

ISN International Career Development Grant (CDG) Report

(Deadline: two months after completion of the project)

Beneficiary:

Name	Lin Kooi Ong
Email address	Lin.ong@usq.edu.au
Institutional address:	
• Department	School of Health and Medical Sciences
• Institution	University of Southern Queensland
• City	Toowoomba, Queensland
• Country	Australia

Project title:

The synergy of growth hormone and exercise on brain recovery after experimental stroke

Project duration:

From (DD/MM/YY)	To (DD/MM/YY)
2 Jan 2021	30 Dec 2022

Report about the outcome of the grant and future perspectives

(3 pages max.)

(1) What were the major goals of the project?

An important question that this project aimed to address is “do growth hormone treatment combined with exercise after experimental stroke significantly improve functional outcomes compared to growth hormone treatment or exercise alone?”

(2) What was accomplished under these scientific goals and objectives?

NOTE: Research interruptions (Relative to opportunity)

Dec 2021 – Apr 2022 New academic position and relocation from Kuala Lumpur, Malaysia to Toowoomba, Australia

Jan 2021 – Apr 2021 Institution legal requirement for grant establishment

Mar 2020 – Jan 2022 Research activities are adversely affected by COVID-19 pandemic due to campus closure and travel restrictions (>1 year)

Due to research interruptions listed above, the scientific goals and objectives were amended accordingly to accommodate feasibility.

Aim 1: To critically appraise whether growth hormone is a potential therapeutic target for stroke recovery, and to provide suggestions for future research directions.

Outcomes: Supervised 3 final year project students and completed a narrative review on growth hormone deficiency after stroke and therapeutic effects of growth hormone treatment on brain recovery after stroke. Extended preclinical studies and found growth hormone increases BDNF and mTOR expression in specific brain regions after stroke.

Aim 2: To investigate hippocampal secondary neurodegeneration and cognitive function after stroke.

Outcomes: Demonstrated that secondary neurodegeneration is a potential modulator of post-stroke cognitive impairment, and identified several key hallmarks related to secondary neurodegeneration including loss of structure or function of neurons, neuroinflammation, accumulation of neurotoxic proteins and cerebrovascular dysregulation.

(3) Career Advancement of the beneficiary

The most notable career advancement was tenure position offer as Senior Lecturer in Biomedical Science at University of Southern Queensland.

I also commenced several leadership roles including:

- 2023 – Present** School Research Committee, School of Health and Medical Sciences, University of Southern Queensland
- 2022 – Present** Emerging Leaders, International Stroke Recovery and Rehabilitation Alliance
- 2022 – Present** IBRO Early Career Committee, International Brain Research Organization
- 2022 – Present** EXCO member, Basic Neuroscience Chapter, Malaysian Society of Neurosciences
- 2022 – Present** Grant review panel, Travel Awards and Child Care Fellowships, International Society for Neurochemistry
- 2020 – Present** Young Scientists Network, Academy of Sciences Malaysia

My abstract was selected for Young Investigator Colloquiums at Asian-Pacific Society for Neurochemistry meeting.

The findings from this project were used as preliminary data for the application of several other funding opportunities. I successfully secured UniSQ Research Capacity Building Grant scheme to investigate post-stroke cognitive impairment and secondary neurodegeneration.

(4) How and when was audience informed on the ISN and on the benefits of an ISN membership?

ISN was promoted and the Career Development Grant was acknowledged in scientific meetings (oral/poster presentations) and publications outlined in Q5.

Acknowledgements

LKO, FRW and MN acknowledge ongoing support from NHMRC Centre for Research Excellence in Stroke Recovery and Rehabilitation. LKO and SSB acknowledge support from Research Advantage for ECR Higher Degree by Research (HDR) Scholarship and Greaves Family Postgraduate Scholarships in Medical Research (HMRI 1054). LKO acknowledge support from IBRO-APRC Travel & Short Stay Grant, International Society for Neurochemistry Career Development Grant and Monash University Malaysia. LECF and RJT acknowledge support from NeuroSurgical Research Foundation and Perpetual.

