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Abstract Group: 10.1. Respiratory Infections

Keyword 1: Bacteria **Keyword 2:** Experimental approaches **Keyword 3:** Infections

Title: Microcalorimetry for bacterial strain discrimination - a first step in developing a novel technique for the diagnosis of severe infections

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Body: Microcalorimetry has been used to study bacterial growth kinetics (expressed as thermograms) as a result of their specific metabolism. While most respiratory tract infections have a benign outcome, some present with septic disease and poor prognosis. There is a need for novel techniques that provide rapid diagnosis and aid in antibiotic stewardship. The current study uses Differential Scanning Calorimetry (µDSC) to evaluate detection and discrimination criteria for bacteria using their specific thermograms. The thermograms were obtained from broth cultures of Escherichia coli (ATCC 25922) and Staphylococcus aureus (ATCC 25923) at an initial 1/100 dilution of 0,1 McFarland suspension. The studied parameters of the 2-peak shaped thermograms were time to bacterial growth detection (t0.015), time to exponential growth phase (t0.05), height (HFMax1) and time (t1stMax) to first peak heatflow. Results showed that E. coli grows faster and has higher heatflow peaks than S. aureus, allowing for fast and reliable differentiation. Numerical values and statistical significance of discrimination parameters are presented in the table:

Parameter	E. coli Mean (SD)	S. aureus Mean (SD)	p value
t0.015 (h)	0.7733 (0.31410)	1.5244 (0.35735)	< 0.001
t0.05 (h)	1.6786 (0.46648)	2.9969 (0.53285)	< 0.001
HFMax1 (mW)	0.1937 (0.02234)	0.0859 (0.01214)	< 0.001
t1stMax (h)	3.92(2.75, 4.59)*	5.27 (4.08, 5.59)*	0.002

* Median (min, max)

The thermograms act as kinetic fingerprints for bacterial growth and our study proves that bacterial discrimination is possible within 4 to 6 hours, and may aid in the workup of infections that require rapid bacteriological information to guide therapy.