

Analytical performance evaluation of a new homogenization system for tissue biopsies

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1. Introduction

Diagnostics of infections from solid tissues require accurate microbiological diagnostics with careful approaches for sampling, pre-analytical processing and diagnostic analysis. To increase the diagnostic accuracy, pre-processing steps are implemented such as homogenization or grinding of tissue, which improve microbial release from the specimens¹.

A new homogenization system has recently entered the market with two separate components:

- **ProbeAX Evolution:** Single-use sampling tube designed with a ceramic block featuring a rough surface and a stainless steel grater integrated into the tube lid.
- **SpinAX Instrument:** Rotation at high speed (2200 rpm) with an oscillating motion, generating a grinding action of the sample between the ceramic block and the metal grater.

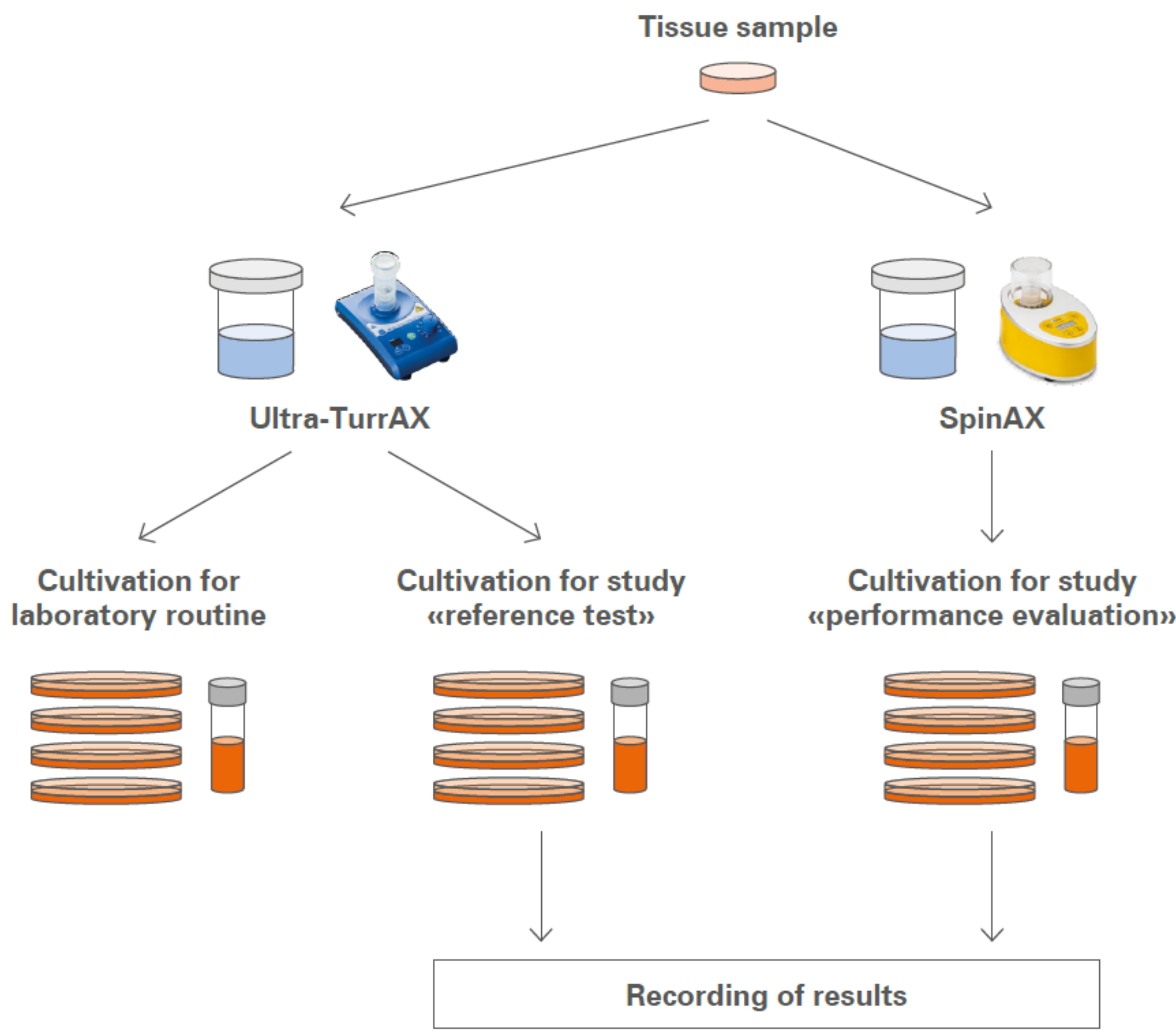
This grating process effectively breaks down tissue, disrupts biofilms, and releases bacteria or fungi into the physiological solution. The resulting solution can be utilized for cultivation on agar plates, enrichment broths, or molecular diagnostics of pathogenic organisms.



