

## Press release

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### Basic information

Name: Sarah Stammose Freund

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Department of: Clinical Medicine

Main supervisor: Professor Thomas Baad-Hansen

Title of dissertation: Tumor megaprosthesis: serum ion levels, functional outcomes, and innovative material evaluation

Date for defence: 16.08.2024 at (time of day): 14:30 Place: Aarhus University Hospital, Auditorium J116-113, Indgang J, Plan 1, J110

Press release (Danish)

Forbedring af ledbevarende kirurgi for patienter med knoglekræft

Fremskridt inden for megaprotoser med fokus på metal ion niveauer i blodet, patienternes funktionsniveau og potentialet af nye materialer blev undersøgt i et nyt ph.d.-projekt fra Aarhus Universitet, Health. Projektet er gennemført af Sarah Stammose Freund, der forsvare det d. 16/08/2024.

Ledbevarende kirurgi er den primære behandling for knoglekræft, og med forbedret overlevelse er der et voksende behov for bedre funktion og holdbarhed af protoserne. Omfattende fjernelse af knogle forstyrrer den naturlige bevægelse mellem sener og knogler, hvilket fører til halten og nedsat mobilitet. Ydermere anvendes der ofte kobolt og krom som metallegeringer i megaprotoser, der potentielt er giftigt, hvis de frigives i kroppen.

Denne ph.d.-afhandling har vist forhøjede metal ion niveauer hos patienter med metal/polyethylen knæmegaprotese inden for det første år efter operationen, især hos yngre, mere aktive patienter.

Derudover blev der observeret betydeligt nedsat muskelstyrke i både det opererede og raske ben.

En sammenligning mellem det klinisk anvendte Trevira®-implantat og et nyt 3D-printet titaniumimplantat i en dyremodel viste stærkere og bedre vævsadhæsion af titaniumimplantatet.

Samlet understreget disse fund vigtigheden af at overvåge metal ion niveauer i blodet og forbedre implantatdesign for at forbedre patienternes funktionsniveau. De lovende resultater af 3D-printede titaniumimplantater giver håb for bedre protoser i fremtiden for patienterne.

Forsvaret af ph.d.-projektet er offentligt og finder sted den 16/08/2024 kl. 14:30 i Auditorium J116-113 på Aarhus Universitetshospital, Indgang J, Plan 1, Palle Juul-Jensens Boulevard 165, 8200 Aarhus N. Parking på P21 anbefales. Titlen på projektet er "Tumor megaprosthesis: serum ion levels, functional outcomes, and innovative material evaluation". Yderligere oplysninger: Ph.d.-studerende Sarah Stammose Freund, email: [sarah.freund@auh.rm.dk](mailto:sarah.freund@auh.rm.dk), mobil +45 60148360.

Bedømmelsesudvalg:

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Thomas Fichner Bendtsen (Chair of the committee), Professor

Department of Clinical Medicine, Faculty of Health, Aarhus University  
Department of Anaesthesiology, Aarhus University Hospital, Denmark

Press release (English)

## Advancing Limb-Preserving Surgery for Bonecancer Patients

The study investigates advances in tumor megaprosthesis, focusing on serum ion levels, functional outcomes, and innovative material evaluation. The project was carried out by Sarah Stammose Freund, who is defending her dissertation on 16/08/2024.

Limb-preserving surgery is the primary treatment for bone cancer, and with rising cancer survival rates, there is a growing need for improved functional outcomes and longer-lasting prosthetics. Extensive bone resection disrupts natural tendon-to-bone movement, leading to issues like limping and reduced mobility. Furthermore, potentially toxic metal alloys like cobalt and chromium, commonly used in megaprotheses, can release ions into the body.

The present PhD study has revealed elevated metal ion levels in the blood of patients with metal-on-polyethylene knee megaprotheses within the first year of surgery, particularly in younger, more active patients. Additionally, significant muscle strength deficits were observed in both treated and untreated limbs. A comparison of soft-tissue integration between the presently used Trevira® tube implant and a novel 3D printed titanium implant showed that the latter offered stronger and better soft-tissue adhesion. These findings emphasize the importance of monitoring metal ion levels and enhancing implant designs to improve patient outcomes. The promising results of 3D printed titanium implants offer a hopeful path forward for better functional outcomes and prosthetic longevity in limb-preserving surgery.

The defence is public and takes place on 16/08/2024 at 14:30 in Auditorium J116-11 at Aarhus University Hospital, Entrance J, Level 1, Palle Juul-Jensens Boulevard 165, 8200 Aarhus N. Parking P21 is recommended. The title of the project is "Tumor megaprosthesis: serum ion levels, functional outcomes, and innovative material evaluation". For more information, please contact PhD student Sarah Stammose Freund, email: sarah.freund@auh.rm.dk, Phone +45 60148360.

Assessment committee:

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