JOURNAL OF CLINICAL MICROBIOLOGY, Oct. 1996, p. 2640–2641 Vol. 34, No. 10
0095-1137/96/$04.00+0

Impact of Chlorhexidine-Silver Sulfadiazine-Impregnated Central Venous Catheters on In Vitro Quantitation of Catheter-Associated Bacteria

I read with interest the article by Schmitt et al. (21) concerning the residual antiseptic effects of silver sulfadiazine-chlorhexidine-impregnated central venous catheters on catheter culture systems.

The authors' recommendation that inhibitors of these compounds should be added to culture media for assessing microbial colonization of antiseptic catheters is well-known. For example, Modak and Sampath stated in their first report on this novel catheter (17) that they used a lecithin-containing medium to inactivate these drugs in order to neutralize the impact antiseptic-bonded catheters might otherwise have on quantitative catheter culture data.

It may be interesting to the readers of the *Journal of Clinical Microbiology* that in a couple of laboratory tests (3, 17, 19), animal experiments (3, 4, 12, 17, 19), and clinical trials (2, 8, 9), inactivators have already been deliberately used in culture media for culturing antiseptic catheters in the way suggested by Schmitt et al. (21). For example, in our first full report on animal experiments, we stated that a mixture of Tween 80, lecithin, sodium oleate, sodium thiosulfate, proteose peptone, and tryptone was added to all culture media to inactivate the residual action of antiseptic substances during the culturing process (3).

Schmitt et al. (21) again stressed that inactivating substances should be added for culturing antiseptic-bonded catheters. Because of the prolonged antiseptic activity, it is, in our own experience, necessary to add these substances when using sonication and subsequent culture and when utilizing broth culture methods.

However, we disagree with Schmitt et al. (21) that this is mandatory in the roll-plate technique: our laboratory results from an in vitro study similar to that of Schmitt et al. (21) indicate that rolling antiseptic-bonded catheters over blood agar plates before or after bacterial contamination has no significant effect on bacterial growth, irrespective of whether the antiseptic-impregnated catheter was suspended for 5 min or 2, 12, 24, or 48 h in saline or broth before testing. This is in part supported by previous findings of Schmitt et al. (20) in a study whose results were presented in abstract form that blood agar plates exposed by the rolling method to sterile antiseptic-coated and noncoated catheters supported identical growth of *Staphylococcus epidermidis* added after rolling. In contrast to this preliminary report, Schmitt et al. stated in their recent article (21) that blood agar plates on which antiseptic-impregnated catheters had been rolled exhibited a clear zone of inhibition of bacterial growth in the area where the catheter had been rolled. In my opinion it is difficult to decide from the few data pairs given by Schmitt et al. as the means of duplicate tests without further statistical variables (21) whether the observed differences between antiseptic-coated and noncoated catheters on roll-out plate cultures are statistically significant or chance findings.

From our laboratory findings, the trials using Maki's method (14) probably produced valid results with regard to bacterial colonization of antiseptic-bonded catheters (1, 10, 11, 15, 16, 18, 22).

Luckily, we can neutralize the potential impact of antiseptic-bonded catheters on microbiological cultures as suggested by Modak and Sampath (17) and Schmitt et al. (21). However, this problem is more difficult to tackle with antibiotic-coated catheters, for which, in general, no inactivating substances are available (5–7, 13).

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Author's Reply

I and my colleagues appreciate the comments of Dr. Bach, who correctly points out the differences between our original abstract (1) and the final published manuscript (2). In our original experiment, 5-cm segments of antiseptic- and non-antiseptic-impregnated catheters were rolled on blood agar plates. An inoculum of 10^5 CFU of *Staphylococcus epidermidis* was added to each plate, and colonies were counted after 24 h of incubation. We observed no numerical difference between the plates on which antiseptic- and non-antiseptic-impregnated catheters had been rolled (more than 300 colonies on each plate); we made no note at the time of the bacterial growth pattern on the plates.

When we submitted that work for publication, a reviewer commented that the inoculum size used in this experiment may have been too large to allow an antiseptic effect to be seen if one existed. We agreed and repeated the experiment using the following inocula: 1.5×10^1, 1.5×10^2, 1.5×10^3, 1.5×10^4, and 1.5×10^5 CFU. At all inoculum levels, on plates on which antiseptic-impregnated catheters had been rolled, colonies of staphylococci grew only in the areas of the plate that had not been contacted by the catheter. Plates on which non-antiseptic-impregnated catheters had been rolled exhibited bacterial growth in all areas of the plate. Dr. Bach's criticism of the numerical data presented in this section is valid. In our opinion, the numerical data are not as important in this experiment as was the bacterial growth pattern, which strongly suggested an antiseptic effect. We regret not stating this point more clearly in our article and appreciate the opportunity to clarify our position.

We would like to reiterate that the relevance of these in vitro results to the in vivo setting is unknown, as is their applicability to other types of antiseptic- or antibiotic-impregnated catheters. Additionally, our experiments suggest that antiseptic effects on catheter cultures may wane over time. However, we feel that our results strongly support the use of inhibitors of silver sulfadiazine and chlorhexidine when catheters impregnated with these compounds are cultured and have incorporated them into the techniques used in our clinical laboratory.

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