OSU Professor Discovers New Gene Function

A vast majority of the general public is aware that maintaining a balanced diet is the key to good health. What many of us don’t know, however, is why. We know that we are supposed to eat a lot of fruits and vegetables, limit our sugar intake, and avoid eating fast food when we can. We eat vegetables because they are high in vitamins and minerals, which are good for you. We know milk has calcium, which builds strong bones. And, somehow, vitamin C tablets “boost the immune system”, so we’re supposed to take them when we start to feel under the weather. However, if implored to go deeper, many people would probably find difficulty in explaining exactly how these things work and what these vitamins and minerals actually do in our bodies. Luckily, the Department of Nutritional Sciences at Oklahoma State University does much more than teach students how to eat a healthy diet. Its faculty performs complicated and extensive research in order to discover new information about how the foods we put into our bodies affect our bodies at the molecular level.

The nutrients from the foods we eat have a huge impact on our health. One major role they play is in our genes and fetal development. There have been many genetic disorders discovered to be caused by nutrient deficiencies in utero, but there is still much to be discovered. One professor in particular, Dr. Winyoo Chowanadisai, has dedicated his career to researching the purposes of our genes and how they are affected by the nutrients in our food. With his Bachelor’s degrees in Molecular Neurobiology and Psychology and his Ph.D. in Nutrition, he studies specific genes and what they do. Specifically, Dr. Chowanadisai studies zinc, the metal mineral that is a component of many of our foods. Zinc is required for neurological function, or making our brains work properly. In one of his recent articles he published, Dr. Chowanadisai and his research team analyzed a gene that codes for ZIP12, a zinc transporter. Zinc transporters are proteins that attach to zinc molecules after they enter the bloodstream and carry them through the blood to wherever the body needs it.

The Human Genome Project and subsequent research has brought vast amounts of information about our genes. The basis of Dr. Chowanadisai’s project was to determine if it was possible to use computers and the information already known about genes to make predictions about their role in the body and whether they play a role in neurological diseases. He started by using information already out there, then used his own animal models to test what they found. He used another study’s results that measured the expression levels of all genes in the genome. The gene that makes ZIP12 was highly expressed, or it was made and used a lot by the body, but it had never been closely examined.

To test the need for ZIP12 in the body, Dr. Chowanadisai did an experiment in which he took healthy mice, removed the gene that codes for ZIP12, and observed their growth, development, and brain function. Without the ZIP12 gene, the mice developed fewer and shorter neurites, which are structures that project out of neurons. Basically, their nerves and nervous systems did not develop the way they were supposed to. After seeing the results in the mice, he repeated the process of removing the gene, but this time with frog embryos so he could observe how they developed before birth. These embryos developed a genetic defect that would be the equivalent of anencephaly in humans, which is fatal.

With these results, Dr. Chowanadisai and his team were able to conclude that ZIP12 is necessary for proper function and development of our nervous system and brain. Moving forward, Dr. Chowanadisai still has some questions he’d like to see answered. Could a high zinc intake help prevent birth defects? Does low zinc intake while pregnant increase the chance of birth defects? These questions are unanswered as of now, but recent advancements in genetic research and technology have made finding these answers a realistic possibility. The results from studies like these can help the healthcare community give the best possible nutritional recommendations to the public in order to maximize our health.

References

Chowanadisai, W., Graham, D., Keen, C., Rucker, R., & Messerli, M. (2013). A zinc transporter gene required for development of the nervous system. *Communicative & Integrative Biology*, *6*(6), e26207. doi: 10.4161/cib.26207