

employed for the propagation of the phages.<sup>2, 4</sup> Hence our findings here cannot be justifiably generalized for the *in vivo* action of these phages towards all strains of V form *B. typhosus*. These observations, however, are sufficient to demonstrate a significant difference in the relative efficacy of these phages on experimental typhoid infection in mice.

*Conclusion.* Of the 4 serological types of Vi-phage propagated on Ty2 strain of V form *B. typhosus*, only the Type I Vi-phage failed to show noticeable protective action under the specified experimental conditions. The Type II, III and IV were found to be equally effective in their protective action.

### 13286 P

#### **Influence of Specific Soluble Substance on Course of Experimental Pneumococcus Pneumonia.**

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The specific soluble substance (SSS) of pneumococci has been shown by many workers to inhibit the action of natural or acquired antibodies, either partially or completely. The purpose of this investigation was to determine the effect of this material\* on the course of experimental canine Type I pneumococcus pneumonia when administered in sufficient quantity to completely neutralize the humoral defense mechanism.

Healthy 10K dogs were used in this study. They were infected by the intrabronchial route using a uniform dose of 0.001 cc of actively growing Type I pneumococci suspended in 1 cc of starch-broth mixture.<sup>1</sup> This quantity was employed since in the experience of this laboratory such dose seldom produces bacteremia and characteristically results in a localized lobar lesion. Five control dogs in this series confirmed this finding. Hourly samples of blood were taken for culture and serum pneumococcal-promoting power.

<sup>4</sup> Craigie, J., and Yen, C. H., *Trans. Roy. Soc. Canada*, 1937, **37**, Sec. V, 79.

\* The SSS used in this study was supplied by the Lederle Laboratories, Inc., through the courtesy of Dr. W. G. Malcolm.

<sup>1</sup> Terrell, E. E., Robertson, O. H., and Coggeshall, L. T., *J. Clin. Invest.*, 1933, **12**, 393.

Observations of the leukocyte count and temperature were recorded at these intervals. Chest roentgenograms were taken in all dogs 24 hours after infection and repeated as indicated.

Using normal dog serum in serum-leukocyte mixtures,<sup>2</sup> pneumococidal action was completely abolished in a dilution of 1:250 SSS. To obtain this concentration in a 10K animal it was necessary to use 1.5 g of SSS. When this dose was administered intravenously the dog immediately developed shock and died within a few hours. The largest intravenous quantity that could be given, compatible with life, was 0.30 g dissolved in 50 cc Locke's solution. This dose produced an immediate decrease in leukocytes to leukopenic levels, followed by a progressive rise until marked leukocytosis was present within 8 to 24 hours. The temperature curve paralleled the white blood cell count. Concentration of the blood, tachycardia and fall in pulse pressure occurred. The effect on the pneumococidal-promoting power of the serum was somewhat variable. Of 32 dogs tested, 18 had complete abolition of this property, 4 had moderate impairment, 7 minimal inhibition and 3 had no demonstrable deviation from normal.

In 11 dogs 0.3 g of SSS was injected 15 minutes after the initiation of infection. Of this group 7 developed overwhelming bacteremia resulting in death. Although 4 dogs recovered, only one maintained a sterile blood stream, the remaining 3 animals showed a transient bacteremia.

The next procedure was to inject 0.30 g of the polysaccharide, allow sufficient time (12 hours) for the body to overcome the shock of its administration and infect the animal while a high titer of SSS was present in the blood stream. Of 9 dogs so treated, 4 ran an uncomplicated course; 2 survived a transitory bacteremia; and 3 developed progressively increasing bacteremia resulting in death.

Five animals were infected and 0.30 g SSS given after a period of 16 hours had elapsed. Well localized lobar lesions were demonstrable in chest X-rays taken before the introduction of polysaccharide. In this series one dog developed a mild transient bacteremia; all recovered.

Lesions in the bacteremic dogs differed strikingly from the controls. The area of infection was circumscribed and limited to a small portion of the infected lobe; cellular reaction was minimal. Phagocytosis, as indicated by the number of intracellular organisms, was markedly lessened and only slight intra-alveolar edema was present. Such small lesions have never been observed previously in experi-

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<sup>2</sup> Robertson, O. H., and Sia, R. H. P., *J. Exp. Med.*, 1924, **39**, 219.

mental canine pneumonia accompanied by bacteremia. In such instances consolidation of at least one lobe occurs and the usual finding is that of multilobar involvement.

To control shock effect as a possible factor in these results, non-specific protein shock was induced in 5 dogs, at the time of infection, by the intravenous injection of peptone and precipitable substance from uninoculated culture media. One developed a mild transient bacteremia; all recovered. Heterologous SSS (Type II and III) was given to 4 dogs. Although bacteremia occurred in all cases (one death in an animal developing multilobar involvement and empyema) the lesions produced were similar to those of the control series and involved the entire infected lobe. Only one dog had complete loss of serum pneumococcal-promoting power which occurred at the time of a demonstrable empyema 24 hours post infection.

*Conclusions.* Intravenous administration of 0.1 g or more per kg of SSS produces death in normal dogs. 0.03 g per kg was found to be compatible with life. Injection of this quantity produced marked alteration in the usual course of the disease. Although serum-leukocyte mixtures did not always show complete abolition of blood pneumococcal power, the presence of this substance in the blood and tissues resulted in overwhelming bacteremia, inability of the dog to localize infection and impaired phagocytosis in the pulmonary lesion.

13287 P

**Neutralizing Antibodies Against St. Louis and Western Equine Encephalitic Viruses in Horses and Fowl.**

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It had previously been noticed that certain serums from healthy domestic fowl in California<sup>1</sup> showed neutralizing antibodies against the Br strain of western equine encephalomyelitic virus. Serums from areas where this disease is endemic appeared to yield more positive results than those from supposedly non-endemic regions. A correlation had also been observed with human serums between the presence of antibodies for both the western equine virus and that

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<sup>1</sup> Howitt, B. F., *J. Inf. Dis.*, 1940, **67**, 177.