Endourology 2022 Summer Scholarship

Title: Determining Optimal Stone Culture Microbiology Protocols

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Introduction: Kidney stone cultures were originally described to help distinguish embedded organisms from surface contamination[1] and provide appropriate antibiotic therapy for patients to treat potential post-operative infection.[2,3] To date, there are controversial studies that discuss the significance of performing such stone cultures. Currently there are no published microbiology protocols nor standard policy recommendations for how best to perform these tests.[4,5] As a result, there is no mention of stone cultures in the guidelines from the American Urological Association (AUA)/Endourologic Society or the American Society for Microbiology (ASM).[6]

A recent multi-institutional survey of fellowship-trained endourologist practice patterns found large variability in how stone cultures are performed by microbiology labs at different institutions.[7] Stone cultures are not universally available and labs culture stones in a variety of ways with most treating them as either a "tissue" or a "urine" culture. From a microbiology perspective, these protocols require different bacteriological media, growth conditions, and specimen volumes. Without standardization as to how stone cultures are performed and reported, it remains unclear what the optimal method is to perform a stone culture.

Project Aim: Determine whether "tissue" versus "urine" culture protocols result in discrepancies in reporting and how such discrepancies impact post-operative clinical management.

Hypothesis: Performing stone cultures as a "tissue" culture will result in the identification of a higher number of organisms and provide higher sensitivity compared to current practice of stone cultures performed as a urine culture.

Methods: Kidney stones were collected from 18 ureterorenoscopy/laser lithotripsy and 33 percutaneous nephrolithotomy cases, with their corresponding upper urinary tract urine samples, and taken directly from the OR to the lab in sealed sterile containers with saline. Stones were crushed using sterile hemostats. Each stone sample was cultured both as a "tissue" and "urine" specimen, while urines were cultured using standard urine culture protocols. Once cultured, any organisms grown were identified using biochemical testing and/or Matrix-Assisted Laser Desorption/Ionization – Time of Flight mass spectrometry (MALDI-TOF MS). For each case, bacteria grown from stone cultures, either "tissue" or "urine" were compared to each other as well as the concurrent kidney urine specimen. Discrepancies in organisms grown were reported and analysis conducted to determine statistical significance. This study already had IRB approval as culture results will be linked to prospectively collected clinical and specimen data under the UArizona ReSKU (Registry for Stones of the Kidney and Ureter) Protocol (#1910099958).

Results: Among the 51 stones cultured from 33 PCNL and 18 URS cases, 27/33 (64%) and 6/18 (33%) demonstrated growth on tissue, urine or both cultures. Based on lab reporting guidelines, 27/33 (82%) PCNL and 5/6 (83%) URS cases had different reportable results based on culture type. Of the 33 total stones that grew organisms, only 6 (18%) had similar results on both tissue and urine protocols. One patient with a "positive" stone culture experienced post-operative sepsis.

	Stone as a Tissue Culture	Stone as Urine Culture 1uL	10uL
Original Growth	Moderate *Klebsiella pneumoniae* & *Enterococcus faecalis*	No Growth	<10k *K. pneumoniae* & >100k *E. faecalis*
Reported as	Moderate *Klebsiella pneumoniae* & *Enterococcus faecalis*	No Growth	<10k K. *pneumoniae* & >100k *E. faecalis*

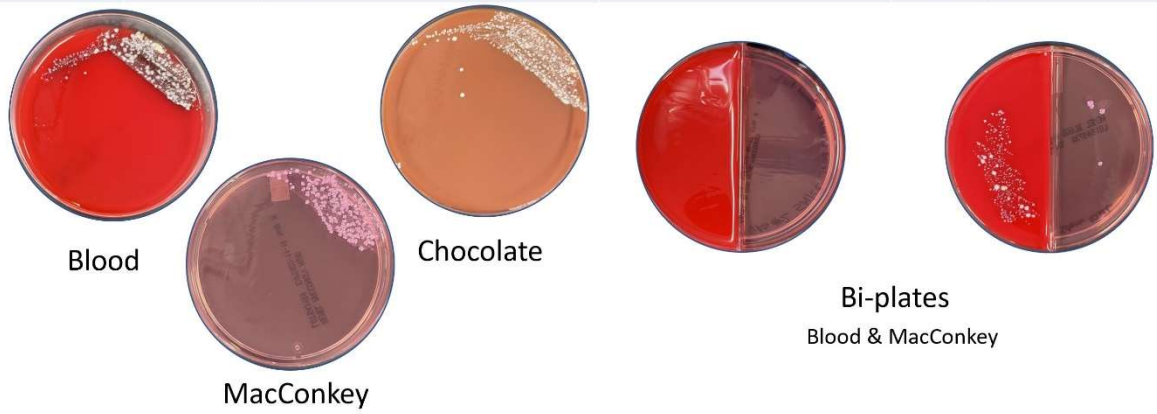

Figure 1: Differences in growth between culture types and corresponding reported growth for PCNL 33.
Green = Reportable as is; Red: Reported Differently/Not Reported

	Stone as a Tissue Culture	Stone as Urine Culture 1uL	10uL
Original Growth	Moderate growth *K. pneumoniae, E. faecalis, S. aureus*	>100k *P. aeruginosa;* <10k *Proteus mirabilis*	
Reported as	Moderate growth *K. pneumoniae, E. faecalis, S. aureus*	Reported as Gram Negative Rods	>100k *P. aeruginosa;* <10k *Proteus mirabilis*

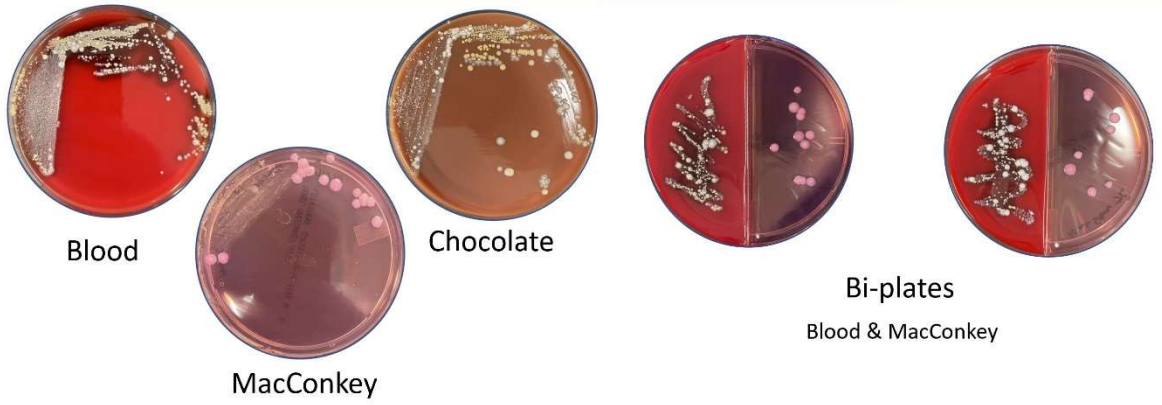

Figure 2: Differences in growth between culture types and corresponding reported growth for PCNL 21.
Green = Reportable as is; Red: Reported Differently/Not Reported

Conclusion: Kidney stone culture results differ based on whether a tissue or urine protocol is used as well as which urine protocol is followed. It appears that performing a stone culture utilizing a "tissue" protocol is more sensitive in detecting bacteria within kidney stones.

References:

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