

of cases accompanied by a low complement titer and practically all the high Vitamin C figures are associated with high values of complement.

Conclusion. From these observations one may conclude that there is a qualitative relationship between Vitamin C intake and complement titer in the human plasma, although an adequate explanation of the phenomenon is not clear at present.

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Serological Studies on Subjects Vaccinated Against Typhus Fever.

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Since the introduction of louse vaccine by Weigl¹ for active immunization against epidemic typhus, the effectiveness of the vaccine in protecting experimental animals and human beings has been demonstrated. This has been summarized by Biraud and Deutschman.² In the last few years, doctors, nurses, and attendants in the Peiping Union Medical College who are likely to be exposed to typhus fever were inoculated with a louse vaccine.* This vaccine, comprising a total amount of material from 100 infected lice, was administered in 3 doses. They were given subcutaneously at weekly intervals. It was thought that it might be of interest to study the serological response of individuals after vaccination, especially in view of the scanty information of such kind in the literature. For this purpose, specimens of blood were taken by venapuncture from the vaccinated subjects at different intervals of time after the last injection. The sera so obtained were then used for agglutination against typhus *Rickettsiæ* and *Proteus X₁₉*. The agglutination test against the latter was done by the macroscopic technic of Dreyer, in which a formalinized suspension of bacteria was used as antigen. The rickettsiæ agglutination test was performed by the macroscopic technic

¹ Weigl, R., *Med. Klin.*, 1924, **20**, 1046.

² Biraud, Y., and Deutschman, S., *League of Nations, Epidemiological Report R. E. 183*, p. 138, 1936.

* Typhus vaccine was supplied by the microbiological laboratory of Catholic University of Peking.

TABLE I.
Comparative Titer of Weil-Felix Reaction and Rickettsial Agglutination in Sera of Vaccinated Individuals.

Mo. elapsed after last injection	No. of cases	No. of negatives	Typhus rickettsial agglutination						Weil-Felix reaction								
			No. of positives			No. of negatives			No. of positives			No. of negatives					
			1:10	1:20	1:40	1:80	1:160	1:320	1:10	1:20	1:40	1:80	1:160	1:320			
1/2-1	45	9	18	9	5	1	1	2	9	2	2	9	12	6	6	1	
1/4-2/3	38	14	12	10	2	0	0	0	2	0	0	6	4	12	10	4	0
3-3 1/2	29	10	9	10	0	0	0	0	4	0	0	3	4	10	5	3	0
4-14	9	4	5	0	0	0	0	0	1	0	0	1	2	2	3	0	0
Total, 1/2-14	121	37	44	29	7	1	1	2	16	2	2	12	19	36	24	13	1

of Zinsser and Castaneda.³ The suspension was made up of 1 cc of typhus vaccine which contains material from 50 lice and 9 cc of 1:10,000 merthiolated saline. The coarse particles of the suspension were allowed to settle in the ice chest for at least 24 hours before use. The agglutination tubes were incubated in water-bath or incubator at 37°C overnight, after which readings were taken by means of a low magnifying lens (×2). The result was considered to be positive when definite clumping of the organisms was seen. Positive and negative sera were always included each time for antigen control. Serum diluted with saline was similarly incubated to serve as serum control.

The results of the comparative study of Weil-Felix reaction and typhus rickettsial agglutination are summarized in Table I.

From the table, it may be seen that while both Weil-Felix reaction and typhus rickettsial agglutination were obtained with the majority of sera of subjects shortly after inoculation, no parallelism between the titers of their respective antibodies was observed. For instance, in one serum, the rickettsial agglutinin attained a high titer of 1:320, whereas Weil-Felix reaction was positive only in 1:10. In another case, the serum agglutinated *Proteus* X₁₉ to a titer of 1:320, while the rickettsial agglutinin was not higher than 1:20. There were also quite a number of sera which showed no agglutination for typhus *Rickettsiæ* (in dilution of 1:10) but gave positive Weil-Felix reaction and *vice versa*. Furthermore, although we have as yet little information of the persistence of the respective agglutinin titers, it appears that the typhus rickettsial agglutinins that have been promptly stimulated tend to wane more rapidly. On the other hand, the agglutinin titer for *Proteus* X₁₉ seemed to persist longer.

³ Zinsser, H., and Castaneda, M. R., *J. Exp. Med.*, 1932, **54**, 455.