STICHTING VRIENDEN
VAN HET HERSENINSTITUUT

Nystagmus research at the Netherlands Institute for Neuroscience

What is nystagmus?

Nystagmus is a medical condition in which the eyes make repetitive, uncontrolled movements. These involuntary eye movements can occur from side to side, up and down, or in a circular pattern. Nystagmus can be either congenital or developed during life because of diseases or accidents. People with congenital nystagmus usually have a reduced visual acuity. Congenital nystagmus (also called infantile nystagmus) occurs in 1 out of 700 people.

The cause of nystagmus

Until now, the origin of congenital nystagmus was not known. At the Netherlands Institute for Neuroscience we, together with researchers from the US and Japan, have recently discovered the origin of a specific form of congenital nystagmus. Opposite to what is currently thought, this form of nystagmus is not a condition of the brain. Using multidisciplinary research techniques, we found that the origin of this type of nystagmus lies in the retina.

The retina is the place where light, which falls into the eye, is transformed/converted into electrical signals. These electrical signals are sent to the brain via the optic nerve. Special connection points, the so-called synapses, connect the layers of the retina with each other. In the retina of people with nystagmus specific proteins in the synapses are not functional (e.g. NYX or Cacna1f). To be able to understand how these changes in the synapses lead to the swinging eyes, we investigated mice that had the same changes in the retina as found in humans with nystagmus.

In our research we measured eye movement and electric activity of neurons in the nystagmus mouse retina among other experiments. We found that a specific group of neurons, show rhythmic electric currents. These rhythmic currents are seen by the brain as a signal that the image on the retina is still moving. The brain tries to compensate for this movement and this compensating movement makes the eyes swing. We published these results in the leading scientific journal PLoS Biology, and therefore made our research accessible for researchers worldwide.

What are our future plans?

First, we want to investigate whether the mechanism causing congenital nystagmus that we found in this study, is a general mechanism or if it is limited for this specific form of nystagmus. Currently, we therefore study the retina of mice with mutations in different proteins in the same synaps. If the mutation also leads to oscillating cells and thus nystagmus we know that our results are the general cause of nystagmus. Furthermore, we want to find out the relationship between the eye movements and the reduced visual acuity. We expect that these experiments will allow the development of a treatment for nystagmus in the future.

Where do I find more information?

NRC artikel (Dutch)

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https://www.nrc.nl/nieuws/2019/09/20/het-raadsel-van-de-trillende-oogbollen-a3974110

NZZ artikel (German)

https://www.nzz.ch/wissenschaft/angeborenes-augenzittern-forscher-finden-ursache-in-der-netzhaut-ld.1511529

Science daily article (English)

https://www.sciencedaily.com/releases/2019/09/190912141800.htm

Podcasts (Dutch)

https://www.bnr.nl/podcast/wetenschap-vandaag/10390090/jarenlang-zochten-onderzoekers-op-verkeerde-plek-naar-oorzaak-oogaandoening