Characterizing amyotrophic lateral sclerosis progression through extracellular vesicles

Layman summary

Amyotrophic lateral sclerosis (ALS) is a disease that affects the nerve cells in the brain and spinal cord, called motor neurons. In ALS these neurons deteriorate and die, leading to muscle weakness and difficulties with activities like walking, eating, and speaking. Most of the patients do not survive more than five years after onset because of problems with breathing muscles. Unfortunately, there is currently no cure for ALS, however, different studies have found various genes linked to ALS which are involved in how the disease develops.

One interesting area of research is the study of extracellular vesicles, which are small vesicles that cells release to communicate with each other. Depending on the cell from where they come from, these vesicles can either protect or harm other cells. In ALS, the vesicles released by affected MNs may carry disease-related substances, such as ALS-related proteins to healthy motor neurons nearby.

In this study, we used induced pluripotent stem cells, which are tiny building blocks that can turn into many different types of cells in your body, to create motor neurons from ALS patients and healthy individuals. We also made a control group from the same patients but with the ALS cause fixed, called isogenic control. Then we collected the vesicles from these motor neurons to compare the levels of ALS-related proteins. The results showed that ALS-related proteins are in the motor neurons and their vesicles.

Next, we added vesicles from ALS patients in healthy motor neurons to see how it affected their shape, their survival, and the location of a specific ALS-related protein within these neurons. These findings suggest that vesicles from ALS patients can change the shape of healthy motor neurons, possibly spreading ALS-related changes.

This study gives us a better understanding of ALS and might help in developing new treatments in the future.