Garvan Institute of Medical Research

SoMS Honors projects 2022

The role of the NPY system in the development of neuroblastoma

Background and experimental design

Cancer cells communicate with a wide range of other cell types including inflammatory cells, fibroblasts, endothelial cells etc. and a great deal of information is known about their interactions and how this may influence the development and progression of cancer. Importantly, cancer tissue is also known to be innervated by large networks of neurons, however, very little knowledge exists on whether this neuronal innervation plays a role in tumour development and growth. The few studies investigating this question are mostly focused on sensory input and the associated pain the cancer causes to the individual.

Neuroblastoma is the one of the most common malignant tumours occurring in childhood and resulting in 15% of the cancer-related children death. Although recent novel strategies have improved significantly in treating neuroblastoma, the 5-year survival rate of neuroblastoma particularly high risk neuroblastoma is still below 50%. There is an urgent need to develop novel and effective therapies to improve the treatment outcomes.

Recently, exciting new research from our lab and our collaborators at the Children Cancer Institute has now identified that neuropeptide Y (NPY) derived from either sympathetic neurons and the adrenal glands has a strong cancer promoting ability in neuroblastoma via signalling through its Y receptors (Y1R, Y2R and Y5R). in fact, NPY levels are strongly upregulated in neuroblastoma and linked to progression of tumour growth and relapse. NPY and its receptors are extensively expressed in the central nervous system and they are best known for their critical roles in controlling appetite and energy balance. In the periphery, NPY is co-expressed and co-released with the sympathetic nerves in the adrenal glands, which neuroblastoma most commonly arises in and around. However, it remains to be elucidated as to how NPY influences the development and progression of neuroblastoma. Therefore, in this proposal, we will employ neuroblastoma cell lines and primary neuroblastoma cells to investigate the role of the NPY system in modulating neuroblastoma.

This is a collaborative project with Dr Belamy Cheung at the Children's Cancer Institute.

Key research methods/techniques associated with this project

- In vitro and ex vivo cell culture
- Cell transfection
- RNA silencing and short interfering RNA (SiRNA)
- Molecular biology techniques: RNA and protein extraction; qPCR; Western blotting; Immunofluorescence/immunochemistry; immunoprecipitation; RIA; ELISA; histology
- Microscopic analysis: imaging using Light microscope, fluorescence microscope, confocal microscope
- High throughput next generation RNA sequencing analysis
- Statistical analysis

Neuroendocrinology Group's research interests

- The Neuroendocrinology Group's field of study is geared toward major contemporary heath issues of diabetes and obesity. Our study focusses on understanding how the brain and peripheral tissues coordinate to control body weight, insulin secretion and whole-body energy & glucose homeostasis with an emphasis on the role of brown fat and white fat browning in the development of obesity, diabetes and cancer.
- The candidates will investigate the underlying molecular mechanisms that contribute to the development of diabetes and obesity employing state-of-the-art technologies in metabolic and neuroscience research.

Contact Details

- **For more information, please contact:**
  A/Prof Yanchuan (Yan) Shi, MD, PhD
  Group Leader of Neuroendocrinology,
  Clinical Science Pillar, Garvan Institute
  Email: y.shi@garvan.org.au
  T: (02) 9295 8530
  M: 0402533786

- **Learn more about the lab and research focuses:**
  https://www.garvan.org.au/people/yanshi
  https://www.garvan.org.au/research/healthy-ageing/neuroendocrinology

- **Learn more about publications:**
  https://www.ncbi.nlm.nih.gov/pubmed/?term=shi+Y+garvan