

IMPROVED METHOD FOR BIOPSY HOMOGENISATION AND RAPID DETECTION OF INFECTIONS

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INTRODUCTION

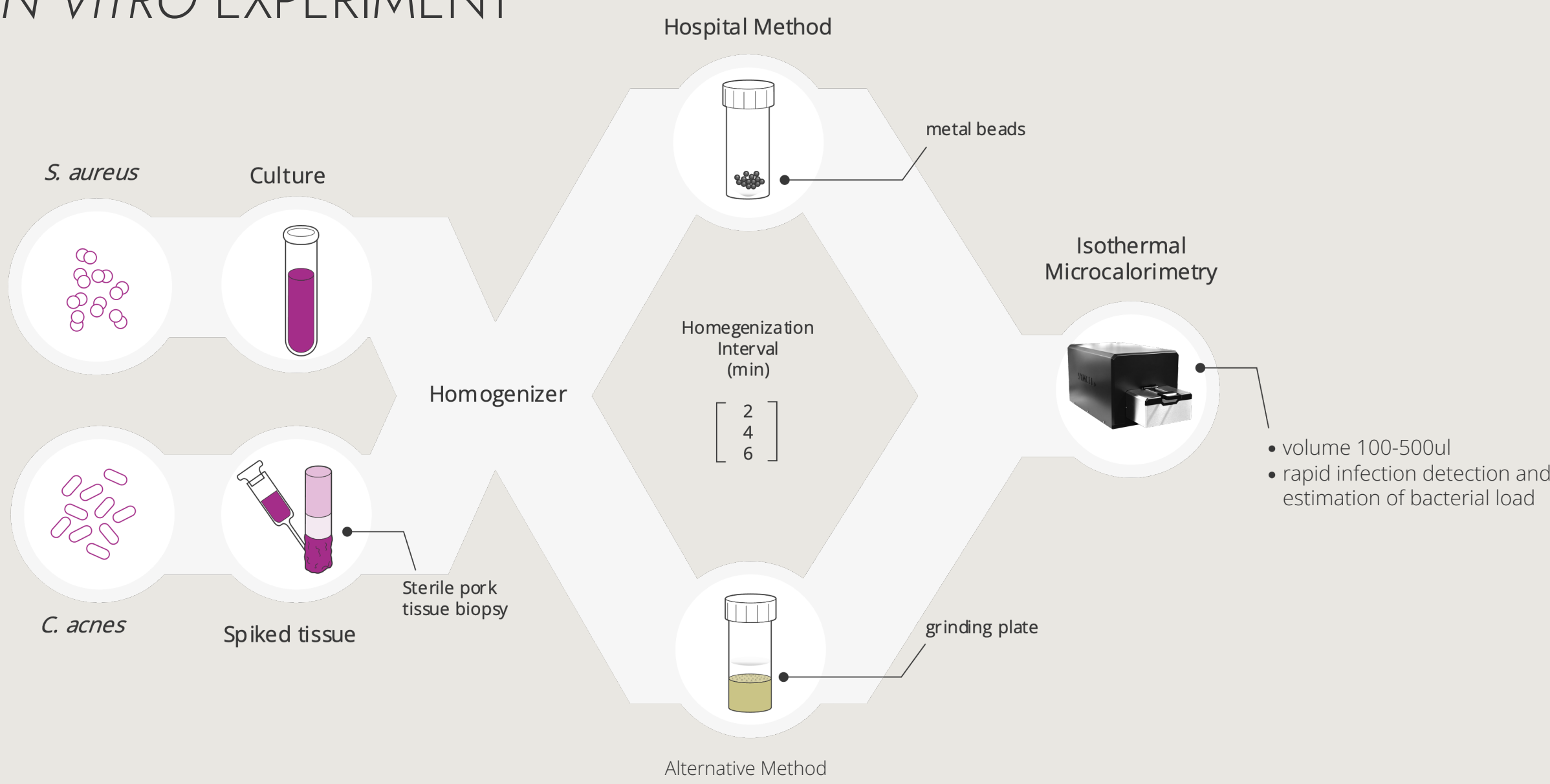
Microbial infections in prosthetic joint infections (PJIs) present significant diagnostic challenges. This study explores two homogenization techniques combined with isothermal microcalorimetry (IMC), for detecting microbial infections.

