Researchers reveal gene and magnesium deficiency link

May 11 2011

Scientists in Europe, led by Charite - Universitatsmedizin Berlin and the Max Delbrück Center for Molecular Medicine in Germany, have found a link between genes and magnesium deficiency. Presented in the journal *American Journal of Human Genetics*, the study could lead to the development of new treatments for genetically triggered magnesium deficiencies. The research was funded in part by the EUNEFRON ('European network for the study of orphan nephropathies') project, which has clinched almost EUR 3 million under the Health Theme of the EU's Seventh Framework Program (FP7) to probe the natural history and pathophysiology of rare inherited diseases affecting key structures of the kidney.

The researchers discovered changes in a gene that helps regulate magnesium processes. Someone who suffers from a magnesium deficiency will inform their doctor that they feel very tired and that their muscles are very weak. Heart rhythm disturbances and severe seizures may also be reported. Patients diagnosed with high blood pressure or diabetes may be deficient as well.

How important is magnesium? Experts say our bodies need it as it contributes to enzyme and muscular function and neuronal transmission. The normal serum magnesium concentration ranges from 0.7 to 1.2 mmol/l in adults, and low levels of serum magnesium may go unnoticed because the symptoms fail to show for quite some time.

Experts generally implicate diet and nutrition in cases of magnesium deficiency. But this latest study sheds new light on how changes in the Cnnm2 gene trigger changes in the human blueprint, and in turn in the structure and function of protein sequencing.

According to the team, the change impacts a protein that is anchored in the membrane of both kidney and intestinal cells, and brings about the absorption of magnesium in the blood stream. Because this process stops working in the defective protein, the blood stream fails to absorb the magnesium, which is excreted through the intestine and urine, and therefore lost.

"Our results provide us with a number of new insights into magnesium metabolism in the body," explains Dr. Dominik Müller from the Department of Pediatric Nephrology at Charité - Universitätsmedizin Berlin. "In the end, following further research and development, we see the possibility to deal with such deficiencies medicinally."

More information: Stuiver, M., et al. (2011) CNNM2, encoding a basolateral protein required for renal Mg2þ handling, is mutated in

dominant hypomagnesemia. *The American Journal of Human Genetics* 88: 333-343. DOI: 10.1016/j.ajhg.2011.02.005