

# Microbiologic Yield and Cost of Mycobacterial Cultures from Osteoarticular Specimens

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## INTRODUCTION

- Diagnosis of bone and joint infections often requires collection of multiple surgically collected specimens for laboratory testing to identify a microbiologic etiology
- Bone and joint infections caused by mycobacteria are rare (0.5% – 2%), but most data is derived from single-center studies and/or case studies focused on prosthetic joint infections
- Mycobacterial (AFB) culture is more sensitive than direct specimen fluorescent stain
- For example, the microbial burden required to detect an organism using each modality:
  - Culture: 10-100 CFU/ml
  - Direct specimen stain: 1,000-10,000 CFU/mL

### Study Goals

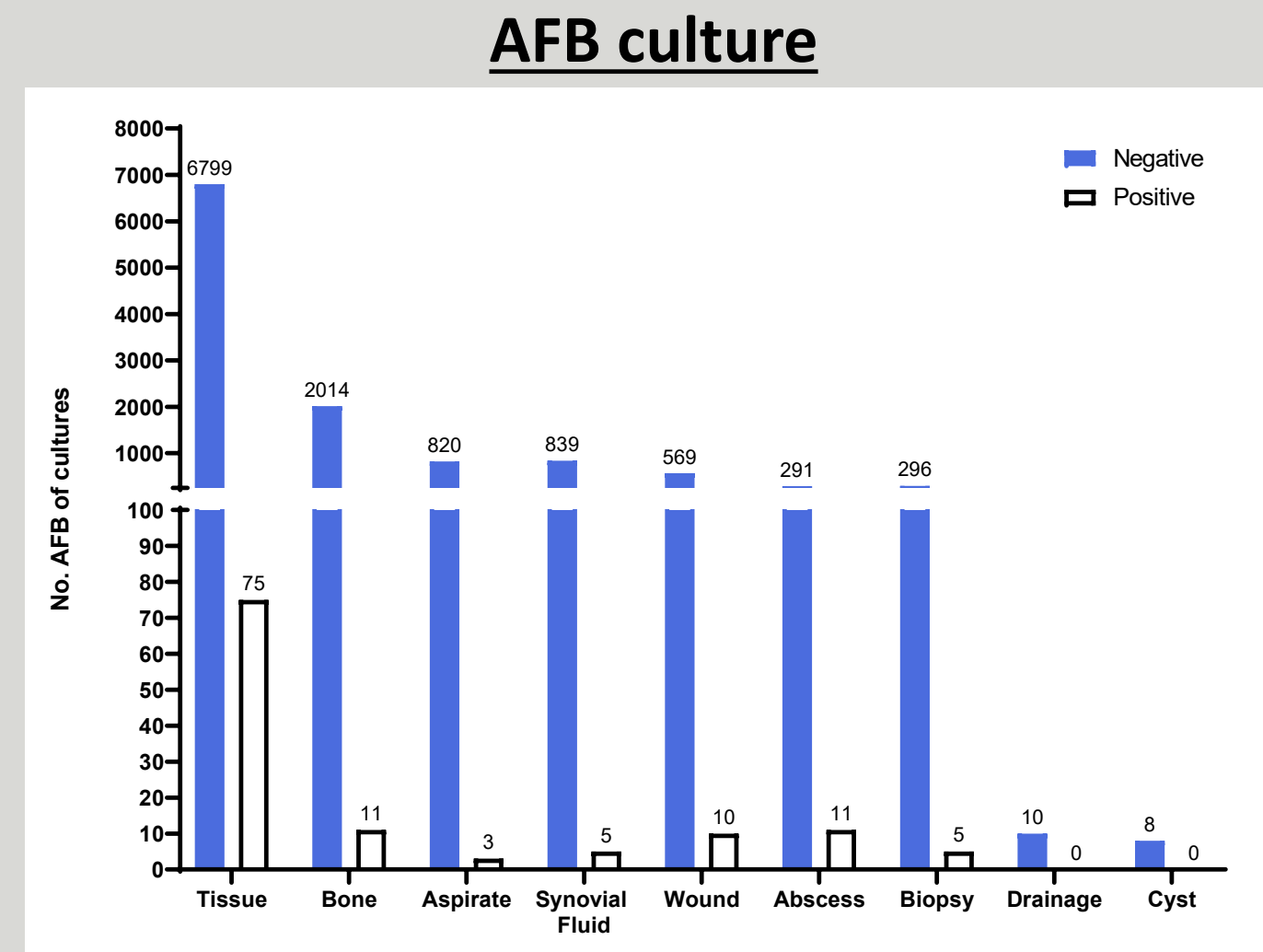
- Describe utilization and yield of mycobacterial direct specimen stains and cultures for all osteoarticular specimens
- Assess impact of negative cultures on lab full-time workflow and full-time equivalent (FTE)