OBJECTIVE

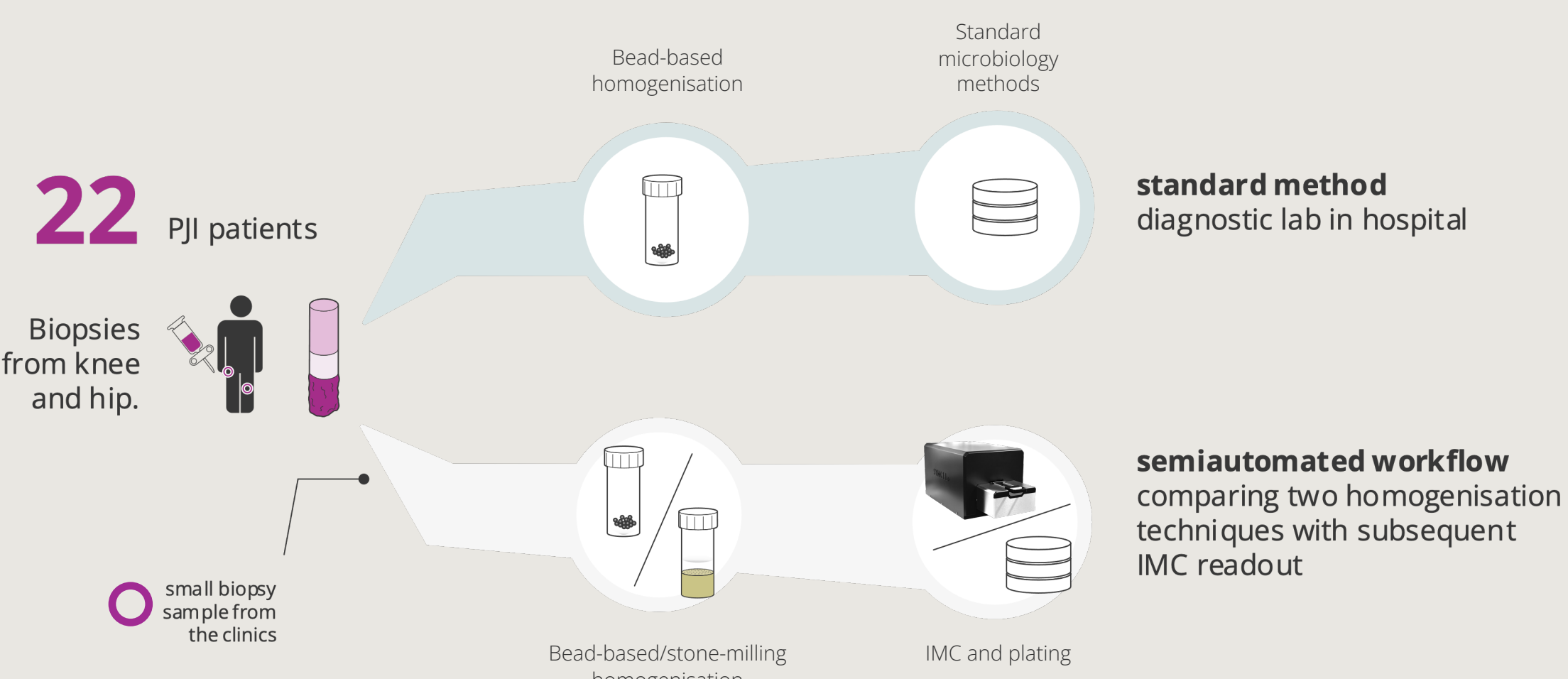
- To evaluate the impact of homogenisation technique on recovery rate and detection speed depending on homogenisation techniques combined with an IMC readout.
- To assess the potential of these methods in a clinical workflow, compared to standard hospital techniques.

