientific Meeting on Receptors, Chinese Association of Pathophysiology, Shenzhen, China, 12-13 December 2014	Yes 31 Jan 2016	No	yes	yes
12/2013/Singapore	*Targeting oxidative stress to reverse vascular pathogenesis in diabetes and hypertension*	Conference on Pharmacology and Drug Development, Singapore, December 9-11, 2013	Yes 30 Sept 2014	No	yes	yes
12/2013/ Berlin	*Adipose tissue as the therapeutic target to protect vascular function in diabetes*	MDC, Max-Delbruck-Centrum Fur Molekulare Medizin Berlin-Buch, Charite University, Berlin, Germany, 20 December 2013	Yes 30 Sept 2014	No	yes	yes

10. ***Student(s) trained*** (please attach a copy of the title page of the thesis)

Name	Degree registered for	Date of registration	Date of thesis submission/ graduation
Wai San Cheang	PhD	Jan 2010	Nov 2013
Li Wang	PhD	August 2011	Sept 2014
Zhen Gao	PhD	August 2011	Sept 2013
Jian Liu	PhD	August 2009	Sept 2013
Yang Zhang	PhD	August 2010	August 2013
Jiang-Yun Luo	PhD	August 2012	June 2015
Dan Qu	PhD	August 2012	June 2016
Lingshan Gou	PhD	August 2013	June 2016
Weining Hu	PhD	August 2012	May 2016
Yuhong Huang	PhD	August 2014	April 2017

11. Other impact *(e.g. award of patents or prizes, collaboration with other research institutions, technology transfer, etc.)*

The items marked in blue are enclosed (other items were provided with certificates in the previous progress report on 31 Jan 2016)

The PC hold **two press conferences**; one in April 2014 to release information on vascular benefits of physical exercise at the time the PC received the Croucher Senior Research Fellowship Award and another was on December 2016 to announce the novel findings immediately after publication in Nature.

Prizes and awards to the PC Yu Huang

Second-class Award, The State Natural Science Award, China (2015)
Croucher Senior Research Fellowship Award (2014), Hong Kong Croucher Foundation (裘槎優秀科研者獎, 2014, 香港裘槎基金會)
The Robert F. Furchgott Lecture at the MOVD 2013 (11th International Symposium on Mechanisms of Vasodilatation), Zurich, Switzerland (4th October 2013)

Prizes and awards to Yu Huang's students and postdoctoral fellows

Mingyu Huo (PhD., 2015-2018)

1. Poster Award of Young Investigator Award Competition, 7th Scientific Meeting of the Asian Society for Vascular Biology, Hualien, Taiwan, 27-29 October 2016

Dan Qu (Ph.D, 2012-2016):

1. 1st Prize of Oral Presentation for the Young Investigator Award at the 20th Annual Scientific Meeting of the Institute of Cardiovascular Science and Medicine, Hong Kong (19 November 2016)
2. The Talent Development Scholarship 2013-2014, Hong Kong Special Administration Region Government Scholarship Fund (June 2014)
3. 2nd Prize for Young Investigator Award Competition (Poster Presentation) at 9th Scientific Conference on Cardiovascular Sciences across the Strait. Tainan, Taiwan, 16-20 August 2013.

Jiang-Yun Luo (Ph.D., 2012-2015, Postdoctoral Fellow, August 2015-)

1. 2016 XXII International Society for Heart Research (ISHR) World Congress Travel Award (Argentina, April 2016)

Weining Hu (Ph.D, 2012-2016):

1. 2nd Prize of Oral Presentation for Young Investigator Awards, at the 19th Annual Scientific Meeting of the Institute of Cardiovascular Science and Medicine and the 10th Across the Strait Conference on Cardiovascular Science, Hong Kong (21 November 2015)
2. Young Investigator Award, International Conference on Endothelium-Dependent Hypolarizations (EDH 2015), Nyborg, Denmark, 14-17 2015
3. The Talent Development Scholarship 2014-2015, Hong Kong Special Administration Region Government Scholarship Fund (June 2015)
4. Second Best Prize, Young Investigator Award (Oral Presentation), Asian Society for Vascular Biology (ASVB) – Vascular Neuroeffective Mechanisms, USA (VNEM) at Pharmacology & Physiology International Scientific Congress 2014, Kuala Lumpur, Malaysia, 22-24 August
5. Best Poster Presentation Award at 2013 Annual Scientific Meeting of Hong Kong Society of Endocrinology, Metabolism and Reproduction, Hong Kong, 24 November 2013

