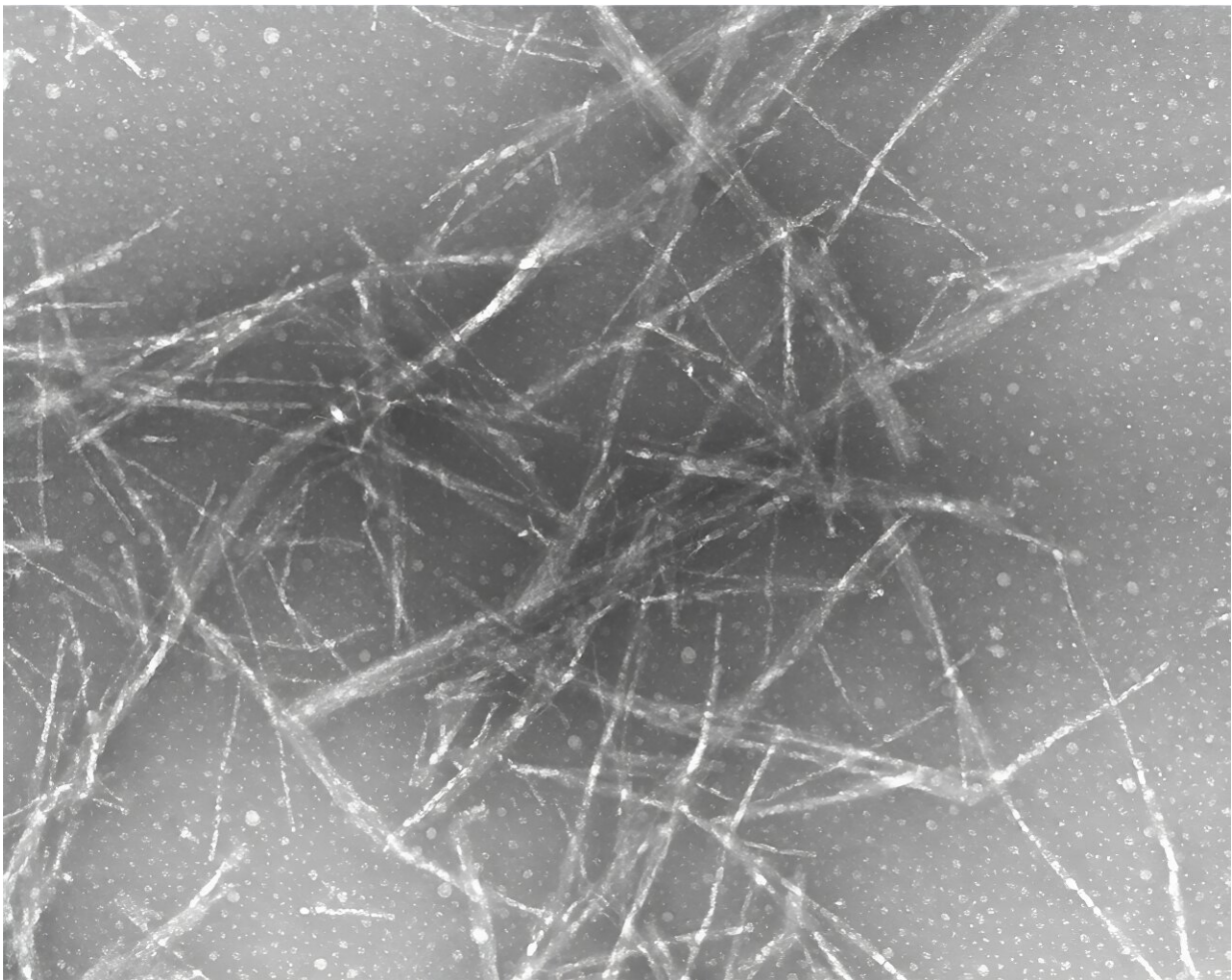


Discovery of proteins associated with the progression of dialysis-related amyloidosis