METHODS

1 IN VITRO EXPERIMENT



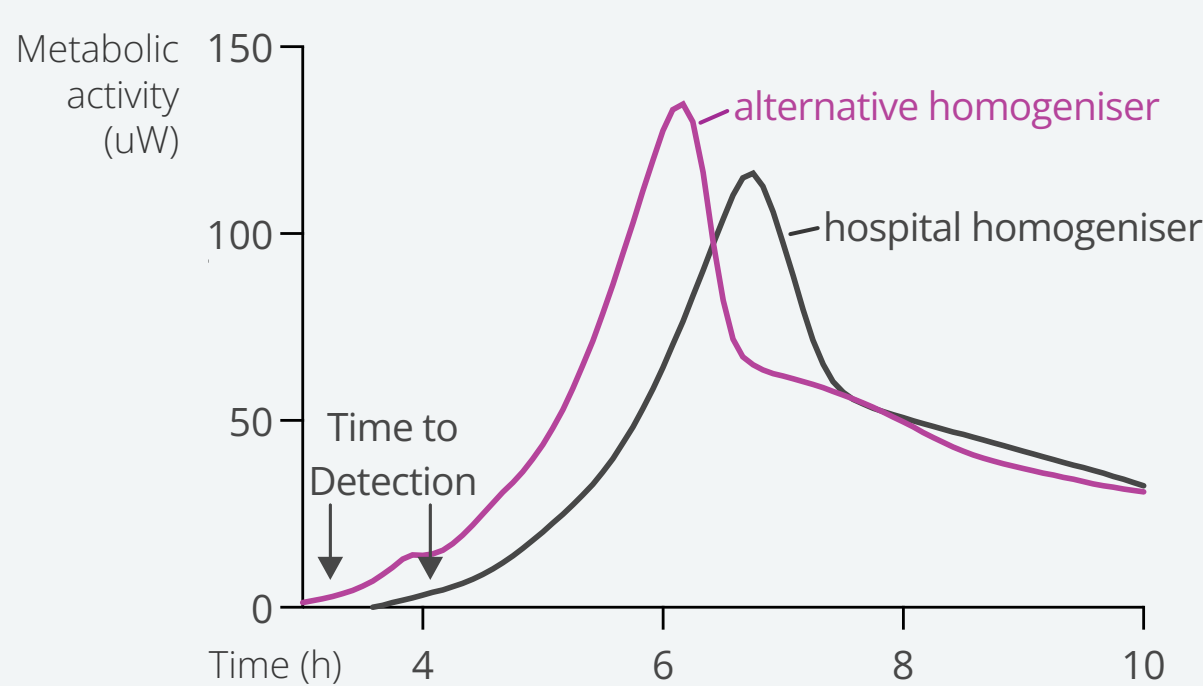
2 IN VIVO EXPERIMENT



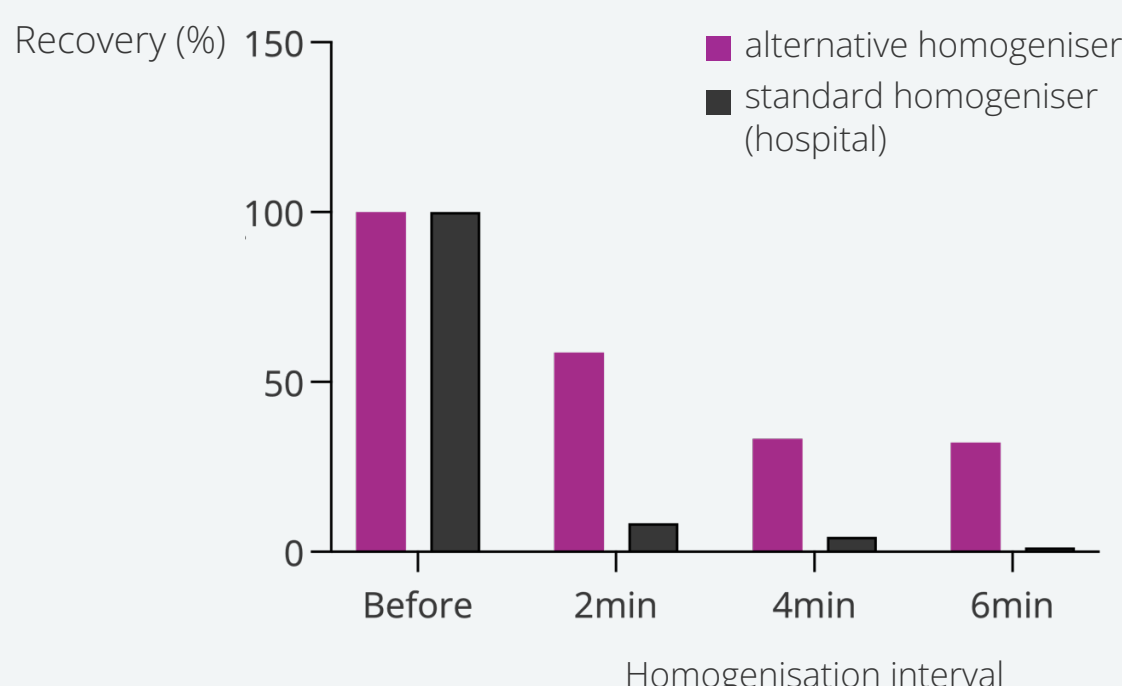
RESULTS

COMPARING THE IMPACT ON DETECTION TIME AND MICROBIAL RECOVERY OF HOMOGENISATION TECHNIQUE DIRECTLY ON LIQUID *S. aureus* CULTURES

