Genes and Alzheimer’s

We know that Alzheimer’s disease is the result of amyloid plaques and neurofibrillary tangles which lead to a shrinking brain. What scientists don’t know is why some people get the disease while others don’t. Thus, recent research has focused on risk variants tucked away in our very genome that could affect the development of Alzheimer’s. The biggest risk variant found so far for late-onset Alzheimer’s is the ApoE gene, which when mutated, disrupts the delivery of necessary nutrients to neurons. As a result, the neurons die and significantly increase the risk for Alzheimer’s.

In search of other risk factors, a recent article published in the New England Journal of Medicine compared genomes of 2261 Icelanders with Alzheimer’s. Genetic information from 110,050 subjects was used as a control.

The result was a discovery of a new risk variant in the TREM2 gene, which codes for a receptor on the surface of cells called microglia. Microglia are the primary immune response cells in the brain; they phagocytose (eat up) toxic cells and induce inflammation. Without a normal TREM2, the microglia cannot produce proper inflammatory response to get rid of toxins. Researchers found that carriers of the TREM2 variant had more severe cognitive impairment than non-carriers, suggesting that inflammation and the immune system play key roles in Alzheimer’s disease. This finding supports previous studies and calls for future research investigating the therapeutic potential of anti-inflammatory agents in the brain.

Letter from the Executive

After more than a year of research and development, I am pleased and excited to announce the formal launch of the Dementia Therapeutics program. New clients will be admitted into the program beginning February 1, 2013.

Dementia Therapeutics is a scientifically-based, non-pharmacological approach to slowing the progression of cognitive decline associated with neurodegeneration. DT also helps delay the onset of symptoms in areas of the brain that have not yet been pathologically affected. Interventions are provided almost exclusively on a one-to-one basis by trained professionals and administered primarily within the client’s home. The DT approach involves cognitive rehabilitation, sensory and social stimulation, exercise, dietary modifications, emotional coping, and recreation. More information on the program and its services may be obtained from the company’s website www.dementiatherapeutics.com.
Although the variant of TREM2 is rare compared to ApoE, it could serve as another biomarker to help diagnose Alzheimer’s early. This large-scale look at the genomic makeup of individuals with Alzheimer’s sheds light on other risk factors for Alzheimer’s, and demonstrates science’s continued efforts in search of treatment options for the disease.


The Difference between Social Isolation and Loneliness

Past research suggests that there is a link between social isolation and cognitive decline. However, very few studies have looked at the actual association between social isolation and feelings of loneliness. Holwerda et al. sought to determine the relationship between feeling lonely and actually being alone. An individual with dementia might interact with people daily and therefore have a high level of engagement with others but feel dissatisfied with the quality of social interaction and therefore remain lonely. Similarly, an individual might spend a lot of time alone but never feel lonely. There are many risk factors that have been studied and linked to the development of dementia; still, the role that feelings of loneliness play with regard to social isolation and dementia is less clear.

Before a multivariate analysis was done, Holwerda et al. found that those who lived with others had a decreased risk of dementia compared to those who didn’t. After controlling for a comprehensive set of psychiatric, demographic and somatic factors, however, social isolation showed no such association. In the same multivariate analysis, individuals who reported feeling lonely were almost twice as likely to develop dementia as those who did not feel lonely, and feelings of loneliness were not unique to people who lived alone. So, regardless of social interaction, individuals can experience feelings of loneliness that pose a risk factor for development of dementia. From this information, it is important to realize that everyone is different and has different preferences. In order to help loved ones avoid such feelings of loneliness, the best thing we can do is try to understand their needs and whether or not they prefer to be alone more often or be surrounded by others. From there, we need to understand what type of social interaction is quality interaction for a particular person.
While this study found that feelings of loneliness are linked to greater risk of dementia, even when controlling for other variables such as social isolation and depression, it is still unclear what mechanisms are involved and what the relationship is. Further research is needed to determine whether loneliness is a prodromal stage of dementia or if biological mechanisms of loneliness, prior to any stage of dementia, instigate a progression of neural decline that leads to dementia.


A Short Burst of Exercise to Boost Memory

Ever feel bad you didn’t put in that obligatory thirty-minute exercise for the day? A recent emerging study may encourage you to get up and moving, even for a little bit. Scientists at UC Irvine’s Center for Neurobiology of Learning and Memory have found evidence that a short burst of aerobic exercise can enhance memory recall. Neurobiologist Dr. Sabrina Segal and her colleagues had participants, ranging in age from 50 to 85, with normal and mild deficits in memory, look at photos of nature and animals. They then immediately exercised on a stationary bicycle for six minutes at 70 percent maximum capacity. After an hour, the participants were surprised with a recall test of the previously seen photos. The result was that participants who rode on the bike, as opposed to those who didn’t, had significant memory enhancement in both the normal and cognitively impaired groups.

The reason? Dr. Segal believes that the key player is norepinephrine, a hormone that increases our heart rate during exercise, and serves as a neurotransmitter involved in memory inside the brain. Since a brief bout of exercise increases the levels of norepinephrine in the brain, this may lead to better consolidation of our memory. Such an idea supports previous research that increasing norepinephrine level improves memory and that blocking it impairs memory.

“The current findings offer a natural and relatively safe alternative to pharmacological interventions for memory enhancement in healthy older individuals as well as those who suffer from cognitive deficits,” Dr. Segal said. All the more reason to get up for a quick ten-minute bike ride or run around the block, even if you don’t feel like doing thirty!

Upcoming Event – Rehabilitation Psychology Conference

In February, our team will be presenting a poster entitled “Full Circle Technology System in Support of Dementia Therapeutics” at the technology preconference of the 15th annual Rehabilitation Psychology meeting in Jacksonville, Florida. This preconference will focus on innovative technologies used to enhance the clinical practice of rehabilitation psychology along with the functional independence and health of individuals with disabilities. Our poster will present screenshots of our system, and we will have one of our iPads for live demonstrations.

Dementia Therapeutics will present on the technology system that we have developed to enhance clinical practice and provide in-home rehabilitative interventions for clients with various forms and levels of dementia. Our system uses a web application and iPad to carry out various interventions that allows for more efficient time management and provides instant access to client history, intervention content and methods, and client progress. It ultimately helps extend in-home residence and quality of life.

Digital client records are becoming more commonplace and the Dementia Therapeutics program integrates everything: initial assessments and diagnosis, treatment plan and interventions, and outcomes.

- **Client Admission** is handled by review of medical records, formal assessment of neuropsychological status, environmental evaluation, and interviews, of which summary data are entered into the client’s profile.
- **The Intervention Plan** is prepared based on the admission evaluation; on average, sixty interventions are carefully selected within the web app and added to the intervention plan.
- **The primary provider** accesses client data and the intervention plan on the web app via an iPad in preparation for interventions. On site, the provider can view the entire plan and view directions, including links to relevant stimuli and solutions documents.
- **The client** is able to perform many of the cognitive interventions directly on the iPad, from the stimuli documents or with a carefully selected collection of iPad apps for cognitive exercise.
- **Performance** data is entered in daily reports by the provider, using the iPad. The data is immediately available to administrators to view and alter if necessary.
- **Weekly assessments** are automatically generated by aggregating the provider’s daily reports. These assessments can be annotated by provider and administrators before family members access them in the client’s profile.