Curriculum –vitae

DR. B.V.SHYAMALA

Professor
Developmental Genetics Lab
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Education & Research career

M.Sc.: University of Mysore

Ph.D.: University of Mysore

Postdoctoral Research: NCBS, TIFR Bangalore, INDIA, (1992-1996)

Institute for Cellular and Molecular Biology, SINGAPORE, (1993)

Emory University School of Medicine, Atlanta, U.S.A. (1999-2001)

Research Interest (Present)

Understanding the genetic and molecular regulation of Brain Development

Nervous system, specially the Brain is the most complex organ system of the body. This complex system functions to integrate all other organ systems of the body into a co-ordinated unit - the Organism, and further connect the organism in turn with the external environment where it lives. The 'Making' of this organ during development and its functioning thereafter has been enigmatic and continues to be so, for decades to come. Lot of intriguing questions:

- How do the precursor cells differentiate to form the neurons?
- How is their number and identity decided?
- How do the axons and dendrites extending out from the cell body find their way and make precise connections with their partners to result in a functional neural circuit?
- How are these innumerable number of individual circuits integrated finally to form a composite and highly coordinated organ – The Brain?

The intricate program necessary for the construction of brain will have to be encrypted as an equally robust and precise genetic program, any defective step in which would have consequences as developmental brain anomalies/diseases. Broader interest of our lab is to understand the mechanisms and pathways that regulate Nervous system development and disorders. Working towards this long term goal, we aim to identify the genes involved and decipher their specific function in adult brain development. **We use *Drosophila,* the most versatile and tractable genetic model as our system for study.**

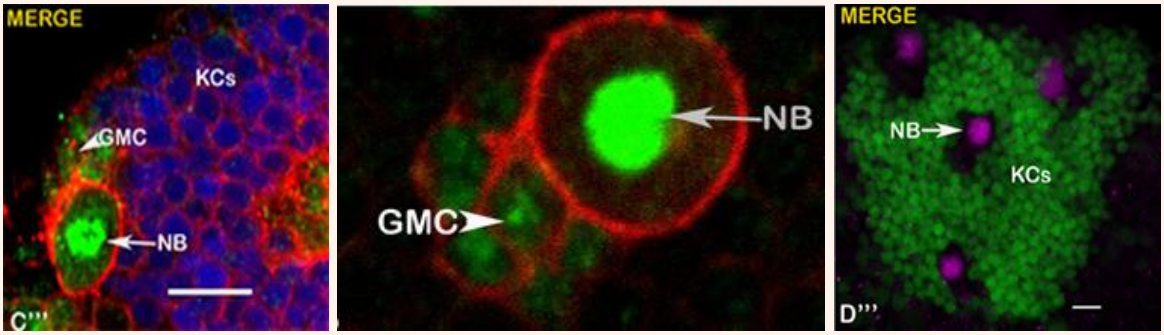
- **Expression based screening for genes specific to Brain**

Expression based screening for genes is carried out initially and the identified genes will be characterized further with respect to their function in brain development. Lab has a collection of P-Gal4 enhancer trap strains of *Drosophila melanogaster* which have very specific, spatially and temporally regulated expression of the reporter gene in the developing brain (Shyamala and Chopra , 1999; Venkatesh and Shyamala ,2010). These P-Gal4 insertion strains have been used by several labs both in India and abroad for targeted expression experiments and as lineage and region specific marker strains. Two of the strains (SG18.1 and SG29.1), have found place in the FlyBase and Bloomington Drosophila Stock Centre, from where they are made available for Drosophila workers globally. The spatial and temporal specific expression of the reporter gene in these enhancer trap strains will reveal to us the expression pattern of the native gene of the genome present at the site of p-insertion and thus lead us to identification of a gene of interest based on its expression pattern.

- **Scalloped A Hippo tumor suppressor pathway gene regulates adult brain development and cognitive behavior of flies**

One of our major investigations (Rohith & Shyamala 2018, 2019) has disclosed the importance of *scalloped* gene in brain development. Scalloped is a member of the Hippo tumor suppressor pathway. It is homologous to Human TEAD transcription factor, known in connection with several nervous system deformities and cancer. We have demonstrated the function of scalloped in regulating the development of mushroom bodies, the learning and memory centers of *Drosophila* brain. The cellular function of the gene has been worked out. Scalloped function is shown to be critical to regulate proliferation of Mushroom Body Neuroblasts and to limit the neuronal cluster size to normal in the fly brain. Our findings are distinctive because, this effect of *scalloped* loss of function in brain is contrary to the typical loss of tissue phenotype which it shows in other, most studied

organs like wings, eyes, lymph nodes etc. Very special observation made is that, Scalloped expressed in the differentiated neurons will nonautonomously regulate proliferation of the precursor neuroblasts.



Further we have demonstrated that the developmental brain deformity in Scalloped mutants causes impairment of cognitive behaviors such as learning, long term and short term memory. Future investigations are focused towards elaboration of the other interactive genetic pathway components that subserve the function of Scalloped in this context.

- **More candidate genes with intriguing expression pattern in the fly brain are being characterized.**

Neurodegeneration and Drug discovery

Neurodegenerative diseases and mental retardation are some of the most critical diseases affecting human population. Most of these cases of neurodegenerative diseases and mental retardation have been found to have familial histories, but their genetic basis has scarcely been understood. Research has demonstrated that similar genetic and molecular mechanisms operate in both the flies and humans in development and disease. In the recent years *Drosophila* models for human diseases has been shown to be excellent systems for studying neurodegenerative diseases like Alzhimers, Huntingtons and Parkinson's etc. We have several projects in progress aiming to understand the molecular genetic effect of neuroprotective herbs, using transgenic disease models of *Drosophila.* The outcome of the projects is expected to reveal the mechanics of the neuroprotective properties and the validity of some of the herbal medicines used by practice in traditional medicine systems.

