

## Molecular mechanism of sex specific cell death of neural stem cells in developing brain of fruit flies

By Dr. Bilqeesa Bhat

Researchers at Hyderabad based Centre for DNA Fingerprinting and Diagnostics (CDFD) for first time reported that Homeotic genes (genes responsible for anatomical structures development) and DM-domain genes physically interact, and showed that Homeotic gene are capable of using sex specific forms of DM-domain gene as partners in gene regulations. Study showed that Homeotic gene involved in making tail end of body of fruit flies worked with the DM domain gene to bring about sexual dimorphism in developing central nervous system (CNS) by causing sex-specific death of a small subset of neural stem cells in females, while such a thing did not happen in the male fruit flies. Therefore, female fruit flies did not have a subpopulation of specialized neurons, which male fly had them. These neurons are important for male specific mating behaviour in fruit flies.

Sexual reproduction is central to maintenance and propagation of all organisms. Two major well-defined identifying features of all sexually reproducing higher organisms are anterior-posterior axis or head to tail axis, and a complex sexually dimorphic CNS. The 'head to tail' axis of the body is characterised by divergent non-repetitive regional features seen along the length of the body.

A family of genes called Homeotic genes express serially along the head to tail axis and give different regional identities to the cells by regulating differential gene expression. While as the CNS comprising the brain and the spinal cord, runs along the length of the body and has 'head to tail' axis determined by Homeotic genes. The divergent and non-repetitive features in CNS are represented as different neuronal cell types, specialized to carry out different functions like locomotion, feeding and mating.

Sexual dimorphism in animal body as well as in CNS is critical for successful mating and animal reproduction. The dimorphism though regulated by many genes, finally converge down to a highly conserved DM domain (protein domain) containing transcription factor across different animal species.

Even though it is well known that tail end of the body is evolutionarily specialized for sexual mating across different organisms, how the sex determining genetic pathways intersect with head to axis to specialize the tail end of the body for sexual mating behaviour was not well understood.

Considering the wide-ranging role of Homeotic- and DM-domain gene in development and determination of sexual identity, their capacity to collaborate with each other could be a common theme for generating and maintenance of sexual dimorphism in animal development across different species.

Contact details:

Dr. Rohit Joshi, Staff Scientist, CDFD, Hyderabad.

Email: [rohit@cdfd.org.in](mailto:rohit@cdfd.org.in), phone-91-40-27216156