

Establishing the first Orthopaedic Infection Biobank in Denmark

FRAMED MSI

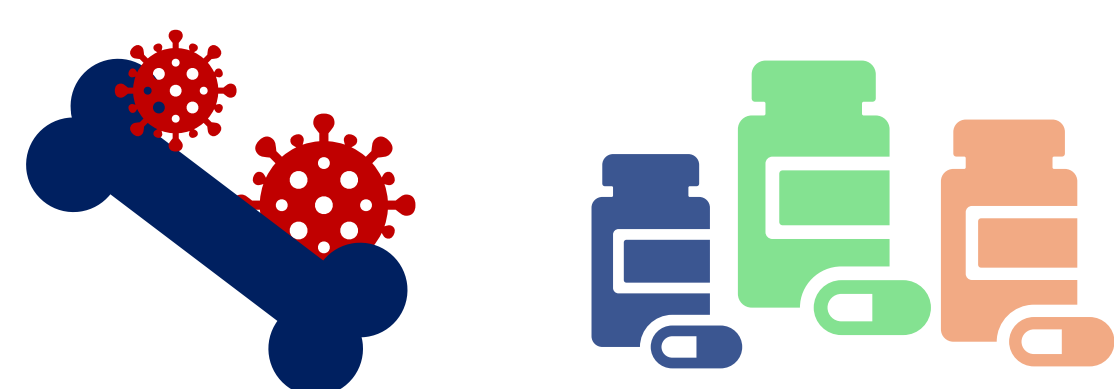
Fragment Recognition of All Musculoskeletal Infections Providing Early Diagnostics

Geil T ^{1,2,3,4}, Jørgensen NP ^{1,2}, Meyer RL ⁶, Nielsen RA ^{2,5}, Stærke NB ^{2,5}, Larsen OH ^{2,3}, Slater J ^{1,2,4}, Bue M ^{1,2,4}

¹Department of Orthopaedic Surgery, Aarhus University Hospital, Aarhus, Denmark; ²Department of Clinical Medicine, Aarhus University, Aarhus, Denmark; ³Department of Molecular Medicine (MOMA), Aarhus University Hospital, Aarhus, Denmark; ⁴Microdialysis Research (ADMIRE), Orthopaedic Research Laboratory, Aarhus University Hospital, Aarhus, Denmark; ⁵Department of Infectious Diseases, Aarhus University Hospital, Aarhus, Denmark; ⁶Interdisciplinary Nanoscience Center (iNANO), Aarhus University, Aarhus, Denmark.

FRAMED MSI BIOBANK JOURNEY

1 BACKGROUND



Musculoskeletal infections (MSIs) constitute severe and intricate clinical entities associated with substantial morbidity and mortality, presenting significant diagnostic and therapeutic challenges.

The timely diagnosis of these conditions remains difficult, and the escalating issue of anti-microbial resistance further complicates effective treatment strategies.

2 IDEA GENERATION & PLANNING



THE IDEA

Creating an Orthopaedic Infection Biobank can provide high-quality frozen bio-specimens, enabling hypothesis-driven research and accelerating the discovery of new diagnostic biomarkers. Ultimately, improving early recognition and understanding of MSIs.



RESEARCH STRATEGY

- Biobanking is an established and ethically regulated approach to support biomedical research.
- The Orthopaedic Infection Biobank is the first of its kind in Denmark.
- It is unique due to its high level of integration with clinical data in the Danish public health IT system.



TEAMWORK

A selection of study parameters, clinical variables, and laboratory analyses was defined through multidisciplinary collaboration guided by established resources.

