

# Performance of three ready-to-use bottles for grinding orthopaedic samples

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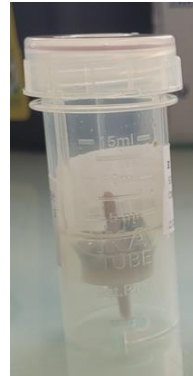
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# INTRODUCTION

- ■ Diagnosis of essential IOA by culture (antibiogram)
  - Grinding of solid samples required before seeding
  - **Objective: optimise sensitivity / limit contamination**
  - Medium: sampling media allowing direct grinding without handling the sample
  
  - **OBJECTIVE = to compare the analytical performance of two new ready-to-use vials**
    - ProbeAx Evolution (PAx ; Axonlab A.G.)
    - TISSUtainer (TIt ; Diagante)
- au flacon Ultra-Turrax® UTX-001 (UTx ; Labelians)

# SUPPORTS EVALUES



## Ultra-Turrax® UTX-001 (UTx ; Labelians)

## TISSUtainer (TIt ; Diagante)

## ProbeAx Evolution (PAX ; Axonlab)

|                        |                                   |                                               |                                                 |
|------------------------|-----------------------------------|-----------------------------------------------|-------------------------------------------------|
| <b>Grinding medium</b> | Sterile water quality<br>BM 2 mL  | Quality preservation<br>environment BM, 10 mL | Quality saline solution<br>BM 5 mL              |
| <b>Grinding method</b> | Steel beads x10                   | Steel beads x4                                | Ceramic block + stainless<br>steel metal grater |
| <b>Grinder</b>         | Ultra-Turrax® (IKA)               | MM400 (Retsch®)                               | SpinAX (AxonLab A.G.)                           |
| <b>Grinding time</b>   | 1 min / 1 sample                  | 2,5 min / 2-8 samples                         | 1 min / 1 sample                                |
| <b>Marking</b>         | CE (old regulations 98/79/<br>CE) | DM-DIV sterile class A,<br>CE IVDR            | DM-DIV sterile class A,<br>CE IVDR              |

# EQUIPMENT AND METHODS

- Prospective study
- 2 orthopaedic surgery units at the Hospices Civils de Lyon (HCL)
- 15 patients with strong suspicion of IOA
  - Diagnostic samples taken for routine care (RC) in Ultra-Turrax tubes
  - Among these samples, 2 taken in triplicate and introduced into the operating room in the 3 tubes
  - In the laboratory:
    - Ultra-Turrax tubes processed according to the RC flow
    - ProbeAx and TISSUainer bottles processed for the study according to the availability of the technicians in charge (pre-analytical storage at +4°C if waiting; 1-3 days)

# INTERPRETATION OF RESULTS

- Culture reading: quantification/identification of colonies obtained
- **Definitions:**
  - **Species responsible for AIO:** if found  $\geq 2$  times on SC or study swabs for potentially contaminating bacteria and  $\geq 1$  time for non-classically contaminating bacteria
  - **Contamination** if only 1 positive sample with a species that is not very virulent in flora or the environment
- **Comparaison :**
  - **Nombre d'espèces bactériennes** retrouvées avec chaque poudrier
  - **Référence** : résultats globaux des pvts en Ultra-Turrax du SC
  - Pour chaque espèce retrouvée par  $\geq 2$  types de poudriers, comparaison semi-quantitative du **nombre de colonies** obtenues (catégories  $> 50$  UFC, 26-50, 11-25, 6-10, 1-5, uniquement bouillon)

# RESULTS

- The 3 to 7 UTx vials produced for the SC of the 15 patients were recovered.
  - 7 infections monomicrobial
  - 5 infections polymicrobial
  - no microorganisms for 3 patients

# RESULTATS

- Pour les 3 patients avec prélèvements **stériles**

| Patient | Ultra-Turrax SC | TISSUTainer                       | ProbeAx Evo  |
|---------|-----------------|-----------------------------------|--------------|
| 2       | 2/2 stériles    | 2/2 stériles                      | 2/2 stériles |
| 5       | 2/2 stériles    | 2/2 stériles                      | 2/2 stériles |
| 14      | 2/2 stériles    | 1/2 stérile<br>et 1/2 contaminé * | 2/2 stériles |

