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Preservation of Bacterial Cultures on Silica Gel

This circular was written in response to a number of inquiries. Judging from these, present methods for preservation of bacterial cultures are not entirely satisfactory, and it would be a real contribution to laboratory technique to work out a better one. Unfortunately, I can only suggest a principle that seems very plausible, but that has not yet been empirically justified.

The working principles are (1) that suitably dried bacteria should survive just as well in a sealed tube under air as in vacuo, and (2) that if this is correct, chemically inert desiccants such as anhydrous silica gel could greatly facilitate the practice. The following arrangement has been tried: small vials or tubes are filled nearly full with silica gel (Davison Company, Baltimore; Grade 40, 6-16 mesh). About 1 to 1.5 gms. of silica fits well into the tubes used. The tubes are plugged, then baked in a sterilizing oven at 160-180 C., 2 hours, to dry and sterilize the tubes. These are stored in a desiccator. The bacteria to be preserved are suspended in 2% peptone. About .05 ml. is pipetted directly to the silica, and the end of the tube sealed off. The tubes were then stored in a refrigerator. The water disappears very quickly. To regenerate the cultures, the tubes were broken, and the silica poured into broth. Considerable gas is liberated. After about an hour to allow redispersion, viable counts were made on the broth. The 24-hour survival, in apparently dried condition, was quite high (about 10%), but this was more encouraging than long-term experiments. After four - five months, the survival has been low, of the order of 10^{-5}, and some tubes are inviable. In its present form, the method is not a success, and cannot be recommended for long-term preservation and storage. I think that it could be greatly improved, without complication, by experiments leading to a better suspending fluid, and possibly by drying the cells on a layer of glass bead over the silica. What is most needed is an improved theoretical understanding of the biology of suspended animation in successfully dried cultures.

Despite its shortcomings, the silica gel tubes provide an ideal method for mailing cultures. They are not affected by undue cold in the way agar slants are, and probably ought to be more resistant to high temperatures as well. The mechanical strength of small sealed tubes allows them to be sent with simple padding in an ordinary envelope, and the absence of any liquid minimizes possible hazards from breakage and leakage.

I hope that other workers with suitable facilities to study preservation problems, or with a potential interest in the biophysics of suspended animation may be able to make some use of this suggestion.

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cc: Davis