

In vitro susceptibility of *Cutibacterium acnes* to dalbavancin: comparison between gradient test and the agar dilution reference method

Sara Svensson^{1,2}, Susanne Jacobsson³, Erika Matuschek⁴, Bo Söderquist^{1,2}



¹School of Medical Sciences, Faculty of Medicine and Health, Örebro University, Örebro, Sweden, ²Department of Orthopedics, Faculty of Medicine and Health, Örebro University, Örebro, Sweden, ³Department of Laboratory Medicine, WHO Collaborating Centre for Gonorrhoea and other STIs, National Reference Laboratory for STIs, Faculty of Medicine and Health, Örebro University, Örebro, Sweden, ⁴EUCAST Development Laboratory, Clinical Microbiology, Växjö Hospital, Växjö, Sweden



Region Örebro län

Introduction

Cutibacterium acnes, a human commensal, occasionally causes infections requiring long-term antibiotic treatment, including periprosthetic joint infections. Dalbavancin is a new lipoglycopeptide that allows intermittent dosing because of its exceptionally long half-life, 150-200 h. However, data on susceptibility of *C. acnes* to dalbavancin are lacking, and no EUCAST breakpoints have been defined.

Aim

To determine the minimum inhibitory concentration (MIC) distribution of *C. acnes* for dalbavancin, and to compare the gradient test to the agar dilution reference method. Vancomycin was used as a comparator.

Material and Methods

Bacterial isolates: 217 *C. acnes* isolates collected from positive tissue samples from arthroplasties (knee, n=18; hip, n=33; shoulder, n=65; and ankle, n=1), skin samples (n=15), and positive blood cultures (n=85).

Antibiotic susceptibility was tested by agar dilution according to EUCAST methodology for anaerobic bacteria ($\pm$ polysorbate 80) and by gradient test; MIC test strips (MTS) (Liofilchem, Italy) and Etest (bioMérieux, France).