\* 1 colonie *Cutibacterium acnes* sur SCS14

# RESULTS

- For the 7 monomicrobial infections: detected in 6 out of 7 cases (86%) in at least 1 of the 2 samples in the study, across all vials compared (UTx, PAX, TIt).

| Patient | Microorganisme                | Pvts SC<br>globaux | Ultra-Turrax<br>SC | TISSUTainer | ProbeAx | Additional species in<br>the study                                                                                 |
|---------|-------------------------------|--------------------|--------------------|-------------|---------|--------------------------------------------------------------------------------------------------------------------|
| 3       | <i>Finegoldia magna</i>       | 4/5                | 1/2                | 1/2         | 2/2     |                                                                                                                    |
| 4       | <i>Staphylococcus aureus</i>  | 5/5                | 2/2                | 1/2         | 1/2     |                                                                                                                    |
| 7       | <i>Pseudomonas aeruginosa</i> | 5/5                | 2/2                | 2/2         | 2/2     | <i>Corynebacterium striatum</i> (TIt et PAX) ; <i>Proteus mirabilis</i> et <i>Streptococcus constellatus</i> (PAX) |
| 9       | <i>Cutibacterium acnes</i>    | 5/5                | 2/2                | 2/2         | 2/2     |                                                                                                                    |
| 10      | <i>Staphylococcus aureus</i>  | 4/4                | 2/2                | 2/2         | 2/2     |                                                                                                                    |
| 13      | <i>Cutibacterium acnes</i>    | 2/5                | 0/2                | 0/2         | 0/2     | 1 contaminant en TIt et 1 en PAX                                                                                   |
| 15      | <i>Cutibacterium acnes</i>    | 5/5                | 2/2                | 2/2         | 2/2     |                                                                                                                    |

# RESULTS

- For the 5 polymicrobial infections (16 bacterial species in SC): 14 (87.5%) detected in UTx bottles, 11 (69%) in PAX and 12 (75%) in TIt.

| Patient | Microorganisme                    | Pvts SC<br>globaux | UltraTurrax<br>SC | TISSUTainer | ProbeAx | Additional species in the study                                                      |
|---------|-----------------------------------|--------------------|-------------------|-------------|---------|--------------------------------------------------------------------------------------|
| 1       | <i>Escherichia coli</i>           | 5/7                | 2/2               | 2/2         | 2/2     |                                                                                      |
| 1       | <i>Staphylococcus aureus</i>      | 1/7                | 0/2               | 0/2         | 0/2     |                                                                                      |
| 6       | <i>Enterobacter cloacae</i>       | 5/5                | 2/2               | 2/2         | 2/2     |                                                                                      |
| 6       | <i>Enterococcus faecium</i>       | 5/5                | 2/2               | 2/2         | 1/2     |                                                                                      |
| 8       | <i>Pasteurella canis</i>          | 2/3                | 1/2               | 2/2         | 2/2     | <i>Neisseria spp</i> en plus<br>avec PAX et TIt                                      |
| 8       | <i>Fusobacterium spp</i>          | 2/3                | 2/2               | 2/2         | 2/2     |                                                                                      |
| 8       | <i>Parvimonas micra</i>           | 1/3                | 0/2               | 0/2         | 0/2     |                                                                                      |
| 11      | <i>Proteus mirabilis</i>          | 5/5                | 2/2               | 2/2         | 2/2     | 1 contaminant en PAX                                                                 |
| 11      | <i>Staphylococcus aureus</i>      | 2/6                | 2/2               | 0/2         | 0/2     |                                                                                      |
| 12      | <i>Escherichia coli</i>           | 5/5                | 2/2               | 2/2         | 2/2     | <i>Staphylococcus epidermidis</i><br>en plus avec PAX et TIt<br>1 contaminant en PAX |
| 12      | <i>Staphylococcus aureus</i>      | 5/5                | 2/2               | 2/2         | 2/2     |                                                                                      |
| 12      | <i>Enterococcus casseliflavus</i> | 4/5                | 2/2               | 2/2         | 2/2     |                                                                                      |
| 12      | <i>Acinetobacter nosocomialis</i> | 5/5                | 2/2               | 1/2         | 2/2     |                                                                                      |
| 12      | <i>Lysinibacillus fusiformis</i>  | 2/5                | 1/2               | 0/2         | 0/2     |                                                                                      |
| 12      | <i>Bacillus thuringiensis</i>     | 5/5                | 2/2               | 2/2         | 2/2     |                                                                                      |
| 12      | <i>Streptococcus mitis-oralis</i> | 4/5                | 1/2               | 2/2         | 0/2     |                                                                                      |

