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Decoding Genetic Switches

University of Dayton, Ohio (url: http://www.udayton.edu/index.php)

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07.21.2011 | Science, Research, Faculty The American Heart Association will fund research on fruit flies at the University of Dayton that may lead to an understanding of how seemingly obscure changes in our genetic code can lead to increased heart disease risk and even lactose intolerance.

The AHA awarded $132,000 to biology assistant professor Thomas Williams, whose research with fruit flies focuses on a portion of the DNA sequence that he calls "genetic switches."

Known to scientists as cis-regulatory elements or enhancers, these switches send signals to genes that instruct them when during an organism's life and where in the body to "turn on" — that is, make a protein. Recent studies have shown mutations in these switches can affect cholesterol levels, heart attack risk, developmental disorders and various disease susceptibilities.

"The effect of mutations in these switches on human health has been largely overlooked for several reasons, including the difficulty in identifying the switches and that most mutations seem to make no difference in their function," Williams said. "The challenge is to identify the minority of switch mutations that do make a difference."

His research will examine the genetic codes of fruit flies of the same species but from different geographic regions of the world. Comparing differences in their genetic switches to differences in their appearance should shed light on why some mutations are important and others are not.

"Fifty years ago, scientists broke the code for how DNA encodes the information to make proteins, but we lack a comparable code for these switches," Williams said. "My lab's research will contribute to understanding the code for genetic switches, thereby assisting scientists working with human genetics to identify the switch mutations that affect our health."

Williams' research is rooted in discoveries since the 1980s that radically different organisms have a similar set of genes, suggesting that much of the Earth's biological diversity comes not from new genes but on how the same genes are used differently.

"Changes in when and where genes are 'turned on' during our lives and over the course of evolution are just as important as changes in genes that alter the protein produced," he said.

Williams has published research on topics in evolutionary biology in Nature, Nature Reviews Genetics and Cell. His research focuses on understanding why members of the same and different species look and behave differently.

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