Results

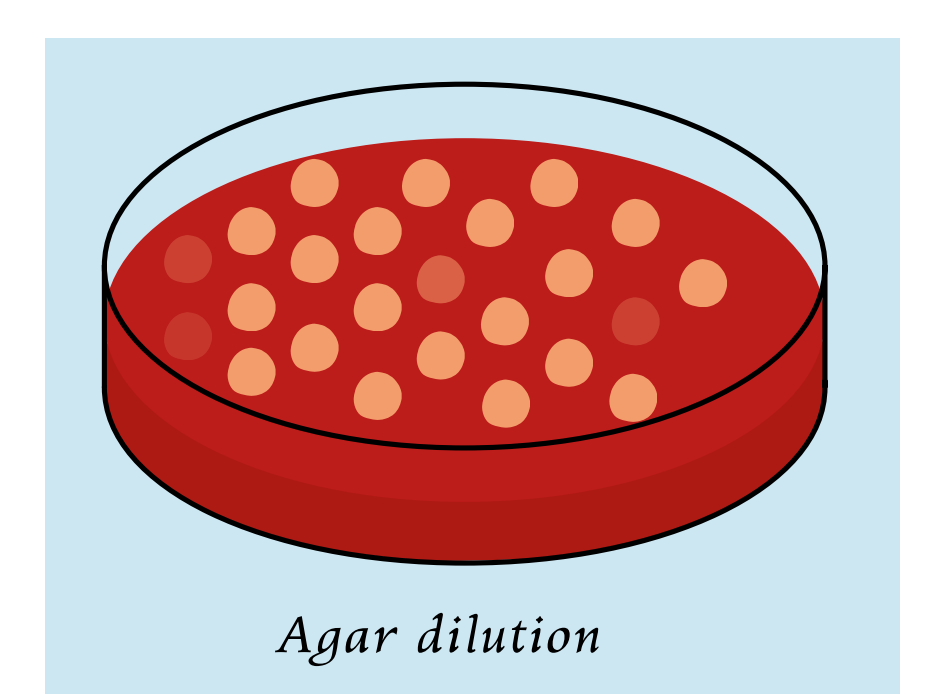
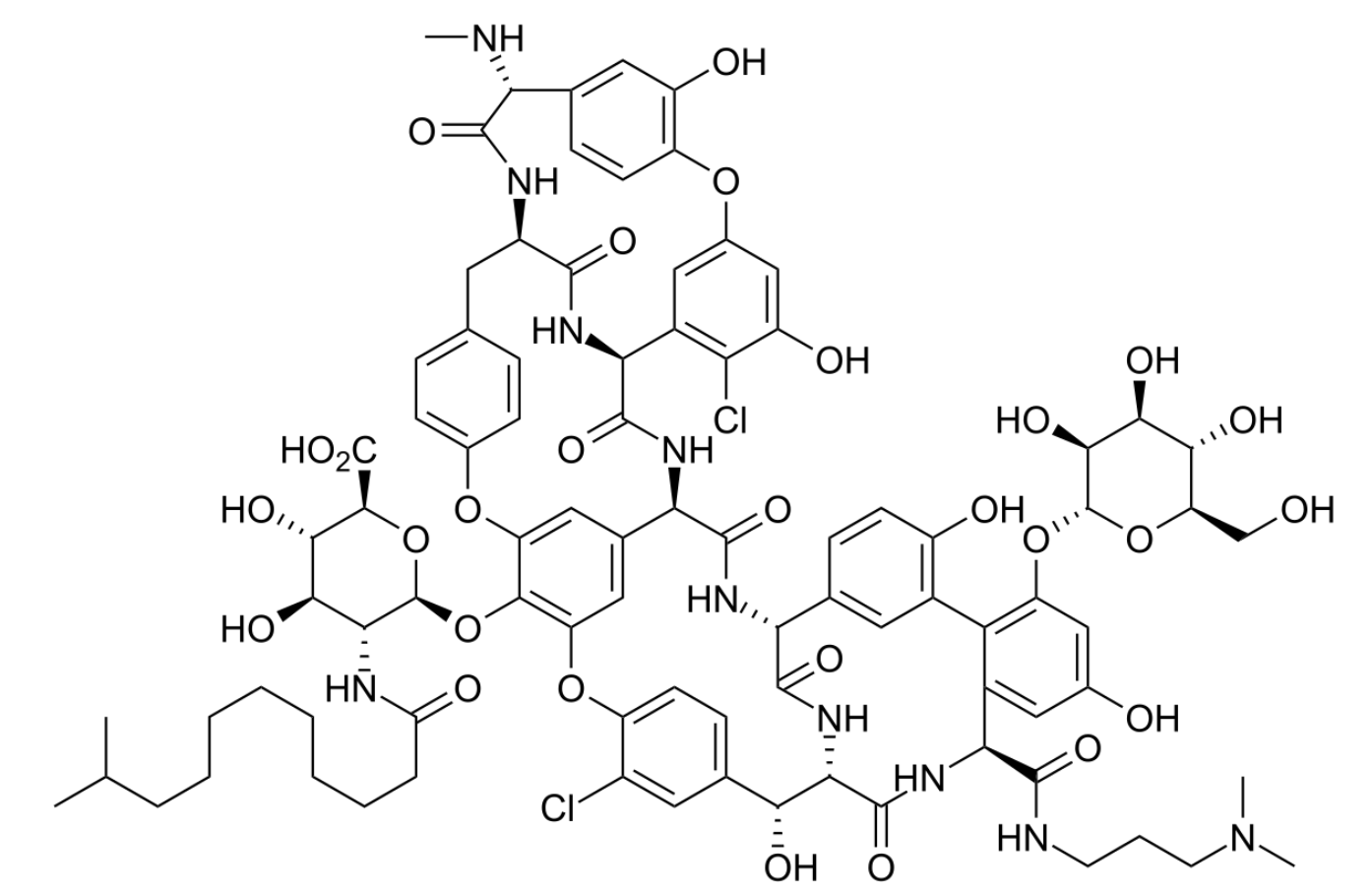
The MIC for dalbavancin against *C. acnes* using the agar dilution method showed a range of 0.016–0.125 mg/L and MIC₅₀ and MIC₉₀ values of 0.03 and 0.06 mg/L, respectively. For vancomycin, the MIC range was 0.25–1 mg/L and the MIC₅₀ and MIC₉₀ values were both 0.5 mg/L. Dalbavancin had a >3-fold lower MIC than vancomycin ($p < 0.001$) (Figure 1).