3 DEVELOPMENT & PROTOCOLS



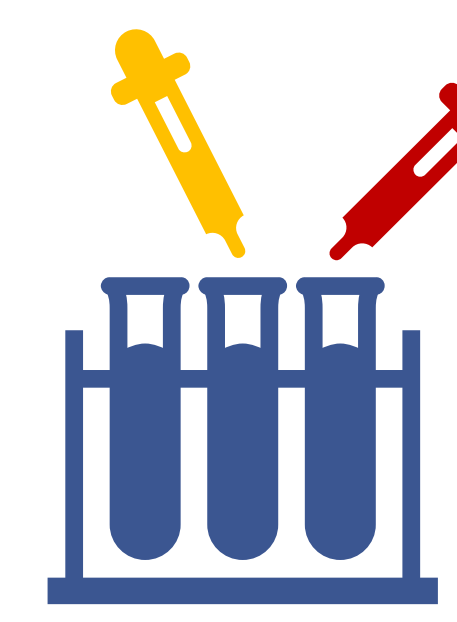
DEVELOPMENT

- Practical challenges that have been addressed:
- Software infrastructure
 - Patient inclusion
 - Transport procedures
 - Sample storage



INFRASTRUCTURE

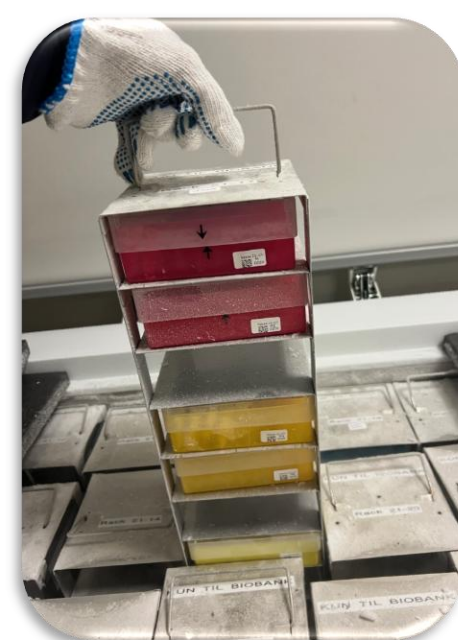
A structured database integrated with REDCap was developed to manage sample registration, coding, and tracking.



SAMPLE COLLECTION

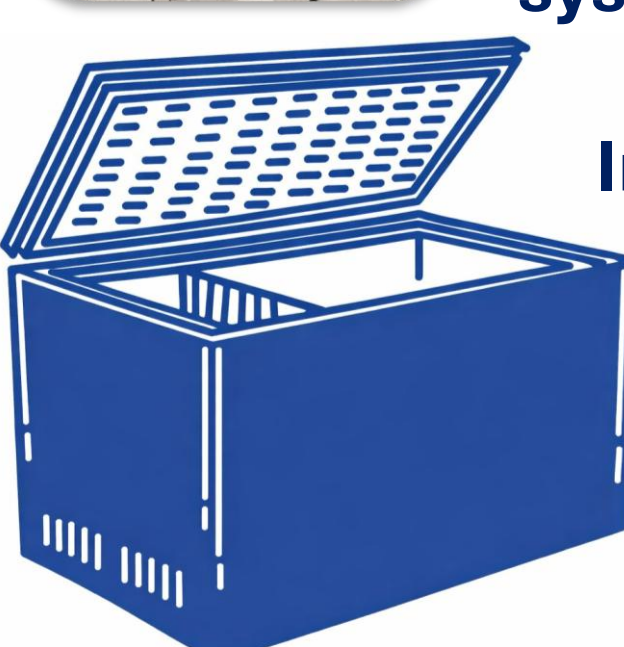
- Intraoperative tissue specimens
- Synovial fluid
- Blood samples
- Microbiological isolates
- Paraffin-embedded tissue samples

4 IMPLEMENTATION



SAMPLE STORAGE

Perioperative samples are processed into aliquots, with fluid samples undergoing protocol-based centrifugation. All fresh samples and microbiological isolates are stored at -70 °C, while paraffin-embedded tissues are stored in designated storage systems.



Included patients in the Biobank to date:

106

With an average of 10 samples each.

