Scientist explores secrets to life through worms

October 17 2008, by Wendy Hostein

Gupta's article on the roles of transcription factors in worms, fruit flies, mice and humans was recently published. File photo.

Who would have thought that worms found in your composter - only seen with a microscope - could be used to study genetic disorders in humans? With 700 million years of separation and roughly half of its genes similar to humans, the worm C. elegans is one of the most widely used animals in biomedical research today.

Bhagwati Gupta, assistant professor in the Department of Biology and Canada Research Chair, knows this and has recently published an article in the BioMed Central journal, BMC Genomics on the roles of

transcription factors in nematodes (worms), fruit flies, mice and humans. Transcription factors (TFs) are proteins that interact with specific DNA sequences and are part of the system controlling the transfer of genetic information from DNA to RNA.

Within the first two weeks of publication, Gupta's paper was rated as "highly accessed" in BioMed Central publications and is already among the top 40 most viewed BioMed research articles published from McMaster in the last year.

This is the first systematic genome-wide comparative study of TFs across so many organisms. Gupta and his colleagues have found that 15 per cent of the worm TFs are conserved all the way up to humans. The fact that many of these TFs are associated with diseases, such as cancers, makes the worm an excellent system to understand the biology of human genes and find cures to various diseases.

The worms are more preferable to work with considering they reach adulthood in less than three days, allowing researchers to study the development of a genetic disorder in a shorter amount of time. Worms are composed of less than 1,000 cells, enabling researchers to see all sorts of complexities at a molecular level - ones that are known to happen in human cells. Furthermore, their exterior is transparent so no invasive research technique is needed, decreasing the ethical complications associated with many studies of genes and disorders.

What is also good about studying these worms is you can feed them almost anything and see results relatively quickly, for example, their reactions to changes in diet and exposure to various drugs aimed at treating human diseases. Not only can these effects be examined at whole organism level but also at single cell resolution as researchers have developed a battery of fluorescing tags to examine growing cells in live animals in real time.

Gupta's lab is the only at McMaster using worms to study mechanisms of reproductive system development and how genetic pathways control formation of tissues and organs. It is one of only two in Canada to have a large collection of mutant C. briggsae worm strains (a sister species of C. elegans) and is one of only three labs in the world engaged in the construction of genetic linkage maps of C. briggsae, as well as being a centre for international distribution of C. briggsae strains.

The study published in the journal builds on the foundation for further study of genes - similar to bricks as part of a house. Gupta hopes this work will set the background to advance the approach to study TF genes in worms and their homologs in other species.

"The more we understand about these genes in different organisms, the more effective our approach will be to diagnose and treat human diseases," says Gupta. "These findings are extremely interesting and provide a foundation to investigate the function of important TFs in mediating development and behavior."

Provided by McMaster University