There was a significant difference between the gradient test and agar dilution method, with the gradient test yielding MIC values that were 3-fold lower than those obtained using the agar dilution method ($p < 0.001$) and no MICs were within essential agreement (Figure 2a).

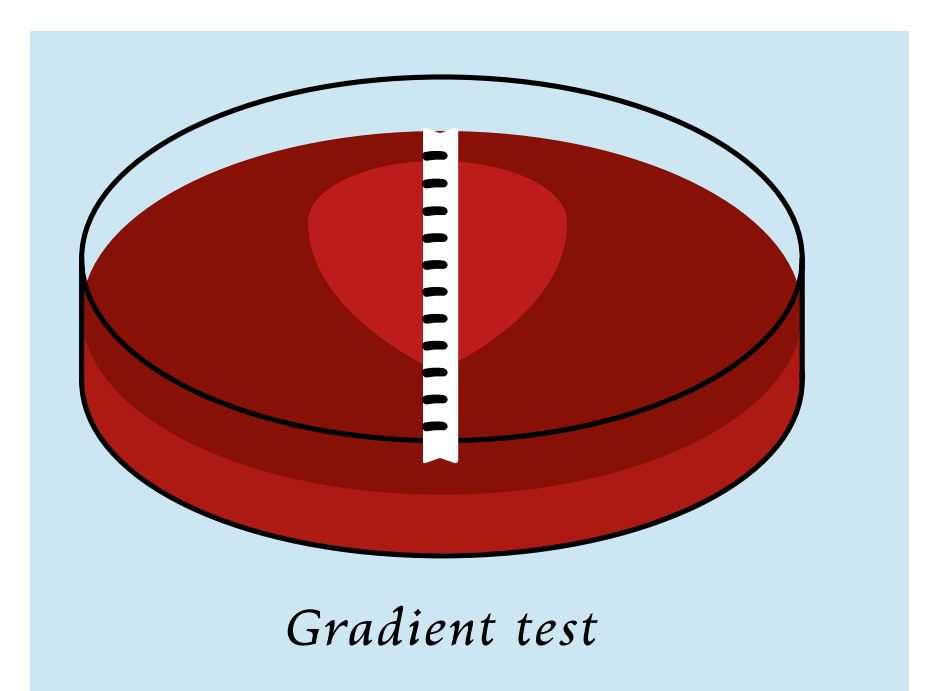
This difference between the two methods was not noted for vancomycin (Figure 3)

The addition of polysorbate 80 did not affect the dalbavancin MIC values. (Figure 2b)

When comparing the isolates by site of origin, a significant difference in the MIC distribution of dalbavancin was observed between the joint and blood isolates ($p < 0.001$), (Figure 4), however, within the joint isolates, no statistically significant differences were observed between knee, hip, and shoulder sites of origin.



