Recently, Seibert and her coworkers[5] have reported that a polysaccharide distinct from tubercle bacillus carbohydrate can be detected in the sera of individuals with tuberculosis. The extent of tuberculosis can be correlated with the amount of this polysaccharide in the serum. Interestingly enough, for many years clinicians have recognized the value of the sedimentation rate as an index of the progress of tuberculosis as well as other disease conditions. From the data given in the present report it is apparent that there is a definite relationship between sedimentation rate and an abnormal, non-specific polysaccharide in the plasma, and further work is planned to attempt to determine whether or not this polysaccharide is related to the carbohydrate investigated by Seibert and her coworkers.

[5] Seibert, F. B., Nelson, J. W., and Seibert, M. V., PROC. SOC. EXP. BIOL. AND MED., 1943, **52**, 219.

Summary. A relationship existed between the sedimentation rate of blood from various disease conditions and the amount of precipitate formed in plasma by the growth of Type III pneumococcus. The possible importance of the presence of an abnormal, non-specific polysaccharide to this finding is discussed.

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Effects of Pectin and Saline Solutions on Survival Time of Dogs in Hemorrhagic Hypotension.*†

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Recent observations of Middleton and Wiggers[1] indicated that intravenous infusions of pectin solutions were generally ineffective when given more than 30 minutes after reduction of mean arterial pressure to a sustained 50 mm Hg. level of arterial pressure. Given before the lapse of such an interval, but when significant hemodilution had already occurred, they caused a further immediate decrease in hemoconcentration due to the fluid injected. However, evidence that additional dilution or increase in blood volume occurs as a result of osmotic attraction of water was not discovered. On the contrary, a slight recovery of concentration in arterial blood generally supervened. Under such conditions, 8 out of 19 dogs reinfused at the end of a 30-minute period of hypotension failed to show a satisfactory dynamic response and died, but the remaining 11 showed a sustained elevation of arterial pressure and pressure pulses of good form from 4 to 6 hours after infusion of pectin solutions. But assuming that these animals would have recovered, only 58% would have been rescued by a comparatively prompt infusion of such solution.

The present investigation, a continuation of these studies, endeavored to determine the actual survival time when animals were transfused somewhat differently and under experimental conditions which might be expected to result in more favorable actions. For example, it is conceivable that most of the readily mobilizable body water has been drawn into the vascular system at the end of a 30-minute period of hypotension, with the result that no or little additional fluid can be reabsorbed when pectin solution with high colloid osmotic pressure is infused. For these reasons, it was felt that such infusions might act more favorably if more water were made available for reabsorption. To accomplish this

* This investigation was supported by a grant from the Commonwealth Fund.

† Condensed report of results presented as a thesis in partial fulfillment of requirements for the degree M.S. in the Graduate School of Western Reserve University.

[1] Middleton, S., and Wiggers, C. J., *Am. J. Physiol.*, 1943, **140**, 326.

the animals received substantial subcutaneous infusions of physiological saline solutions during the experimental period. In addition, it seemed desirable to compare the results following infusion of pectin solutions with those which followed when no infusion was given or similar volumes of mammalian Ringer's solution were administered.

Procedures. As in previous experiments, dogs were anesthetized with morphine sulfate (20-40 mg) followed by sodium barbital, given intravenously (170-180 mg/kilo). The animals were bled rapidly until mean arterial pressure started to decline, then at a rate of 50 cc/min until it reached 60 mm Hg., and thereafter at a rate of 10-15 cc/min until a 50 mm Hg. level was reached. Here it was maintained—if necessary by additional small withdrawals of blood—for 30, 60, or 90 minutes. At the end of such periods of hypotension, one group of 10 animals received no treatment, a second group of 13 animals received infusions of mammalian Ringer's solution, and a third group of 29 dogs were infused with pectin solutions. Of the latter, 6 received a 1% pectin solution supplied by Dr. F. W. Hartman of Detroit and 23 received a 1.5% solution of pectin furnished by Frederick Stearns and Company of Detroit.

Just before use, these solutions were adjusted to pH 7.0 by addition of a 5% Na_2CO_3 solution (*ca.* 1 cc per 40 cc pectin solution). This change from phosphate or lactate buffers to a carbonate was made in accordance with suggestions from several sources that the former might conceivably have deleterious actions in states of hypotension.