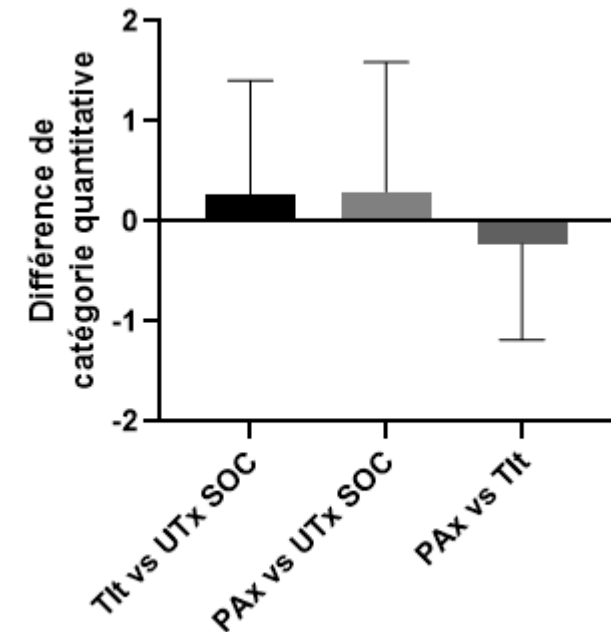
# RESULTS - SUMMARY

| Overall SC results (3 to 7 UTx)  | Results for 2 UTx                                                        | Results for 2 TIt                                                                                                              | Results for 2 PAX                                                                                                                                                   |
|----------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 patients with sterile samples  | stériles                                                                 | stériles                                                                                                                       | stériles                                                                                                                                                            |
| 7 IOA monomicrobial              | - - 6 detected by $\geq 1$ of the samples included<br>- - 1 not detected | - - 6 detected by $\geq 1$ of the samples included<br>- - 1 not detected                                                       | - - 6 detected by $\geq 1$ of the samples included<br>- - 1 not detected                                                                                            |
| 5 IOA polymicrobial (16 species) | 5/5 detected (14 species)                                                | 5/5 detected (12 species)                                                                                                      | 5/5 detected (11 species)                                                                                                                                           |
|                                  |                                                                          | Additional species :<br>- contaminations: 2 (C. acnes, Kocuria)<br>- pathogens: 3 (C. striatum, Neisseria spp, S. epidermidis) | Additional species:<br>- contaminations: 3 (non-aureus staphylococci)<br>- pathogens: 5 (C. striatum, Neisseria spp, P. mirabilis, S. epidermidis, S. constellatus) |

→ Ultimately, the results from the new bottles were strictly consistent or detected more species than the SC UTx in 76.7% of cases for both PAX and TIt.

# RESULTS

- Pre-analytical storage at +4°C for up to 3 days of PAX and TIt bottles did not prevent the detection of fastidious species (*Pasteurella*, *Neisseria*, anaerobes).
- The number of colonies obtained on the culture media was not significantly different despite different grinding volumes depending on the flasks (UTx: 2 mL; PAX: 5 mL; TIt: 10 mL).



Semi-quantitative categorization: > 50 CFU, 26-50, 11-25, 6-10, 1-5, broth only

# DISCUSSION-CONCLUSION

- Prospective study, samples introduced into the new powder containers as soon as they leave the operating room
- small number of patients -> larger prospective studies needed
- Demonstrates at least equivalent analytical performance between the new TISSUtainer and ProbeAx Evo vials vs. Ultra-Turrax.
- Other practical criteria should be taken into account. :
  - bag and bottle holder,
  - impact resistance (pneumatic),
  - noise (UTx > TIt > PAx),
  - space requirement (TIt > UTx et PAx),
  - number of samples processed at the same time (TIt > Utx et PAx)
  - or volume of available mulch (TIt > PAx > UTx)

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