The effect of regulation of phosphorus metabolic process and Alzheimer's

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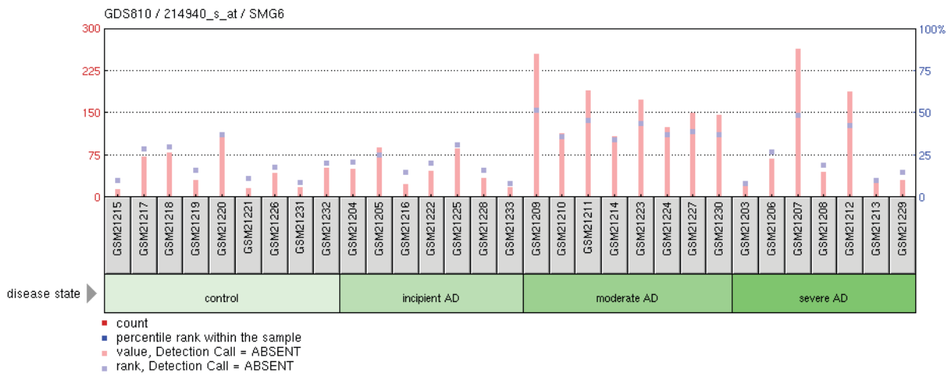
Introduction

Alzheimer's disease is the most common form of dementia and 6th leading cause of death in the United States. More than 5 million Americans have this disease and there are approximately 500,000 people die each year because of it (1 in 3 seniors dies with Alzheimer's or another dementia). The disease deteriorates tissues, cells, and gradually destroys the entire markup of the brain, and Central Nervous System. However, there is no current cure for Alzheimer's disease. I focused on the fact that hypophosphatemia, which is a condition of low levels of soluble phosphate levels in the blood serum, causes neurological dysfunction.

Methods

I used dataset GSE 28146 and BiNGO function in Cytoscape to figure out the up-regulated genes in Alzheimer's patient. Among them, I noticed how many genes were related to phosphorus so I chose SMG6 which regulates phosphate metabolic process. Then, I decided to compare gene expression of SMG6 in control group (people with no AD), incipient AD, moderate AD, and severe AD. Using NCBI website, I found one GEO Profile that substantiated my hypothesis that SMG6 is up-regulated in Alzheimer's patient and the resulting low level of phosphate causes neurological dysfunction.

Results



As you can see above, there is a significant difference between gene expressions of SMG6 among control, recipient, moderate, and severe groups. This graph implies that SMG6 is up-regulated among patients with AD, meaning that patients with AD have significantly lower levels of phosphate in their blood.

Conclusion

Because it is clear that patients with Alzheimer's disease have lower levels of phosphate in their blood due to up-regulation of SMG6 gene, the treatment of AD may include gene therapy such as suppression of SMG6 gene using miRNA or nutritional therapy such as consuming food high in phosphorus (romano, salmon, scallop. . . etc).

Keywords: Alzheimer's disease, phosphate, hypophosphatemia

References:

1. http://www.ncbi.nlm.nih.gov/geo/tools/profileGraph.cgi?ID=GDS810:214940_s_at

My name is Hakkyun Kim, a senior at Pioneer High School. I will be studying Neuro&Bio Engineering at KAIST in South Korea next year.

miRcore changed my view about the medicine. My previous notion of medicine centered only on doctors and surgeons who do hands-on treatment. However, these treatments only seemed to cure symptoms, not the fundamental reason for the disease. For example, the current medicine for cold drops the fever and stops the cough but it does not change the fact that the patient still has "cold". miRcore seemed to provide a solution for this shortcoming. The idea of changing gene expression and democratizing medical research sounded revolutionary yet achievable. The research that I did in miRcore made me realize that even high school students like me could conduct a medical research with the help of the technology. One memorable research is the one that I did in the Computational Biology Camp. Using various different information sources, I tried to find the correlation between a gene and muscular dystrophy. When I successfully came up with a hypothesis that the problem in the synthesis of calcium might be the cause of muscular dystrophy, I felt as if I was a real scientist. Along with the pioneering research, various fundraisers and leadership activities improved me as a person. I did things that I would never have done, such as soliciting at the downtown for donations and asking friends to donate money and I am sure that all these activities made me a better outreaching person. Thanks to the unique experiences at the miRcore, I could clearly decide what I am going to do in future. Hopefully, I can be a forerunning medical researcher who comes up with cures for diseases that once thought incurable.