LIST OF SELECTED PUBLICATIONS

- Rohith, B.N. and **B.V.Shyamala** 2019, Developmental deformity due to *scalloped* non function in *Drosophila* brain leads to cognitive impairment **Developmental Neurobiology**, DOI 10.1002/dneu.22668 pp.236-251
- Rohith, B.N. and **B.V.Shyamala** 2017 Scalloped a member of the Hippo tumor suppressor pathway controls mushroom body size in *Drosophila* brain by non-canonical regulation of neuroblast proliferation **Developmental Biology** *432 (2017) 203–214* Elsevier
- Thangjam Ranjita Devi and **BV Shyamala** 2013, 'Male- and female-specific variants of doublesex gene products have different roles to play towards regulation of Sex combs reduced expression and sex comb morphogenesis in Drosophila' ***J. Biosci****. 38(3), pp455–460,* Springer
- Thangjam Ranjita Devi,1 C. Amruthavalli,2 and **B.V. Shyamala**, 2013'Evolution of Sex Comb From the Primitive Bristle Pattern in Drosophila is Associated With Modification in the Developmental Regulatory Protein Dachshund ***genesis*** 51:97–109 (2013) Wiley Blackwell
- Venkatesh, C.R. and **B.V. Shyamala** 2010**,** Gal4 enhancer trap strains with reporters gene expression during the development of adult brain in *Drosophila melanogaster*. **Journal of Genetics**, 89,e38-e42 Springer
- K. Mysore, **B. V, Shyamala**, V, Rodrigues**.** 2010, Morphological and developmental analysis of peripheral antennal chemosensory sensilla and central olfactory glomeruli in worker castes of *Camponotus compressus* (Fabricius, 1787). **Arthropod Structure and Development** 39 310-321
- Venkatesh, C.R. and **B.V. Shyamala** 2010**,** Developmentally regulated expression of reporter gene in adult brain specific Gal4-4 enhancer traps of *Drosophila melanogaster*. ***Journal of Genetics*** 89 e1-e6 Springer
- **Shyamala, B. V**. Gazi, M. and Bhat, K. M. 2009, A neurodegenerative disease affecting synaptic connections in *Drosophila* mutant for the tumor suppressor morphogen Patched. **Developmental Biology**, 334 (2009) 311-323
- K, Mysore, K. A, Subramanian, R. C, Sarasij, A, Suresh, **B. V, Shyamala**, K, VijayRaghavan, V, Rodrigues 2009, Caste and sex specific olfactory glomerular organization and brain architecture in two sympatric ant species *Camponotus sericeus* and *Camponotus compressus* (Fabricius, 1798). **Arthropod Structure and Development**. **38,**485-497.
- **Shyamala,B.V**. and K.M. Bhat. 2002**,** A Positive role for Patched –Smoothened signaling in promoting cell Proliferation during normal head development in *Drosophila.* **Development** 129, 1839-1847.

- **Shyamala, B.V**. and A. Chopra. 1999**,** *Drosophila melanogaster* chemosensory and muscle development:Identification and properties of a novel allele of scalloped and of a new locus, SG18.1, in a Gal4 enhancer trap screen. **J.Genet78**(2):87-97 (Springer)
- **Shyamala, B.V**. and H.A. Ranganath 1994, Karyotypic divergence due to heterochromatin among seven species of the *montiu*m sugroup of *Drosophila.* **Nucleus** 37(1,2): 46-52.
- **Shyamala, B. V**. and H.A. Ranganath 1991**,** Chromosomes of three species of *montium* subgroup of *Drosophila*. **J. Hered**. 82(#):346-349.
- **Shyamala, B.V**. and H.A. Ranganath 1990**,** Biochemical phylogeny of seven Indian species of the *montium* subgroup of *Drosophila.* Genetica (Hague) 81:71-75.
- **Shyamala, B.V**., P. Meera Rao and H.A. Ranganath 1989**,** Inversion polymorphism and linkage disequilbrium in *Drosophila sulfurigaster neonasuta* **J. Hered**. 80(^):488-490.
- **Shyamala, B. V**. and H.A. Ranganath 1989, Metaphase karyotype differentiation in eight species of the *montium* subgroup of *Drosophila.* Genetica(Hague) 79:191-196.
- **Shyamala, B.V**. and H.A. Ranganath. 1988, Inversion polymorphism in natural populations of *Drosophila nasuta nasuta.* **Proc. Indian Acad. Sci**. (Anim.Sci.)97(6):471-477.

Awards & Recognitions received

1999-2001 **POST DOCTORAL FELLOWSHIP (NIH, USA Sponsered),** Departmentof Cell Biology, **Emory University School of Medicine, Atlanta, Georgia, U.S.A.**

1999 **INDIAN NATIONAL SCIENCE ACADEMY VISITING FELLOW,** National Centre for Biological Sciences, TIFR Centre, Bangalore, INDIA

1999 **POST DOCTORAL FELLOWSHIP offer** from Prof. Volker Hartenstein, **Department of Molecular Cell and Developmental Biology, University California, Los Angeles, U.S.A.**

1998 **POST DOCTORAL FELLOWSHIP offer** from Prof. Akira Chiba, **Cell and Structural Biology lab, University of Illinois, Urbana, U.S.A**

1992-1996 **POST DOCTORAL VISITING FELLOWSHIP,** at Prof.K. Vijayaraghavan's lab, **National Centre for Biological Sciences, TIFR Centre, Bangalore, INDIA**

1984 **Award of UGC NET qualified research fellowship.**