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Advances in biofilm research

Does biomass production correlate with metabolic activity in *Staphylococcus aureus*?

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Background: Biofilm production in *Staphylococcus aureus* can be tested by determining the biomass using the crystal violet (CV) binding assay or by determining the metabolic activity using the XTT assay. However, a comparison between the concordance of CV and XTT in *S. aureus* strains isolated from blood samples has not been previously described to the best of our knowledge. The main objective was to establish a correlation between biomass production and metabolic activity of *S. aureus* strains.

Material/methods: We studied 104 *S. aureus* strains isolated from blood of patients with bacteraemia during 2014. We tested biomass production by CV and metabolic activity by XTT. Strains were divided into terciles according to the cut-offs and classified in groups as being low, moderate or high-biofilm producers and as having low, moderate or high metabolic activity. To assess the correlation between both procedures we calculated the overall categorical agreement and the individual categorical agreement for each group.

Results: The cut-offs for biomass production (CV) and metabolic activity (XTT) were, respectively: low: ≤ 0.238 , ≤ 0.251 ; moderate, $0.271-0.696$, $0.252-0.417$; and high, ≥ 0.792 , ≥ 0.423 . The overall categorical agreement between the procedures was 56.7%. The individual categorical agreement in each group was, respectively: low biofilm producers 59.5% ($p < 0.005$), moderate biofilm producers 25.9% ($p = 0.02$), and high biofilm producers 37.7% ($p = 0.02$) (table).

Conclusions: We found a poor correlation between CV and XTT, especially for moderate and high biofilm production. To determine *S. aureus* biofilm, biomass production (by CV) and metabolic activity (by XTT) must be performed in parallel.

Table. Biofilm production distribution according to CV and XTT

		CV			Total
		Low, N (%)	Moderate, N (%)	High, N (%)	
XTT	Low, N (%)	25 (24.0)	7 (6.7)	1 (1.0)	33

	Moderate, N (%)	5 (4.8)	14 (13.5)	15 (14.4)	34
	High, N (%)	4 (3.8)	13 (12.5)	20 (19.2)	37
	Total	34	34	36	104