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# Utilizing Flow Cytometry for Urine Culture Screening

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## Introduction

### Urine culture stats

Number of urines cultured per month: ~1600

Percentage of negative cultures: ~70%

Average time taken for a negative culture result: 22 – 31 hours

Time taken for urine Formed Elements Microscopic examination (FEME): <4 hours

Currently urine culture and FEME tests are ordered and processed independently of each other in different sections of the laboratory medicine department. They are usually collected at the same time, in separate containers.

We propose using the bacterial cell count from the urine FEME test as a screening method for whether or not to process the urine for culture. Urines with bacterial cell counts below the cut off level would not be cultured.

This would include standard urine culture samples from inpatients only, not urines collected by sterile techniques, from stomas or any outpatient samples.

## Methodology

The study was performed on 158 patient samples that had been sent of urine FEME testing with the sysmex UF-1000i . After the test had been performed the samples were processed directly for urine culture. Following the standard operating procedure in use at KTPH.

### Current urine culture method

1µL of urine is inoculated onto the following agar plates;

- Cystine Lactose Electrolyte Deficient (CLED) agar
- Sheep blood agar

Then incubated overnight (18 – 24 hours) in normal atmosphere at 35°C

### Current urine culture reporting

Growth of < 10<sup>4</sup> cfu/mL are reported as negative.

Growth of > 10<sup>4</sup> cfu/mL are reported as positive, with identification and sensitivity testing performed for significant isolates.

For this experiment growth of <10<sup>4</sup> cfu/mL was considered the cut off point for culture negatives.

The results were calculated using 2 cut off points of bacterial cell counts (20 & 200).

## Acknowledgements

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## References

Maarten A. C. Broeren, Screening for Urinary Tract Infection with the Sysmex UF-1000i Urine Flow Cytometer. J Clin Microbiol. 2011 Mar; 49(3): 1025–1029.

## Results

Total number of positive cultures	32	
Total number of negative cultures	126	
	Cut off bacterial count for culture processing	
	20/µL	200/µL
Positive cultures > cut off	30	24
Positive cultures < cut off	2	8
Negative cultures > cut off	41	7
Negative cultures < cut off	85	119
Sensitivity	93.75%	75.00%
Specificity	67.46%	94.44%
Positive Predictive Value	42.25%	77.42%
Negative Predictive Value	97.70%	93.70%
Reduction in urine culture load	55.06%	80.38%

## Conclusion

Although the higher cut off level of 200 bacterial cells per micro litre is significantly more efficient, reducing the workload by 80%. It lacks the sensitivity of the lower cut off value (20/µL). Given that it is desirable for a screening method to minimise the number of false negatives we propose to use the lower cut off of 20 bacterial cells /µL.

The cost of a urine culture to a patient is \$25.66 (\$43.60 for private patients). Given the average number of samples received by the laboratory each month this screening process could potentially save the hospitals patients around \$22600 per month.

As well as the cost and hospital resource savings, the screening method may positively affect inpatient stay times. Patients could expect a time saving of between 18 and 27hours for negative urine cell counts potentially freeing up bed space.

The new method does require some significant changes in workflow. Urine FEME testing cannot be performed on specimens containing boric acid (used as a preservative for urine cultures). If cultures are to be performed from non-preserved specimens they must be delivered to the laboratory within 2 hours or they can be refrigerated for up to 24 hours. So unless the wards can refrigerate their samples the collection time to receipt in the laboratory must be carefully monitored.