end of the ampulla to its junction with the duct; occasionally the relaxation apparently occurs at the same time throughout the contracted area. The number of separate contractions and relaxations may reach 10 per minute but only a fraction are complete. The contractions persist in decreasing number for about 10 minutes; occasionally for more than 20 minutes.

The adjacent duodenum may or may not follow an ampullar contraction with a contraction of its own. Frequently either duodenum or ampulla may contract without involving the other.

After slitting the duodenum (cautery) the pancreatic ampulla is seen as a grayish-pink knob. With a complete contraction, this knob becomes slightly more prominent, an oval slit appears in its proximal side and a small amount of clear fluid is expelled with more or less abruptness. During issue of this juice the knob pales and becomes less prominent; the opening disappears after expulsion of the secretion.

The same course of events is seen in the *bile* papilla of rabbit. Relaxation is observable with greater ease because the bile papilla is larger. The relaxation generally proceeds as a pink blush from the distal end of the papilla to the choledochoduodenal junction; in the same animal, however, the relaxation may at times begin at both ends of the papilla, or the relaxation travels, like the contraction wave, from the choledochus junction to the tip of the papilla.

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Degree of Immunological Specificity of the Nondialysable Growth Products of *Eberthella, Salmonella, Brucella,* and *Proteus.*

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Morell and Shwartzman[1] recently reported the successful use of dialysis in the preparation and purification of certain immunologically active bacterial products, particularly those of the meningococci. From their work it would appear that nondialysates of this kind carry a rather high degree of specificity. It was with the idea of improving upon the specificity of the Weil-Felix reaction that the work here reported was begun. Using their methods, we were

[1] Morell, S., and Shwartzman, G., *Science,* 1937, **86**, 130.

able to secure immunologically reactive products from proteose-peptone cultures of *Eberthella typhosa, Salmonella paratyphi, Salmonella schottmulleri,* and *Proteus X19* (0504 strain) which flocculated with homologous immune (rabbit) serum. Four days were allowed for culturing and 4 days for dialysis in each instance. Serum from proven cases of endemic typhus cases also flocculated with the *Proteus* non-dialysate. Tests were carried out by layering dilutions of the nondialysate over whole serum. In the positive reactions a visible flocculate formed within 30 minutes at room temperature, about 23°C. Agglutination tests with the same bacterial antigens were carried out at the same time.

TABLE I.

Flocculation Between Endemic Typhus Serum and the Nondialysable Growth Products of *Proteus X19, E. typhosa, S. paratyphi,* and *Br. abortus.* Agglutination of the same organisms by these samples of serum is shown in the adjoining column.

Typhus Serum	*Proteus X19*		*E. typhosa*		*S. paratyphi*		*Br. abortus*	
	Flocc.	Agglu.	Flocc.	Agglu.	Flocc.	Agglu.	Flocc.	Agglu.
1	1:256	1:1280	1:4	1:40	0	1:20	0	1:20
2	1:256	1:1280	1:4	1:30	0	0	0	1:40
3	1:128	1:640	0	1:20	0	0	0	1:30
4	1:64	1:240	0	0	0	0	0	0
5	1:128	1:240	1:4	1:30	0	0	1:4	1:40
6	1:512	1:1280	1:8	1:120	1:4	1:20	1:16	1:80
7	1:128	1:480	1:8	1:80	0	0	1:4	1:40
8	1:128	1:480	1:4	1:60	0	0	1:4	1:40

The results (Table I) show that typhus serum flocculated with the nondialysates of *Proteus X19* at reasonably high titers, at the same time failing to do so at similarly high titers with the nondialysates of *E. typhosa, S. paratyphi,* and *S. schottmulleri.* The agglutinations here recorded of bacterial suspensions by the same serum are not out of keeping with the established relationships between the organisms used. Since the Weil-Felix reaction is still considered as one of the heterophile phenomena, it would scarcely be expected that this method would discover a strict degree of spec-

TABLE II.

Flocculation Between the Nondialysable Growth Products of *Proteus X19, E. typhosa, S. paratyphi,* and *Br. abortus* and Immune Sera. Agglutination is shown in the adjoining column.

Immune Sera	*Proteus X19*		*E. typhosa*		*S. paratyphi*		*Br. abortus*	
	Flocc.	Agglu.	Flocc.	Agglu.	Flocc.	Agglu.	Flocc.	Agglu.
Proteus X19	1:512	1:5120	1:64	1:240	1:4	1:40	1:32	1:240
E. typhosa	1:32	1:160	1:512	1:6400	1:64	1:480	1:32	1:240
S. paratyphi	1:8	1:40	1:32	1:320	1:512	1:6400	1:8	1:60
Br. abortus	1:8	1:40	1:8	1:120	1:4	1:40	1:256	1:5120

ificity between the nondialysates and the immune substances present in typhus serum. Still, the flocculation tests seemed to exhibit more specificity than was found in agglutination tests with typhus serum. Such a degree of specificity was not found in the flocculations between the nondialysates of the other cultures here used and the other immune sera. Instead, the results paralleled the behavior of agglutinating reactions between these immune sera and related organisms (Table II). Under these conditions and with these organisms, flocculation with nondialysates and immune serum seem to be no more specific than the group agglutinations commonly observed between the species used. It seems reasonable to conclude, therefore, that the *in vitro* reactions of the nondialysable growth products of microorganisms studied are without a strict degree of specificity.

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Vitamin-C Inhibition of Agglutinin Production.

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In a previous paper it was shown that ascorbic acid added to or injected simultaneously with horse serum hastens and augments specific-precipitin production in rabbits. A 10- to 30-fold increase in precipitin-titer is readily produced by optimal doses (about 50 mg) of this enzyme-activator. We have extended the study of the potentiating action of ascorbic acid to other antigens. The present paper summarizes our experimental data with bacterial vaccines and sheep erythrocytes (Forssmann antigen).

About 200 two kg rabbits were divided into groups of 6. Each group was injected intravenously with an arbitrary dose of sheep erythrocytes, or of living, heat-killed or formalin-killed suspensions of *B. proteus, B. coli* or *B. typhosus.* One minute after each injection, 3 members of each group were given an intravenous injection with 50 mg ascorbic acid dissolved in 1 cc NaCl-solution.

Very low antibody-titers were obtained as a result of these single injections. Within the limits of the experimental error ascorbic acid had only border-line effects on antibody-yield, except on the yield of

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