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## Use of Bacteriostatic Drugs in Preservation of Blood for Transfusion.

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The increasing use of blood "banks" and "stored" blood for transfusion has repeatedly brought up the problem of a suitable substance for the preservation of human blood under such conditions. Since blood is an excellent menstruum for bacteria, growth of these organisms takes place in blood even at refrigerator temperatures. That bacterial contamination occasionally occurs during the taking of blood from donors is not denied, yet the seriousness of the use of grossly contaminated blood has not been sufficiently emphasized.

Following the finding of a considerable amount of contamination among stored blood samples by routine cultural methods, it became obvious that the problem was being neglected. The risk of contamination in the periodic removal of samples for culturing purposes is too great to warrant it as a routine procedure. The possible use of

TABLE I.
Inoculation with Hemolytic Spore-forming Rod Isolated from "Stored" Blood.

| | No. of colonies developing after | | | | |
|---|---|---|---|---|---|
| | 0 days | 3 days | 6 days | 9 days | 12 days |
| Control | 56 | 7680 | 184,000 | 5,760,000 | 6,400,000 |
| Merthiolate 1:5000 | 54 | 1280 | 34,600 | 170,000 | 260,000 |
| Acriflavine 1:100,000 | 62 | 1150 | 179,000 | 9,600,000 | 10,200,000 |
| Crystal violet 1:100,000 | 57 | 8 | 0 | 38,400 | 34,600 |
| Brilliant green 1:100,000 | 51 | 22 | 200 | 10,000 | 12,800 |
| Sulfanilamide 1:1000 | 61 | 46 | 33 | 21 | 39 |
| Sulfapyridine 1:5000 | 53 | 21 | 0 | 260 | 210 |

TABLE II.
Inoculation with *Staphylococcus albus* Isolated from "Stored" Blood.

| | No. of colonies developing after | | | | |
|---|---|---|---|---|---|
| | 0 days | 3 days | 6 days | 9 days | 12 days |
| Control | 162 | 20,500 | 320,000 | 5,120,000 | 6,400,000 |
| Merthiolate 1:5000 | 157 | 2,560 | 128,000 | 3,200,000 | 3,800,000 |
| Acriflavine 1:100,000 | 171 | 1,340 | 20 | 800 | 960 |
| Crystal violet 1:100,000 | 166 | 4,480 | 153,600 | 2,420,000 | 2,900,000 |
| Brilliant green 1:100,000 | 159 | 310 | 80 | 7,640 | 9,600 |
| Sulfanilamide 1:1000 | 161 | 33 | 40 | 63 | 58 |
| Sulfapyridine 1:5000 | 153 | 158 | 380 | 270 | 290 |

TABLE III.
Inoculation with *Pseudomonas æruginosa* Isolated from "Stored" Blood.

| | No. of colonies developing after | | | | |
|---|---|---|---|---|---|
| | 0 days | 3 days | 6 days | 9 days | 12 days |
| Control | 256 | 12,800 | 522,000 | 24,800,000 | 32,000,000 |
| Merthiolate 1:500 | 234 | 150 | 20 | 6,000 | 8,400 |
| Acriflavine 1:100,000 | 262 | 146 | 1,900 | 17,800,000 | 21,300,000 |
| Crystal violet 1:100,000 | 259 | 294 | 64,000 | 22,400,000 | 32,000,000 |
| Brilliant green 1:100,000 | 238 | 182 | 7,100 | 16,800,000 | 18,800,000 |
| Sulfanilamide 1:1000 | 246 | 144 | 120 | 210 | 160 |
| Sulfapyridine 1:5000 | 253 | 153 | 660 | 3,200 | 2,860 |

a bacteriostatic substance which would be harmless by intravenous administration suggested itself.

The "selective bacteriostasis" of acridine and triphenylmethane dyes as originally demonstrated by Churchman,[1] and the bacteriostatic action of sodium-ethyl-mercurithiosalicylate (merthiolate) as pointed out by Jamieson and Powell[2] were considered. Their failure to produce the desired effect prompted the use of sulfanilamide.

The procedure consisted of inoculating 10 cc of freshly drawn citrated (0.3%) human blood with 24-hour cultures of bacteria in amounts which would introduce less than 3 bacteria per cubic millimeter of blood. The bacteriostatic substances were added and the tubes were then placed in a refrigerator at 4° to 6°C. At 3-day intervals, 0.1 cc amounts were removed from each sample, mixed with a tube of molten agar, and poured on a Petri plate. Colonies were counted after a 48-hour incubationary period.

The results with organisms most frequently isolated from contaminated blood are shown in Tables I, II and III.

The results indicate that sulfanilamide is the only consistently bacteriostatic substance in amounts compatible with intravenous dosage. Similar results were obtained with many other strains of staphylococci and other contaminants isolated from stored blood. It is not known what the ultimate effect of sulfanilamide will be on an individual receiving it; hence it cannot be stated that blood containing sulfanilamide is entirely innocuous.

1 Churchman, J. W., *Newer Knowledge of Bacteriology and Immunology*, Chicago, 1928, Chap. III, p. 19.

2 Jamieson, W. A., and Powell, H. M., *Am. J. Hyg.*, 1931, **14**, 218.