Infusions of mammalian Ringer's or pectin solutions were given at rates of 20-40 cc/min. until blood pressures failed to increase further. Experience had shown that less volume of an infusate is required to achieve this result at more rapid rates of infusion and that dogs during post-hemorrhagic hypotension tolerate a more rapid rate of pectin infusion than have been suggested for normal dogs (3-5 cc/min[2]). Frequently, normal blood pressure was restored by infusing a volume of liquid less than that of the blood lost (*partial infusions*), but in some animals an equal volume was required (*full infusions*). When arterial mean pressure was not maintained above 80 mm Hg. after a partial infusion, a supplementary infusion was given, but the total volume of infusate never exceeded that of the blood which had been lost.

After such infusion—or after a 30-minute period of maintained hypotension in the case of untreated animals—mean arterial pressure was recorded for a minimal period of 4 hours. If at the end of such an observational period it tended to decline, the observation period was extended; if the pressure appeared to remain sustained the exposed femoral arteries were ligated, the wounds were packed with sulfanilamide and repaired and the animals were placed in a cage. If they lived, mean arterial pressures were recorded periodically during the second day. Under conditions of experimentation in which asepsis was not practiced, a survival for 36 hours with mean arterial pressures of 80 mm Hg. or more could fairly be considered to indicate recovery. However, many of these animals were not sacrificed for several days. Such animals ate and drank and used their hind limbs despite ligation of the femoral arteries.

Results. The results obtained on 50 dogs are summarized in Table I.

In view of the unfavorable responses to pectin solutions after a 60-minute interval of post-hemorrhagic hypotension and in view of previous unfavorable results reported by Middleton and Wiggers[1] there appeared to be no need of testing pectin solutions after 90-minute periods of hypotension. The results permit 3 deductions:

1. Anesthetized dogs submitted to a period of 50 mm Hg. post-hemorrhagic hypotension for only 30 minutes, as a rule, do not survive when untreated. In 90% of the dogs a state of circulatory failure develops which has all the dynamic characteristics of shock and leads to death by the following morning.

2. Infusion of pectin solutions materially increases the chance of survival but only when administered during an interval of 50 mm Hg. hypotension which does not exceed approxi-

[2] Hartman, F. W., Schelling, Victor, Brush, B., and Warren, K. W., *J. Am. Med. Assn.*, 1943, **121**, 1337.

TABLE I.

	No. of recoveries	No. of deaths	% recoveries
After 30 min. period of 50 mm hypotension			
No infusion	1	9	10
Ringer's sol.	5	2	71
Pectin "	8	5	61
After 60 min. period of 50 mm hypotension			
Ringer's sol.	4	2	67
Pectin "	3	8	27
After 90 min. period of 50 mm hypotension			
Ringer's sol.	0	3	0

mately 30 minutes. Supplementary subcutaneous injections of saline do not appear to extend the time of effectiveness. The dogs which survived showed no ill effects from a possible retention of a foreign colloid in the body, nor were gross evidences of organic disturbances seen at autopsy.

3. Pectin solutions seem to have no advantage over simple saline solutions; indeed, the latter act more favorably when administered after a 60-minute period of 50 mm Hg. hypotension.

These results, contrary to general belief, suggest that after severe hemorrhage the introduction of salt ions may be more important than the injection of foreign colloids. The reasons for this remain obscure. However, saline solutions lose their effectiveness after the deleterious effects of prolonged hemorrhage—in 3 cases 90 minutes of 50 mm Hg.—have become operative. This again stresses the fact that saline solutions must be used promptly after severe hemorrhage in order to exert any beneficial effects.

Summary. Results on 50 dogs submitted to variable periods of 50 mm Hg. post-hemorrhagic hypotension confirm the conclusions of Middleton and Wiggers[1] that infusions of pectin solutions do not materially increase the chance of recovery unless they are given during an interval which does not exceed 30 minutes of such hypotension. They extend these observations in showing that these beneficial effects are certainly no better than those achieved by administration of simple saline solutions. Finally, they once more stress the fact that the latter are not wholly useless provided they are administered before deleterious effects of prolonged hypotension become operative.

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The Antithyroidal Substances of the Blood and Vitamin A.

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An extensive literature has appeared which has confirmed the findings of Anselmino and Hoffmann[1] concerning the ether-soluble substances of the blood which have a pronounced antithyroidal effect and also are effective in animal experiments, as well as in the treatment of hyperthyroidism.

The present investigation was undertaken in order to determine the relationship of these ether-soluble substances of the blood to vitamin A. This question seemed important to us, since by animal experiments it had been previously demonstrated by one of us,[2] that vitamin A has a strong antithyroidal effect.

The comprehensive literature on the antithyroidal effect of vitamin A includes papers

1 Anselmino, K. J., and Hoffmann, F., *Klin. Wchnschr.*, 1933, **12**, 99.

2 Fellinger, K., and Hochstädt, O., *Wien. klin. Wchnschr.*, 1936, **49**, 1339.