March 1 2024



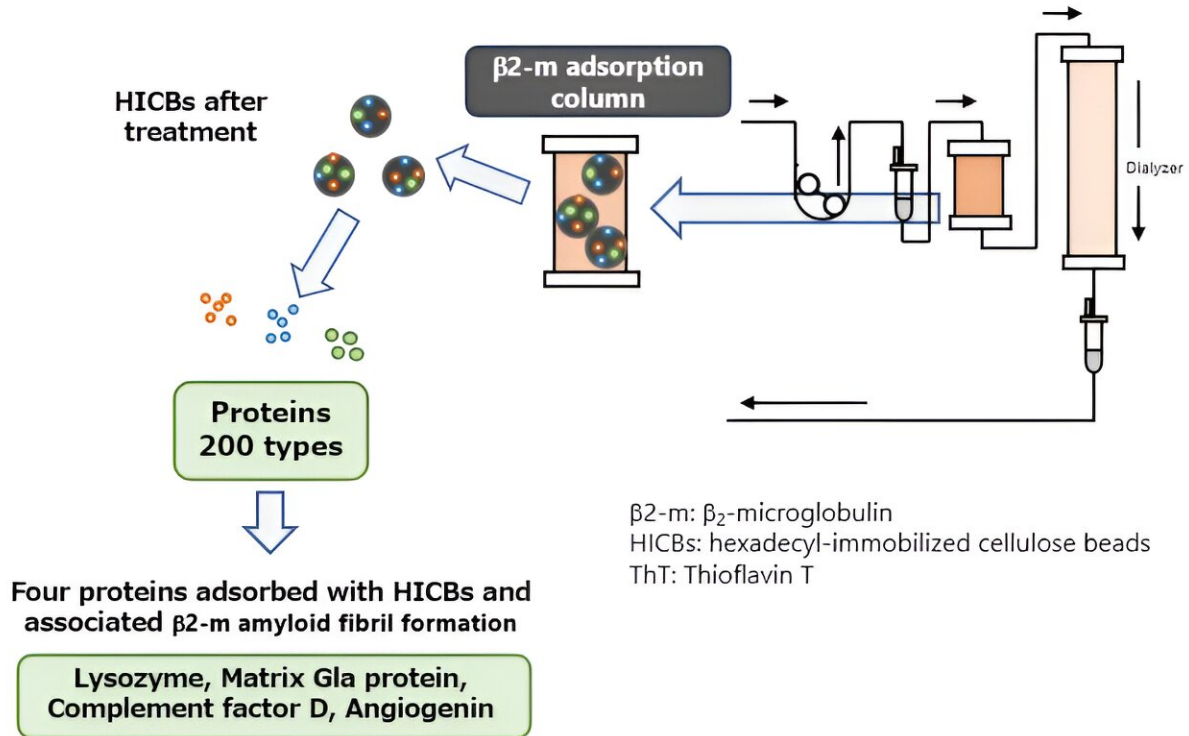
Extended Amyloid Fibrils: Implications in Osteoarticular Disorders Among Dialysis Patients. Credit: Niigata University

Dialysis patients often develop dialysis-related amyloidosis and exhibit bone and joint disorders that impair their activity of daily living. Blood purification devices consisting of hexadecyl-immobilized cellulose beads aimed at removing the precursor protein, β_2 -microglobulin (β_2 -m), are used in the treatment of dialysis-related amyloidosis.

Dr. Yamamoto and colleagues conducted a comprehensive analysis of proteins adsorbed onto blood purification devices, which resulted in the identification of 200 types of proteins, including β_2 -m. Among these, several molecules, such as lysozyme, were shown to be involved in amyloid fibril formation. The [findings](#) were published in the scientific journal *Amyloid: Journal of Protein Folding Disorders*.

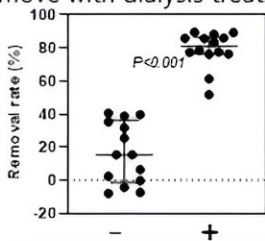
Patients with [advanced chronic kidney disease](#) (CKD) require kidney replacement therapy, such as [hemodialysis](#), to manage their condition. Hemodialysis patients often experience various symptoms, leading to a compromised quality of life and reduced activity levels.

Itching is a common symptom frequently observed in hemodialysis patients. Although its exact causes remain unclear, a survey conducted in Japan in 2000 found that itching was present in 73% of hemodialysis patients, and it was associated with elevated levels of β_2 -microglobulin, calcium, phosphorus, or [parathyroid hormone](#) in the blood.



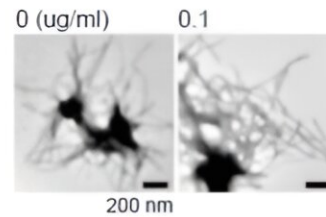
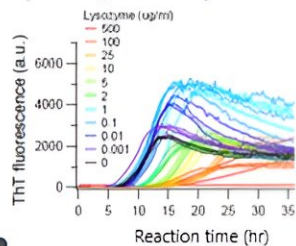
Ex. Lysozyme

Remove with dialysis treatment



Blood concentrations before and after passing through the β2-m adsorption column and dialyzer were measured, and removal rates were calculated.