Agar dilution



Gradient test

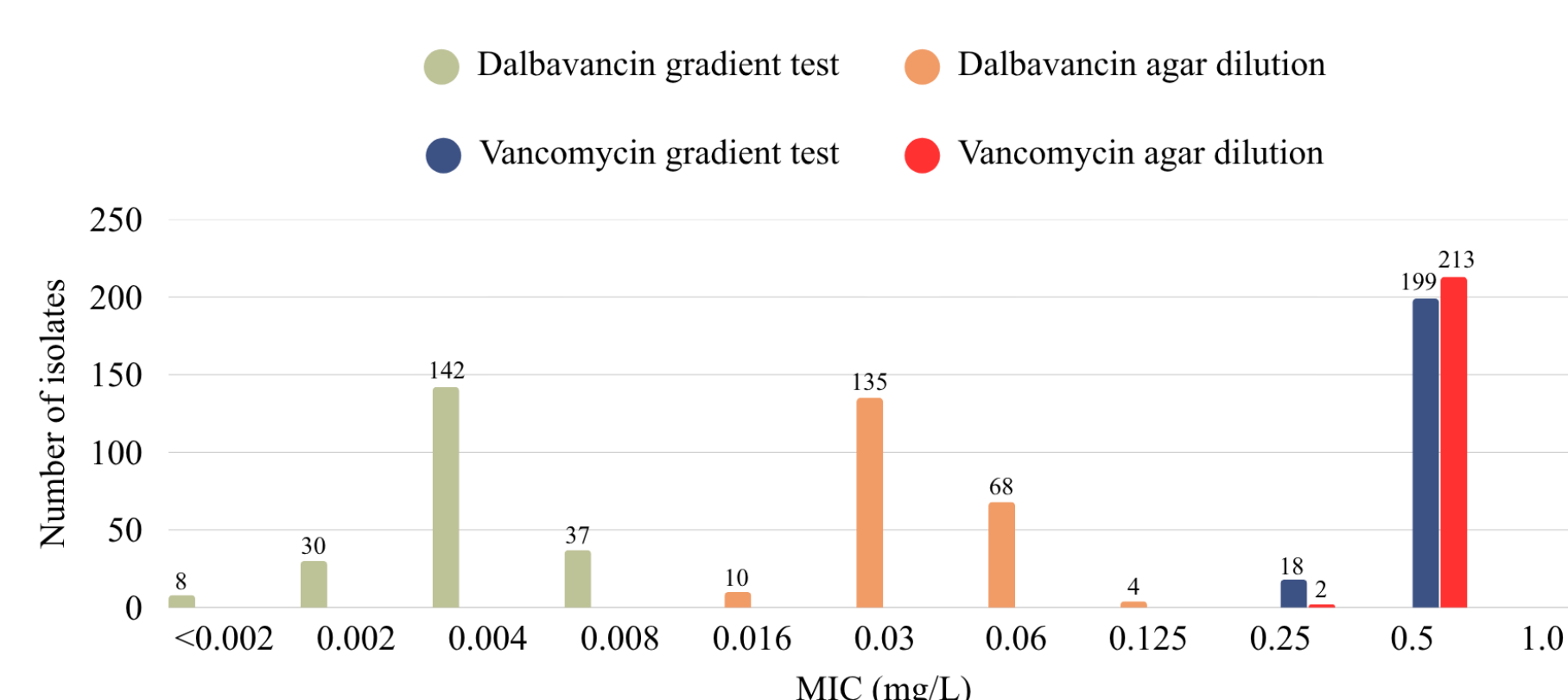


Figure 1. MIC distribution of *C. acnes* determined by gradient test and agar dilution, tested with dalbavancin and vancomycin.