## METHODS

- Retrospective, single center study using the laboratory information system data collection
- All mycobacterial cultures ordered on osteoarticular specimens from Jan 1, 2017 to Dec 31, 2021:
  - Sources include bone, synovial fluid, tissue, abscess, wound, aspirate, biopsy, drainage
  - The specimen type and source were reviewed by an ID physician for inclusion
- Laboratory workflow and FTE analysis

## RESULTS

### Osteoarticular specimen types submitted for AFB culture

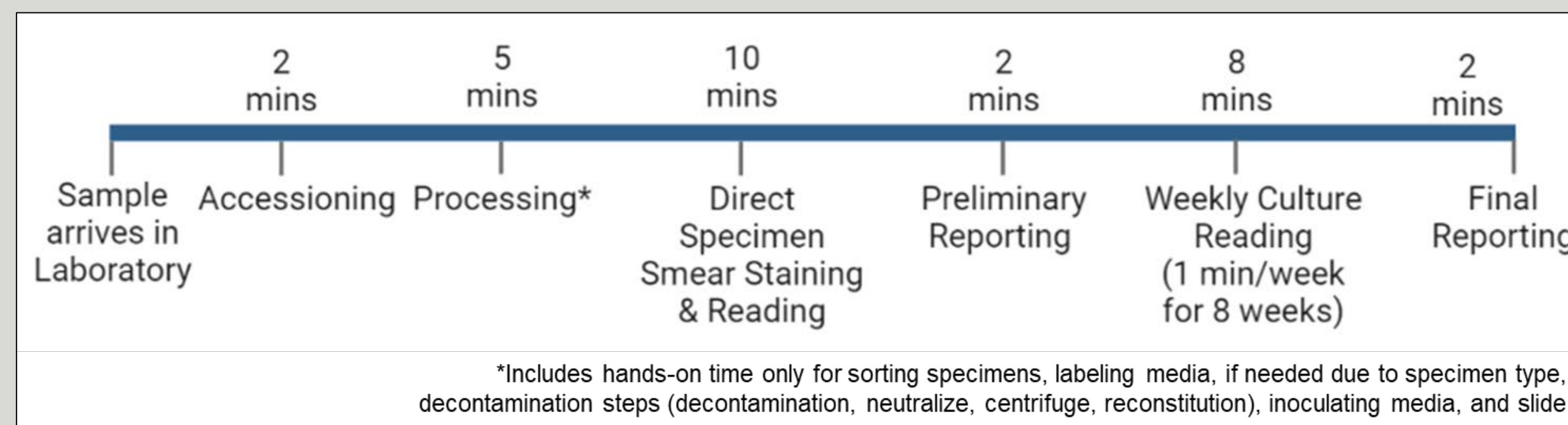


- 11,783 osteoarticular specimens were sent for AFB culture
- 66.1% (7,789/11,783) ordered as AFB culture only
- 33.9% (3,394/11,783) ordered AFB cultures + stain
- 0.026% (2 of 3,394) stains were positive
- 1.01% (120/11,783) of cultures were positive for mycobacteria, corresponding to 72 unique patients
  - 4 patients had co-infections with two different mycobacterial species