Acknowledgments



Prof Michael Nilsson
Prof Rohan Walker
Prof Jørgen Isgaard

Stroke Recovery Lab, the University of Newcastle

Students:

Dr Sonia Sanchez Bezanilla
Dr Wei Zhen Chow
Wen Xin See, Chen Xin Loh, Hui Wen Tee

Funding:

University of Newcastle
Hunter Medical Research Institute
Monash University Malaysia
IBRO-APRC Travel and Short Stay Grant
International Society for Neurochemistry



(5) Have the results been disseminated to communities of interest? Future plan to present the findings at a scientific meeting (oral/poster mode) or publish in scientific journals (specify the tentative title)

Publications:

- 1. Sanchez-Bezanilla, S., Beard, D. J., Hood, R. J., Aberg, N. D., Crock, P., Walker, F. R., Nilsson, M., Isgaard, J., & Ong, L. K. (2022). Growth Hormone Increases BDNF and mTOR Expression in Specific Brain Regions after Photothrombotic Stroke in Mice. *Neural Plast*, 2022, 9983042.**
- 2. Stuckey, S. M., Ong, L. K., Collins-Praino, L. E., & Turner, R. J. (2021). Neuroinflammation as a Key Driver of Secondary Neurodegeneration Following Stroke? *Int J Mol Sci*, 22(23).**
- 3. Sanchez-Bezanilla, S., Hood, R. J., Collins-Praino, L. E., Turner, R. J., Walker, F. R., Nilsson, M., & Ong, L. K. (2021). More than motor impairment: A spatiotemporal analysis of cognitive impairment and associated neuropathological changes following cortical photothrombotic stroke. *J Cereb Blood Flow Metab*, 41(9), 2439-2455.**

Manuscripts under review/preparation:

- 1. Leakage beyond the primary infarction: A temporal analysis of cerebrovascular dysregulation at sites of hippocampal secondary neurodegeneration following cortical photothrombotic stroke. *J Neurochem*, under review.**
- 2. Growth hormone and ischemic stroke: Focus on growth hormone deficiency and therapeutic effects of growth hormone on brain recovery. Under preparation.**

Invited talks and oral presentations:

- 2023 Invited Speaker, Neuroscience: Breach the Research Barrier (NEURO-BRB 2023), 15-16 June 2023.**
- 2023 Young Investigator Colloquiums, Remote hippocampal cerebrovascular dysregulation and cognitive impairment after cortical photothrombotic stroke. 17th Biennial Meeting of the Asian-Pacific Society for Neurochemistry (APSN), 19-21 June 2023.**
- 2022 Invited Talk, Post-stroke cognitive impairment: Pathophysiological insights into secondary neurodegeneration from preclinical studies. StrokeCore Colloquium, 12 July 2022.**
- 2022 Invited Seminar, Post-stroke cognition, secondary neurodegeneration and potential therapeutic strategies. Neuropharmacology Research Strength Webinar Series, Monash University Malaysia, 25 August 2022.**
- 2021 Invited Talk, Growth Hormone and Ischemic Stroke. e-Seminar Faculty of Medicine and Health Sciences Universiti Putra Malaysia's Silver Jubilee: Education & Research Excellence in Diversity, 29 June 2021.**
- 2021 Invited Seminar, Secondary neurodegeneration after stroke: Neuropathological changes and potential therapeutic targets. University of South Australia Clinical & Health Sciences Health and Biomedical Innovation**

Research Seminars, 7 June 2021.

2021 Invited Talk, Enhancing the translational potential of post-stroke cognition research: The touchscreen-based cognitive testing. International Touchscreen Symposium, 21 May 2021.

(Please note that in any publications resulting from the grant ISN funding shall be acknowledged.)

Financial report

Please provide a brief overview how funds have been used.

Total costs (in USD):

	Costs	Total (USD)
1	Small instrumentation	
	Surgical tools	1000
2	Animal costs	
	Animal purchase cost and maintenance fee	1,000
3	Measuring costs*	
4	Consumables	
	Consumables for histology, immunohistochemistry and western blotting	4,500
	Consumables for biochemical assays	1,000
5	Other project costs	
	Publication cost	1,000
6	ISN conference participation [#]	
	Australasian Neuroscience Society Annual Scientific Meeting 2022, Melbourne	1,500
Total costs of the project:		10,000
Total CDG application sum:		10,000

* for equipment use, e.g. microscopy MRI, spectroscopy facilities, and others.

[#] max. 20% of the total grant, only for the applicant.

Other external and local funds used for the completion of the project

Source	Amount (USD)	Used for
Home institution	AUD 15,000	Post-stroke cognitive impairment and secondary neurodegeneration
Host lab		
Other sources	AUD 19,716	Investigation of cerebral blood flow changes in regions of secondary neurodegeneration following ischaemic stroke

Photograph showing the beneficiary and his laboratory (please indicate copyright)



I agree that portions of this report, and a copy of the supplied photograph, may be published on the ISN homepage to inform ISN members of this ISN-supported CDC activity.

Signature of beneficiary:	Lin Kooi Ong
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Place, Date:	Toowoomba, 4/10/2023
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