ProbeAX Evolution tube with SpinAX Instrument

2. Aim & Methods

Aim: Assess analytical performance of a new homogenization system for tissue specimens, the SpinAX/ProbeAX Evolution system (Axonlab, Switzerland), in comparison with Ultra-TurraX® Tube Drive (IKA, Germany)/ProbeAX tubes (Axonlab, Switzerland) system as a reference method.



Two types of tissues samples were compared:

- **Soft tissue** (fibrous and connective tissue)
- **Hard tissue** (tendon, cartilage, bone)

Patient biopsies were split into two parts to be processed with either SpinAX or Ultra-TurrAX system. Then we performed:

- **Gram stained cell counting** according to quantity of cells or bacteria per microscopy field.
- **Semi-quantitative 4-quadrant measurement of bacterial growth** on four types of media plates (chocolate-, chromogenic-, blood- and Schaedler agar) and on Thioglycolate (THIO).

Growth was ranked from 0 (no growth) to 4 (growth in the 4th quadrant). Growth was defined as superior/inferior if growth rank of the two systems differed by > 1 or when there was no growth with one method and growth with the other.

3. Results

→ A total of **95 clinical samples biopsies**, including **31 hard** and **64 soft tissue**, from **49 patients** were analyzed in this study.

Gram staining cell count was **similar for 73 % (154/210) of the observed cell types** (Gram-positive cocci (GPC), Gram-negative bacilli (GNB), erythrocytes, leucocytes, epithelial cells) in all specimen. The remaining observations were possible with SpinAX only in 20 % (42/210) or UT only in 7 % (14/210). Microorganisms or host cells were not detected in 10 samples following Ultra-TurrAX homogenization, with GPC not observed in five samples and GNB in two samples.

1. Percentage of positivity and negativity with both homogenization systems

	SpinAX N° (%)	Ultra-TurrAX N° (%)	Nb sample
Samples			
Positive samples	42 (44.2%)	39 (41.1%)	95
Negative samples	53 (55.8%)	56 (58.9%)	
False negative samples	0 (0%)	3 (3.2%)	

→ Bacterial growth detected in **42/95 samples (44.2 %)** from **26 patients**.

4. Conclusions

- Possible better detection of microorganisms and host cells by Gram staining microscopy with SpinAX.
- 89.4% of the specimen showing similar bacterial growth with both systems → Discrepancies probably explained by biological variation of the microbial load not uniformly distributed in a tissue sample.

Among the positive tissues samples, **94 bacterial and yeast species** were recovered.

2. Assessment of growth et recovery of the clinical isolates

	SpinAX N° (%)	Ultra-TurrAX N° (%)	Nb sample
Global growth			
Similar	84 (89.4%)	84 (89.4%)	94
Better	4 (4.3%)	6 (6.4%)	
Clinical isolates			
Recovered	84 (89.4%)	83 (88.3%)	94
Not recovered	10 (10.6%)	11 (11.7%)	

→ Clinical isolates of *Staphylococcus aureus* from 3 samples were recovered with the SpinAX but not with the Ultra-TurrAX system.

- Overall, the SpinAX homogenization is thus providing an overall similar performance than Ultra-TurrAX with a possible better homogenization and ultra-structure preservation for Gram staining microscopy.
- Additional advantages of the SpinAX:
 - Absence of aggregates after homogenization → Easier pipetting of the SpinAX supernatant
 - Less noise during the SpinAX grinding and homogenizing