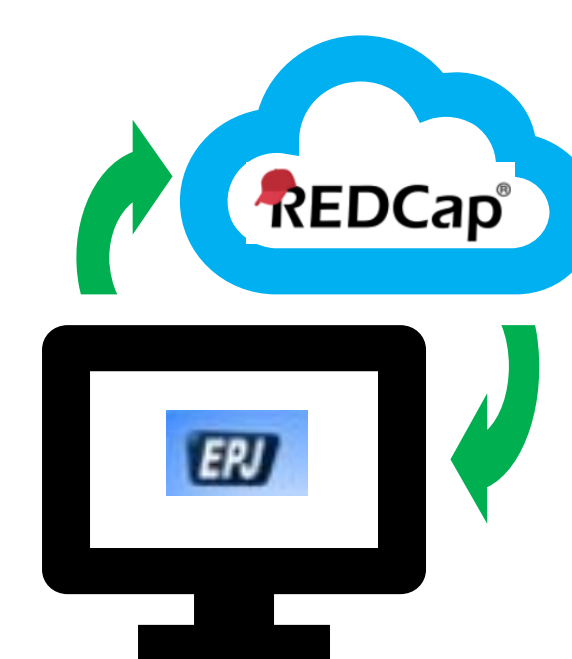


CLINICAL IMPLEMENTATION

All patients with suspected or confirmed MSI have been enrolled since 3rd November 2025 and will be followed up with questionnaires for up to ten years.

Clinical data is collected, including:

- Demographics
- Comorbidities
- Treatment strategies
- Imaging findings
- Microbiological results
- Clinical outcomes



DATA SUSTAINABILITY

The long-term sustainability of the biobank relies on:

- Robust infrastructure
- Standardized workflows
- Multidisciplinary collaboration
- Commitment from involved clinicians

+ An automated data extraction system transfers clinical data from patient records directly into REDCap.

5 DISCUSSION

CHALLENGES



Establishing and maintaining a biobank requires substantial financial, technical, and personnel resources. Large-scale sample collection, processing, and storage demand strict coordination and standardized workflows. Variability in clinical documentation and data availability may affect the completeness and consistency of datasets.

BENEFITS



FRAMED MSI establishes a comprehensive resource to advance understanding of MSIs and strengthen research capacity, including antimicrobial resistance surveillance. By integrating clinical and tissue-specific phenotyping with long-term clinical follow-up, the study will support improved diagnostics, targeted treatment strategies, and preventive approaches. Additionally, immunosuppressive effects and other host-related factors on infection severity and outcomes will be investigated.

CONTACT



Thea Geil
MD student
theageil@clin.au.dk
+45 53 76 47 04

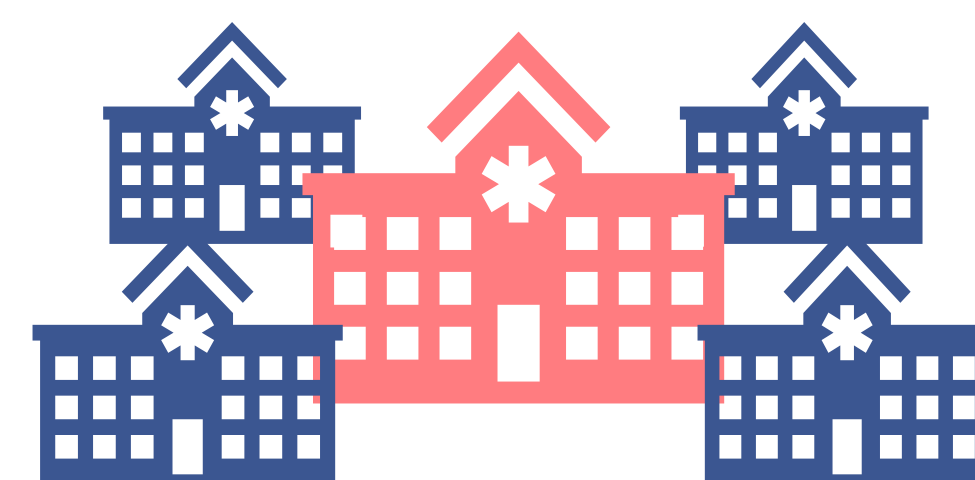


LEARN MORE ABOUT THE BIOBANK ONLINE:

<https://microdialysis.au.dk/research/biobank>
<https://www.youtube.com/@BiobankOrthoInfection>



6 PERSPECTIVES



COLLABORATION

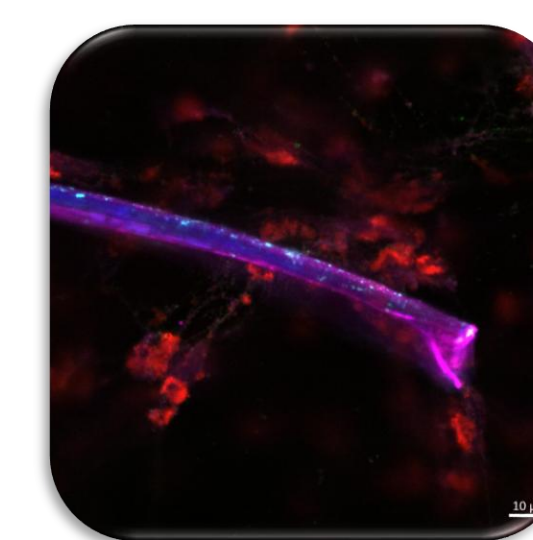
The biobank is built on and supported by multidisciplinary collaboration, enabling coordinated sample collection and future multicentre research. Together we can FRAME MSI!



POSSIBILITIES

The biobank provides a foundation for future research initiatives, enabling large-scale studies, biomarker discovery, and advanced molecular analyses aimed at improving diagnostic strategies in orthopaedic infections.

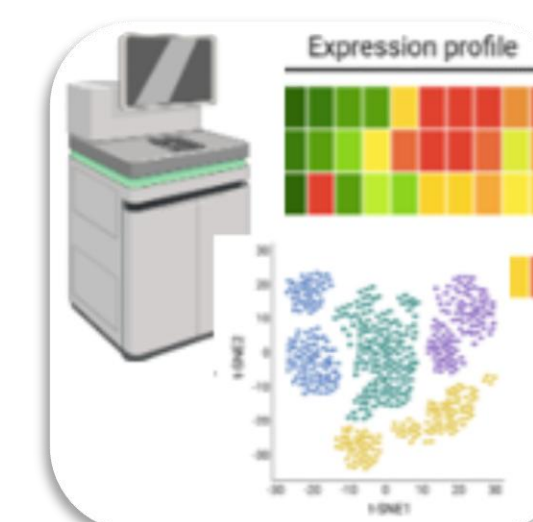
ONGOING PROJECTS



Z-DNA:

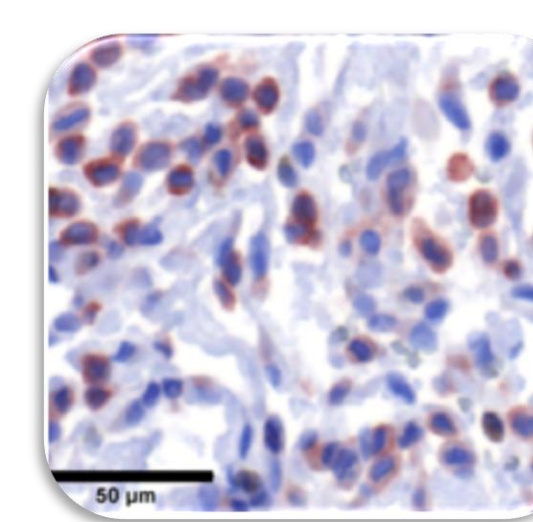
Evaluation of Z-DNA may improve understanding of molecular processes linked to infection and inflammation.

Preliminary microscopy picture from synovial fluid from a chronically infected PJI patient. Magenta = G4 DNA. Green = Z-DNA



cfDNA:

Analysis of blood and synovial fluid may provide a promising biomarker for improved detection and monitoring of infection.



Immune Checkpoint Inhibitors:

Investigation of checkpoint pathways may improve understanding of host immune responses in infection and may reveal mechanisms of immune modulation in infection.