### Positive AFB Osteoarticular Cultures

Organism	# culture positives	# of patients
<b>Rapidly-growing mycobacteria (RGM)</b>	<b>51</b>	<b>32</b>
<i>M. fortuitum</i> complex	29	16
<i>M. chelonae</i>	16	10
<i>M. abscessus</i> complex	4	4
<i>M. mucogenicum/phocaicum</i> group	2	2
<b>Slowly-growing mycobacteria (SGM)</b>	<b>69</b>	<b>44</b>
<i>M. avium</i> complex (MAC)	37	23
<i>M. terrae</i> complex	5	2
<i>M. goodii</i>	4	4
<i>M. simiae</i> complex	4	2
<i>M. smegmatis</i> complex	4	2
<i>M. tuberculosis</i> complex (MTB)	3	1
<i>M. mageritense</i>	2	1
<i>M. szulgai</i>	2	1
<i>M. malmoense</i>	1	1
<i>M. cosmeticum</i>	1	1
<i>M. marnium</i>	1	1
<i>M. paraffinicum</i>	1	1
<i>Mycobacterium</i> species, not MTB	4	4
<b>Total</b>	<b>120</b>	<b>76</b>

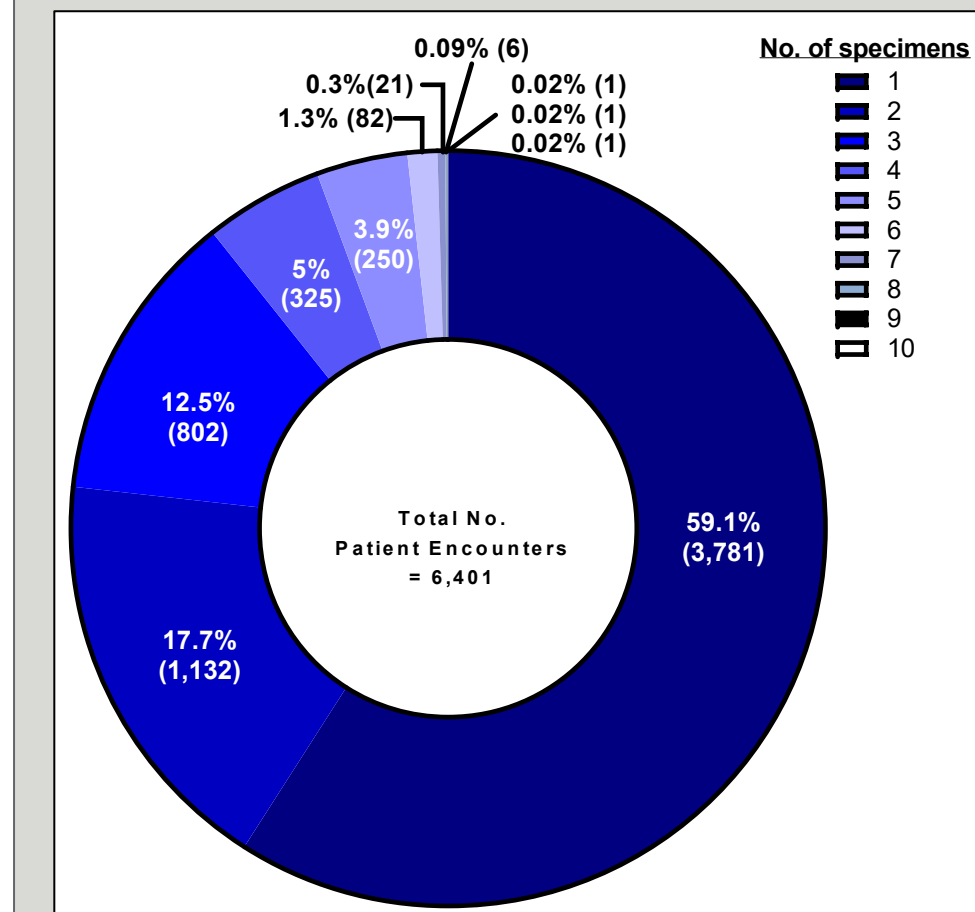
### Laboratory Impact: AFB Culture Laboratory Workflow