β2-m amyloid fibril formation



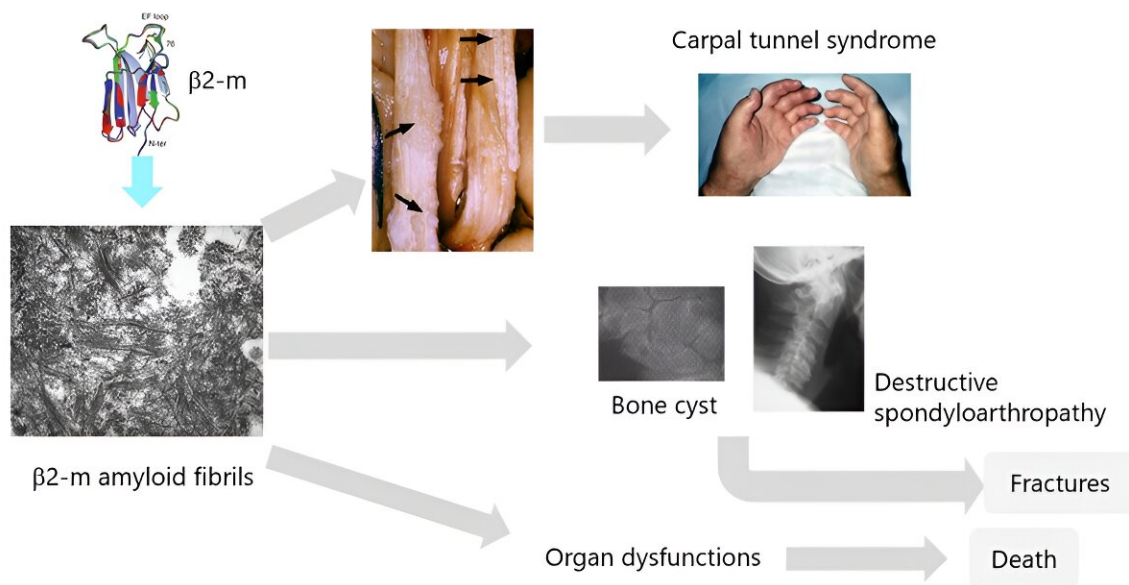
β2-m with various concentrations of lysozyme were reacted. The amyloid fibril formation was observed using Thioflavin T fluorescences and the morphology was observed using electron microscopy.

Identification of the amyloid-related proteins adsorbed with β2-m adsorption column in hemodialysis patients. Credit: Niigata University

Subsequently, improvements in hemodialysis therapy and pharmacological treatments have led to changes in the severity of itching

and its associated factors in hemodialysis patients.

Uremic toxins are a group of molecules whose concentrations increase in the blood due to kidney disease. Those molecules are associated with systemic diseases and prognosis in patients with end-stage kidney disease. Among them, molecules with high protein-bound properties, called PBUTs, such as indoxyl sulfate, are difficult to remove by dialysis and have been reported to be associated with various pathologies. However, there have been no reports regarding their association with itching in hemodialysis patients.



Pathophysiology of dialysis-related amyloidosis. Credit: Niigata University

Therefore, Dr. Yamamoto's team investigated itching and factors associated with it, particularly focusing on PBUTs in hemodialysis patients.

In this study, the team extracted adsorbed proteins from β 2-m adsorption columns on hemodialysis patients with dialysis-related amyloidosis, and analyzed them through mass spectrometry. As a result, 200 types of proteins, including β 2-m, were detected.

Among them, four proteins (lysozyme, angiogenin, matrix Gla protein, and complement factor D) were identified, which are present in amyloid tissue and highly adsorbed by the β 2-m adsorption column. When β 2-m was reacted with those proteins in vitro, the proteins were involved in β 2-m amyloid fibril formation.

More information: Suguru Yamamoto et al, Mass spectrometry-based proteomic analysis of proteins adsorbed by hexadecyl-immobilized cellulose bead column for the treatment of dialysis-related amyloidosis, *Amyloid* (2024). [DOI: 10.1080/13506129.2024.2315148](https://doi.org/10.1080/13506129.2024.2315148)

Provided by Niigata University

Citation: Discovery of proteins associated with the progression of dialysis-related amyloidosis (2024, March 1) retrieved 26 June 2024 from <https://medicalxpress.com/news/2024-03-discovery-proteins-dialysis-amyloidosis.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.