Alzheimer's Disease: The Search for a Treatment

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Today, in the world of science, a race is ongoing. This race concerns finding the treatment of Alzheimer's disease and is set between those investigating treatments with stem cells and those investigating the use of antibodies. Both contestants strive to achieve the same thing: the restoration of the ability to form and preserve memories in people with Alzheimer's. To some extent both methods have the potential of achieving the same goal, but in different ways, and the question is: which one is better and will get there first?

What is the cause of Alzheimer's disease?

To be able to understand how the two treatments for Alzheimer's disease work, it is important to know what, in the human brain, they are trying to treat. The two main hallmarks of the disease are similar in the way they manifest, since they both consist of unusual assemblies of proteins. One hallmark is so called neurofibrillary tangles, which consist of an unnatural assembly of a protein called tau. In this form, the protein causes the inside structure of the brain cells to become unstable, and thus preventing the cells from being able to communicate with one another. The second hallmark of the disease is senile plaques, consisting of a protein called amyloid-β, which also aggregates in an unusual way. This protein will physically damage the brain cells since it grows into sharp tubes and breaks the cells' membranes, which kills the cells. These events can primarily be seen in the hippocampus, a structure deeply embedded inside the human brain, and it is important when it comes to the formation of new memories. This is why the deaths of the cells affect the individual's ability to create memories.

First documented case of Alzheimer's disease

Alois Alzheimer was the first person to scientifically document the symptoms and fate of people with the disease in 1906-1907. He saw signs of confusion as well as loss of memories, which are the most common symptoms seen in diagnosed people today.

Current research on treatments

Treatments of diseases using antibodies are fairly common today, in regards of the development of vaccines in order to prevent people from getting sick. This is something scientists try to apply on Alzheimer's disease. Since antibodies are used by the body itself to mark foreign substances for destruction, it would be a great benefit if it could be used to remove the causes of Alzheimer's. Antibodies have been designed to recognise and bind to specific parts of either the unnatural tau or the amyloid-β, in the hopes of getting a response from the immune defence, and thus decreasing the amount of neurofibrillary tangles or senile plaques. Several different antibodies have been tested in genetically modified rodents showing typical symptoms of Alzheimer's. Symptoms such as inability to form and preserve memories due to anomalies in tau and amyloid-β – in other words, neurofibrillary tangles and plaques. In almost all studies, the rodents showed improvement in their ability to form new memories.

The use of stem cells is a fairly new approach to the treatment of Alzheimer's and mainly focuses on injecting new cells into the brain. These cells will then differentiate into brain cells

– neurons – and replace the deceased cells. Stem cells harvested from human umbilical cords have shown to have a positive effect on mice displaying symptoms of the disease, in the way of lessening the memory deficits. Worth noting is that the mechanisms behind treatments with stem cells are not fully understood. In some cases, they cause a reduction in the amounts of either senile plaques of neurofibrillary tangles, but scientists are not sure why it happens.

Looking to the future

As with all medical treatments, there are worries of side effects. Even though few have been observed in the rodents tested on, things may be different in humans, applying to both stem cell treatments and antibody treatments. With antibody treatment, scientists are worried that, in humans, they may bind to more structures in the cells than only the tau, or amyloid-β, which would be devastating for the treated individual. This would be since the antibodies could bind to the normally occurring versions of these proteins which then would be neutralised by the immune system. Stem cell treatments have worries concerning their abilities to divide into new cells indefinitely, which, in the long run may give rise to cancer.

Although there are uncertainties concerning the two types of treatments, it may be possible that the research on antibodies may be the first to become the new treatment of Alzheimer's disease. This is because more progress has been made concerning human trials, and we have worked with these types of treatments for a longer time than with stem cells. But, whatever happens, there is much support of the notion that there soon will be an efficient treatment for Alzheimer's disease, available for all.

More information

For more information on the subject of the mechanisms concerning Alzheimer's disease and the research on the two types of treatment, please look to the following review.

Granström S. 2017. Framtiden för behandlingar av Alzheimers sjukdom.