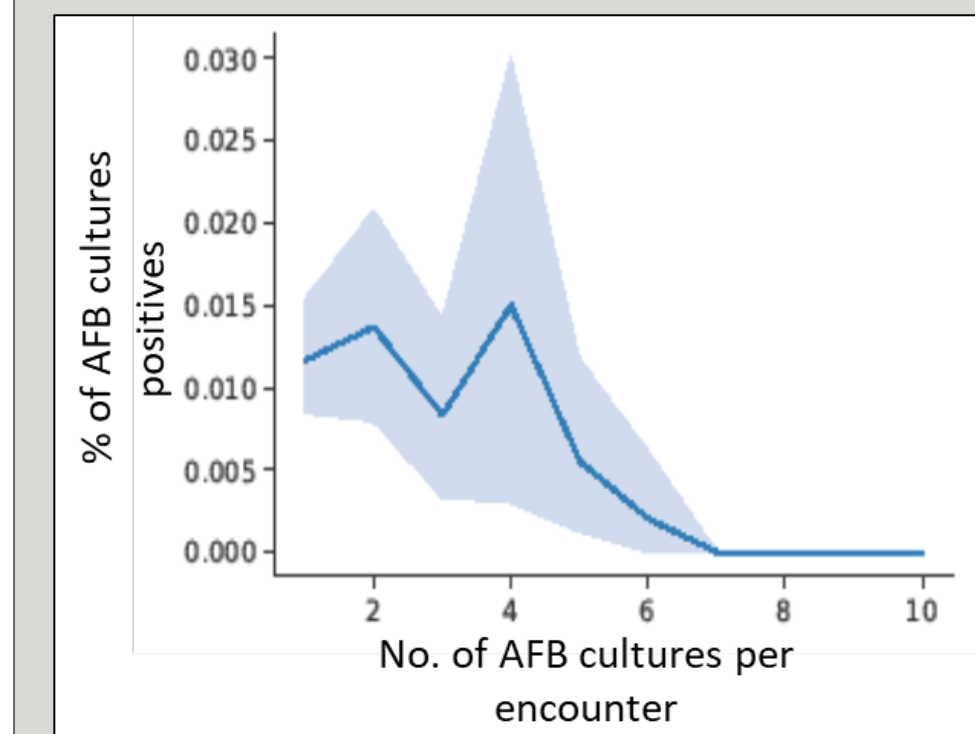
- AFB culture workup is hands-on and is currently not automated for reading solid agar
- Estimated hands-on time for a single negative culture is 15-30 minutes (range incorporated to include direct specimen stain) per our laboratory processes
- Overall, this equates to an estimated 2,000 hours and 97 FTE over the 5-year study period

## RESULTS

### No. of specimens submitted per patient encounter



- 1 to 10 specimens from a single encounter were sent for culture for a patient on the same collection date
- Nearly 60% of patients only had a single specimen sent per encounter
- An average of 2.3 specimens (4,959 unique patients with a total of 11,783) were sent per patient encounter



- The graph shows the average positivity rate for each number of cultures per encounter (95% confidence interval, shaded)
- The likelihood of a positive AFB culture is highest between 2 and 4 specimens collected

## CONCLUSIONS & FUTURE DIRECTIONS

- Direct stains on osteoarticular specimens have low yield
- Only 1% of osteoarticular mycobacterial cultures are positive, but multiple cultures from the same patient encounter increased recovery of mycobacteria

### Future Directions

- Implement the removal of direct specimen AFB stain from the order set on osteoarticular specimens
- Identify clinical predictors to help guide targeted ordering of mycobacterial cultures in osteoarticular infections

## REFERENCES

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