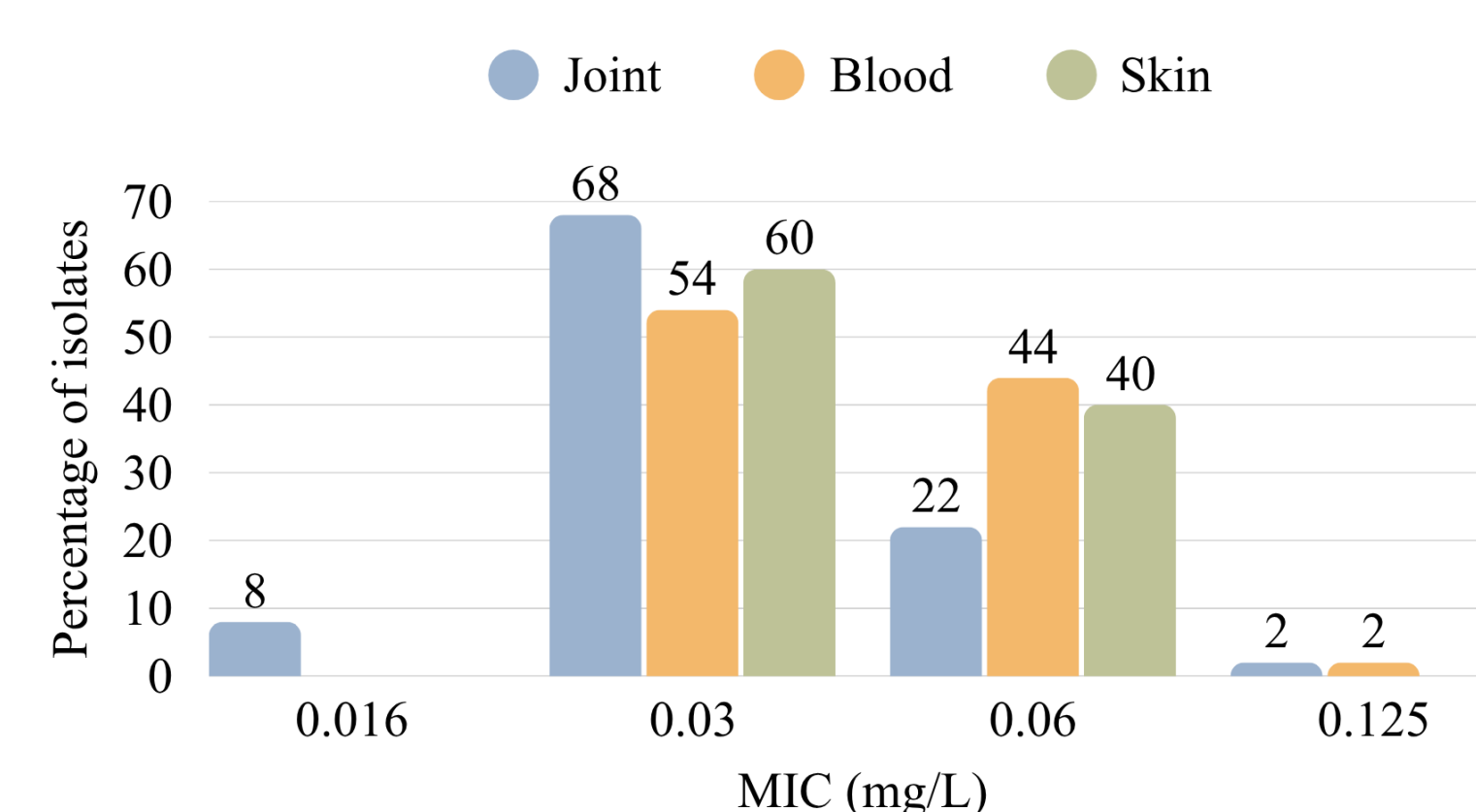


Figure 4. MIC distribution of dalbavancin determined by the agar dilution method for *C. acnes* isolated from tissue samples of prosthetic joints, blood cultures, and skin of healthy individuals.