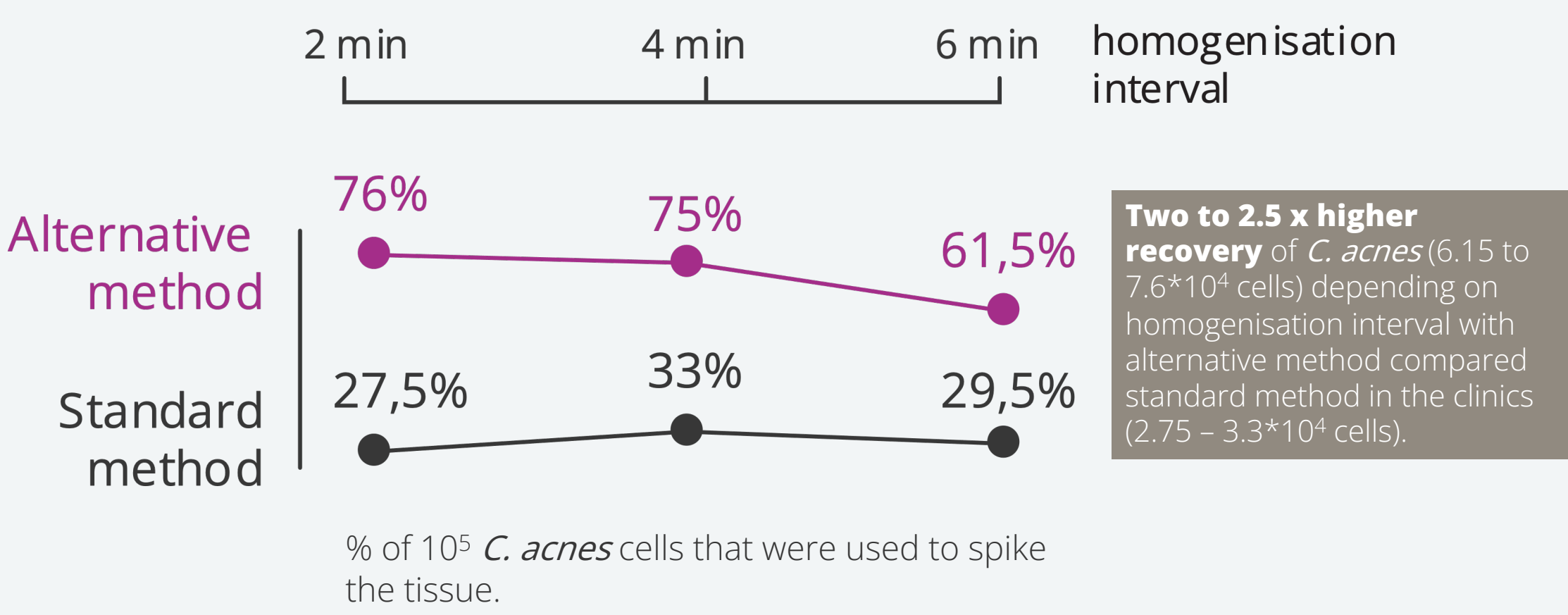
50% faster detection of *S. aureus* (<2 h) after homogenisation with alternative homogenisation method with IMC compared to standard method.



5 times higher microbial recovery using alternative homogenisation methods (2 min interval) than the standard homogenisation method.

