

Title: A proposal to study the regulation of gut-brain communication during *Caenorhabditis elegans* dauer development

Author: Mengyi Cao

Abstract: The communication among different tissues (or organs), such as the gut-brain axis, is crucial in regulating animal physiology and developmental decisions. The nematode *Caenorhabditis elegans* enters a non-feeding, developmentally arrested **dauer** stage to cope with the harsh environments, such as food shortage and over-population. The **dauer decision** is regulated by the multiple pathways (insulin, growth factor, and hormone), involving the **nervous system, XXX neuroendocrine cells, and intestine**. Previous research has established *C. elegans* as a model organism to study stress-responsive development, but tissue-specific regulation of dauer development remains unclear. In particular, little is known about how nervous system coordinates with the intestine to integrate the signaling pathways and make a whole-organism dauer decision. **In this research, we propose to provide a systematic study of how different tissues communicate through multiple signaling pathways and coordinately regulate the dauer decision using cGAL-UAS bipartite genetic tools recently developed in the Sternberg lab.** To achieve this goal, **Aim 1** will focus on investigating the general roles of each tissue during dauer development and build models for the regulatory network; **Aim 2** will focus on temporal participation of each tissue and each pathway in dauer decision initiation and execution, further developing precise circuits of dauer regulation. Altogether, the proposed aims will expand the current knowledge of molecular mechanisms underlying developmental timing of commitment to diapause in response to environmental stress. Using *C. elegans* dauer decision as a model, our research will contribute to better understanding of the inter-tissue coordination, particularly in brain-gut communication, during the developmental decision making process.