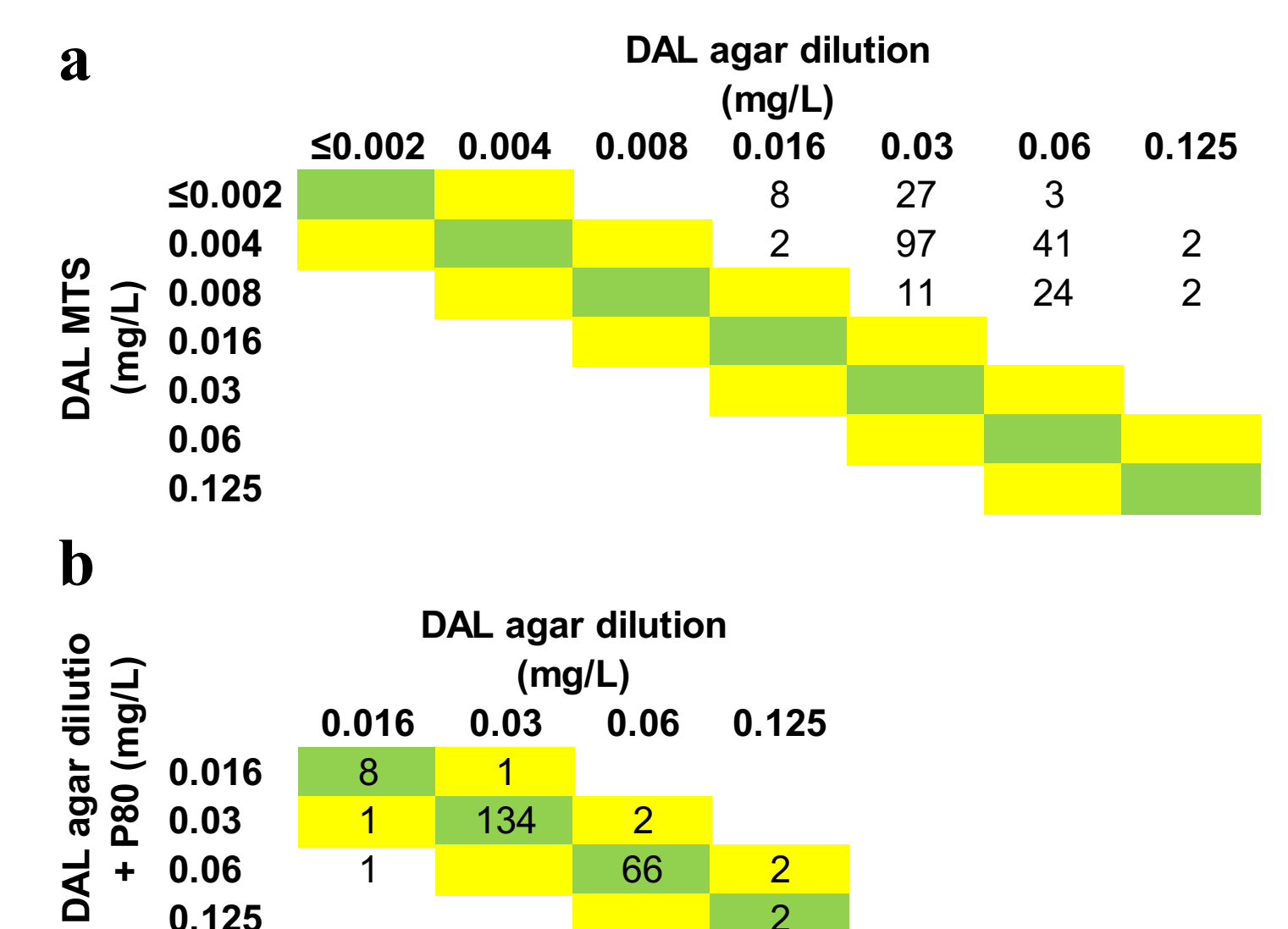


Figure 2. Essential agreement and bias for dalbavancin for (a) gradient test (MTS) vs. agar dilution without polysorbate 80 and (b) agar dilution with polysorbate 80 vs. agar dilution. DAL = dalbavancin. MTS = MIC test strip. Green boxes show identical MICs and yellow boxes show MICs within one doubling dilution.

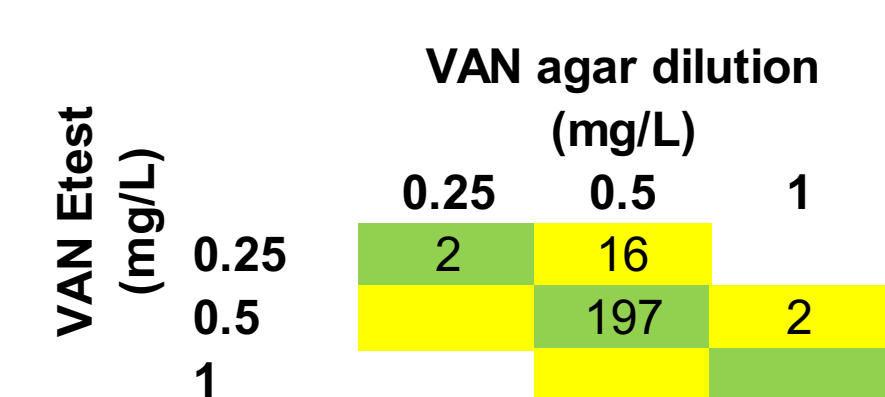


Figure 3. Essential agreement and bias for vancomycin tested using the gradient test (Etest) vs. agar dilution method. VAN = vancomycin. Green boxes show identical MICs and yellow boxes show MICs within one doubling dilution.

Conclusions

C. acnes showed significantly lower MIC values for dalbavancin than for vancomycin, highlighting the potential of dalbavancin as a therapeutic option. The gradient test yielded significantly lower MICs for dalbavancin than the reference method for anaerobes, agar dilution, suggesting that the gradient test for dalbavancin may not be a reliable method for antibiotic susceptibility testing of *C. acnes*.