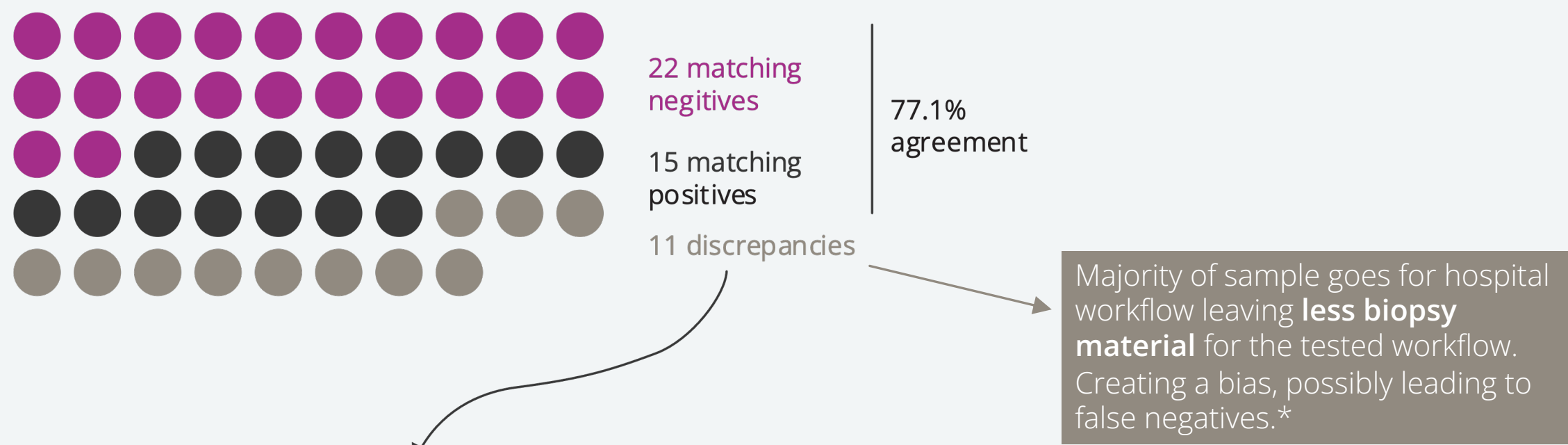


RECOVERY OF OXYGEN SENSITIVE *C. acnes* FROM SPIKED PIG TISSUE AFTER HOMOGENISATION



APPLYING OUR WORKFLOW (HOMOGENISATION + IMC READOUT) TO CLINICAL SAMPLES COMPARED TO STANDARD WORKFLOW

48 patient samples from 22 PJI patients. Two homogenisation methods with IMC based readout and hospital standard method were compared.



Standard hospital workflow	Hospital homogeniser plus IMC	Alternative homogeniser plus IMC
<i>S. aureus</i> + <i>C. simulans</i>	<i>C. simulans</i>	<i>S. aureus</i> + <i>C. simulans</i>
<i>S. aureus</i> + <i>E. cloacae</i> complex	<i>S. aureus</i> (low c.f.u.)	<i>S. aureus</i> + <i>E. cloacae</i> complex
<i>S. aureus</i> + <i>K. oxytoca</i>	<i>S. aureus</i> + <i>E. cloacae</i> complex	<i>S. aureus</i> + <i>E. cloacae</i> complex
<i>S. aureus</i> + <i>E. cloacae</i> complex	<i>S. aureus</i> + <i>E. cloacae</i> complex + <i>E. faecalis</i>	<i>S. aureus</i> + <i>E. cloacae</i> complex + <i>E. faecalis</i>
GAS	GAS+ <i>C. acnes</i>	GAS+ <i>C. acnes</i>
negative sample	<i>C. acnes</i>	<i>C. acnes</i>
<i>S. epidermidis</i>	<i>S. hominis</i>	negative sample

*Four samples (not shown) of the homogenisation+IMC procedure were false negative compared to hospital procedure which can be explained using less biopsy material.

WHAT'S NEXT?

In an ongoing study we expand the study group to **120 PJI patients** allowing to determine **infection detection speed** with the use of IMC.

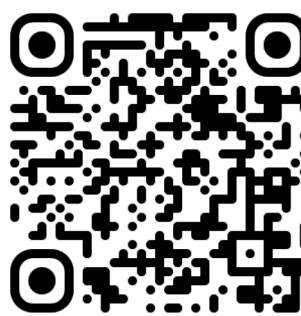
CONCLUSION

- The alternative homogenisation method (SpinAX/ProbeAX Evolution, Axonlab AG, Germany) shows to be less harsh on bacteria compared to standard homogenisation method (Bullet Blender 50DX, Next Advance, USA), allowing for **faster and higher recovery**, ultimately increasing accuracy and speed.
- Using IMC for semi-automated readout, provides **microbial detection within hours** as compared to days with standard microbiology methods.
- Increased detection of sensitive *C. acnes*** with the alternative homogenization method is promising. Confirmation of these findings in a larger study group is necessary

SIGNIFICANCE

A semiautomated workflow combining an improved homogenisation technique, for higher recovery rates and speed in combination with a sensitive IMC-based readout, are promising as a less invasive and more efficient alternative to the current clinical standard.

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