Lei Zhao (PhD, 2013-2016)

1. 1st Prize of Chaired Poster Presentation for the Young Investigator Award at the 20th Annual Scientific Meeting of the Institute of Cardiovascular Science and Medicine, Hong Kong (19 November 2016)
2. EMBO Meeting 2015 Travel Grant for a meeting at Birmingham, UK, 6-9 September 2015

Zhen Gao (Ph.D, 2011-2014):

2. EMBL Advanced Training Centre Corporate Partnership Fellowship (fee waiver), EMBO-EMBL Symposium: Translating Diabetes, Heidelberg, Germany (April 2014)

Wai San Cheang (Ph.D, 2010-2013; Postdoc, 2014-2015):

3. 1st Prize of Chaired Poster Presentation for Young Investigator Awards, at the 18th Annual Scientific Meeting of the Institute of Cardiovascular Science and Medicine, Hong Kong (1 November 2014)
4. EMBL Advanced Training Centre Corporate Partnership Fellowship (fee waiver), EMBO-EMBL Symposium: Translating Diabetes, Heidelberg, Germany (April 2014)
5. The Talent Development Scholarship 2013-2014, Hong Kong Special Administration Region Government Scholarship Fund (June 2014)
6. CUHK faculty Postdoctoral Research Fellowship (2014-2015)
7. 1st Prize of Chaired Poster Presentation for Young Investigator Awards, at the 17th Annual Scientific Meeting of the Institute of Cardiovascular Science and Medicine, Hong Kong (23 November 2013)
8. Best Poster Presentation Award at 15th Hong Kong Diabetes and Cardiovascular Risk Factors, East Meets West Symposium (1 October 2013)
9. 3rd Prize for Young Investigator Award Competition (Oral Presentation) at 9th Scientific Conference on Cardiovascular Sciences across the Strait. Tainan, Taiwan, 16-20 August 2013.
10. Winner of Outstanding Oral Presentation Award of Young Scientist at the 12th Meeting of the Asia Pacific Federation of Pharmacologists, Shanghai, China, 9-13 July 2013
11. Outstanding Poster Presentation Award at the 12th Meeting of the Asia Pacific Federation of Pharmacologists, Shanghai, China, 9-13 July 2013

Yang Zhang (Ph.D, 2010-2013; Postdoctoral Fellow, 2013-2014, Postdoctoral Research Fellow in September 2014 at Division of Genetics, Department of Medicine, Brigham and Women's Hospital, Harvard University, USA)

1. 1st Runner-up for Young Investigator Award (Oral presentation) at Physiology Symposium 2014, Hong Kong (12 June 2014)

Jian Liu (Ph.D, 2009-2013; Postdoctoral Fellow, 2013-2014):

1. Podium Presentation Award at 2013 AAPS (American Association of Pharmaceutical Scientists)@China Symposium, Hong Kong, 17-18 August 2013.

Huina Zhang (Postdoctoral Fellow, currently the associate professor at Institute of Biophysical Sciences, Chinese Academy of Sciences, China):

1. 1st Prize, Young Investigator Award Competition at the 1st Scientific Meeting of Chinese Society for Vascular Medicine, Chinese Association of Pathophysiology, Beijing, China, 20-22 May 2016.
2. 2nd Prize of English Speech Competition at the 25th Great Wall International Congress of Cardiology, Beijing, China, 16-19 October 2014.
3. 1st Prize of Young Investigator Award at 12th Scientific Meeting of International Society for Heart Research – Chinese Section and 15th Scientific Meeting of Chinese Association of Pathophysiology – Cardiovascular Society, 14-17, 2014

Project Coordinator

Contact Information: 39436787

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