Ants may help researchers unlock mysteries of human aging process

November 24 2008

NYU School of Medicine researcher Dr. Danny Reinberg was awarded a Howard Hughes Institute of Medicine Collaborative Innovation Award for new research on ant epigenetics- helping to unravel the impact lifestyle and environment have on genes. The research will investigate what ants can teach us about aging and behavior. Results of the ant study may translate to other species including humans, using gene regulation in ants as a model for aging.

"Ants live exceptionally long lives, they are social creatures, and they engage in stereotypical behaviors that befit their station in life, whether it be worker ant, soldier or queen," said Dr. Reinberg, professor of Biochemistry at NYU School of Medicine's Smilow Research Center. "Ants seem to be a perfect fit for study about whether epigenetics influences behavior and aging."

According to Dr. Reinberg, ants can assume either reproductive or non-reproductive roles in their colonies. The different reproductive roles also have a strong impact on the longevity of queens and workers. Released from the everyday activity of the colony and focused only on reproductive tasks, queens live up to 10 times longer than worker ants. As a consequence of differential aging and different behaviors, some regions of the queen's brain, such as the visual system, are not as well developed as those of the workers. Even though these two types of ants begin life remarkably similar, their individual experiences and differences in aging sculpt their brains and behaviors in vastly different ways. Reinberg hopes that it will be easier to pinpoint the changes in

gene expression that drive the changes in adaptation to specific social roles in the ant community.

"I truly believe that this project will open the door for my next 20 years of science," said Dr. Reinberg, who is a Howard Hughes Medical Institute researcher at NYU and lead investigator for the award. Dr. Reinberg and his collaborators, Dr. Shelley L. Berger of The Wistar Institute and Dr. Juergen Liebig of Arizona State University, are one of eight scientific teams receiving research support through a $10 million pilot program, totaling $40 million over four years, from the Howard Hughes Medical Institute (HHMI).

Dr. Reinberg's and his collaborators' first goal is to deliver the first complete sequence of an ant genome. The group plans to sequence the genomes of three ant species in all. Researchers set out to discover whether changes in the brain and behavior occur as a consequence of living in a particular type of environment investigating the genetic underlying differences in longevity, social behavior and brain aging among queen and worker ants.

"Whether these modifications are indeed epigenetically inherited along with the gene is exactly what the team is seeking to discover in ants," said Dr. Reinberg. "There is not much known about epigenetic changes that may underlie behavior, but I intend to change that," concludes Dr. Reinberg.

More about Dr. Reinberg

For the last 20 years, Dr. Reinberg has focused on understanding gene expression—the process that cells use to produce proteins from genes on double-stranded DNA. DNA sequences in genes are first transcribed to RNA molecules, which then become the templates for proteins. But this process must be controlled so that the correct amounts and types of

proteins are made in a normal cell. He and scientists in his HHMI lab at NYU, and before that at the University of Medicine and Dentistry of New Jersey, have made many fundamental discoveries about how the DNA inside a cell is read and transcribed. "I think we have done a good job in understanding, for example, how chromatin affects transcription," Reinberg says, "and, for me, the next logical step was to begin to take a closer look at epigenetics in living organisms. Epigenetics absolutely fascinates me. The more that you read about it, the more you want to know."

Learn more about HHMI: www.hhmi.org

Source: New York University School of Medicine