

Pilot study tests possible diagnostic tools for amyotrophic lateral sclerosis

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New animal research has shown that measuring copper concentrations and isotope ratios in blood and other tissue may allow early diagnosis of Amyotrophic lateral sclerosis (ALS). At present, there is no test for this disease, meaning that the illness needs to develop before care can begin. The work is being presented at the Goldschmidt conference in Yokohama, Japan.

Amyotrophic lateral sclerosis—a version of Motor Neurone Disease—is a devastating neurodegenerative disease in which motor neurons undergo progressive degeneration and die. ALS, which has affected several high-profile patients, such as Lou Gehrig, Stephen Hawking, and David Niven, is becoming more common as the population ages.

There is little understanding of the underlying biochemistry of the disease. Biochemical tests are restricted to genetic associations, meaning that even if a treatment is developed, one would have to wait until the onset of symptoms before treatment could be initiated.

Now a pilot study has measured the association between the disease and lifetime changes in trace copper, iron, and zinc concentrations in tissues of ALS-affected mice and in healthy control. A group of Australian researchers, led by Professor Anthony Dosseto (University of Wollongong, NSW, Australia) was able to show that copper and zinc concentrations increased in the spinal cord and muscle of the ALS mice. Significantly, this increase emerged prior to the appearance of clinical symptoms, although it is not known if these changes are a cause or a consequence of the disease.

In addition, blood samples taken from ALS mice showed subtle differences in their copper isotope ratio ($^{65}\text{Cu}/^{63}\text{Cu}$) compared to that of blood from healthy mice. As these differences preceded the onset of symptoms, testing this approach on

human subjects could open the way for the development of a blood-based test which would be able to indicate the presence of disease effects before clinical symptoms appear. The US National Institute for Health states that "The onset of ALS may be so subtle that the symptoms are overlooked", meaning that a diagnostic test is urgently needed.

Ageing populations are increasingly susceptible to neurodegenerative diseases. Amongst these diseases is ALS, which involves the progressive death of motor neurons, resulting in paralysis and eventually death. Around 5600 new cases are diagnosed every year in the USA. In the UK, around 5000 people live with ALS.

According to Professor Dosseto: "While this work is only preliminary and applies to a specific mouse model of ALS, it is the first of its kind on this pathology and brings hope that one day we could use isotopic measurement in blood samples as an early detection tool of the disease".

Commenting, Professor Ariel Anbar (Howard Hughes Medical Institute, Arizona State University) said: "Biomedical applications of geochemical methods - especially high precision isotope analyses - have barely been explored. This is the latest study hinting at the exciting possibilities."

Provided by Goldschmidt Conference

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