

# Effect of *Salmonella Choleraesuis* Infection on Immunity to Hog Cholera

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## SUMMARY

This publication reports six experiments designed to determine the effect of *Salmonella choleraesuis* infection on immunity to hog cholera. In five experiments, swine that had been vaccinated with various types of hog cholera vaccines were simultaneously exposed to *Salmonella* and challenged with virulent hog cholera virus. In one experiment *Salmonella* exposure was made at the time of vaccination.

In the first experiment, pigs vaccinated with a vaccine of swine origin were inadequately protected against hog cholera and it was difficult to assess the effect of *S. choleraesuis* infection on immunity. However, vaccinated pigs that were simultaneously exposed to hog cholera virus and *Salmonella* had a higher mortality rate than pigs exposed to either of the infectious agents alone.

In the second experiment, two other types of vaccines were used. One was a vaccine of tissue culture origin and the other was the simultaneous serum and virulent virus method. There were no losses in any of the lots at time of challenge and reactions in pigs receiving *Salmonella* and virus were essentially the same as those of pigs receiving *Salmonella* alone.

In the third experiment a vaccine of rabbit origin was used in comparison with a vaccine of tissue culture origin. There were no losses at the time of challenge and apparently *Salmonella* infection did not act in a synergistic manner with hog cholera virus.

In Experiment 4, pigs which had been infected with *S. choleraesuis* near the time of vaccination with a vaccine of rabbit origin did not completely withstand challenge. There were losses in pigs challenged with virus alone as well as in those receiving virus and *Salmonella* simultaneously. There was no evidence of synergistic activity between the two infectious agents.

In Experiment 5, pigs with or without prophylactic treatment in the feed were exposed to *Salmonella* at the time of vaccination with a vaccine of rabbit origin. When challenged with hog cholera virus, there was an increase in severity of reaction in pigs which had not received prophylactic treatment but this was not considered to be evidence of *Salmonella* infection interfering with development of immunity to hog cholera.

In Experiment 6, pigs vaccinated with an inactivated vaccine failed to develop satisfactory immunity to hog cholera and evaluation of synergistic activity between *Salmonella* organisms and hog cholera virus could not be made.

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## INTRODUCTION

This bulletin contains the results of a series of experiments conducted with swine to determine the combined effect of *Salmonella choleraesuis* infection and hog cholera virus upon immunity established by various types of hog cholera vaccines. Data were obtained by simultaneously exposing vaccinated swine to both infectious agents, as compared to exposure to a single agent, and determining the subsequent reactions and rate of survival. In some instances *Salmonella* infection was used as a stressor at time of vaccination against hog cholera to study the effect such treatment might have on the developing immunity.

## REVIEW OF LITERATURE

Throughout the history of hog cholera in the United States, the organism *Salmonella choleraesuis* has played a significant supporting role in the disease's symptomology and pathology. It is little wonder that early investigators (8) regarded *S. choleraesuis* as an etiological agent of hog cholera. Even after the discovery of a virus as a causative agent, the frequent presence of this ubiquitous bacillus appeared to suggest more than an accidental relationship with hog cholera.

Numerous authors (7,6,2,1) in discussing post-vaccination breaks, have mentioned *Salmonella* organisms as possibly being responsible for losses because of their close association with hog cholera, but a minimum of critical work has been done to evaluate the exact role of these organisms in the production of the disease.

Early experimental tests (9) to determine the effect of *S. choleraesuis* infection on vaccination of swine with anti-hog cholera serum and virus indicated an enhancement of reaction to the virus. In a more recent report (3) investigators found an apparent adjuvant effect between *S. choleraesuis* and hog cholera virus when studying the routes of transmission of hog cholera. When swine were simultaneously exposed to innocuous doses of *S. choleraesuis* and hog cholera virus per os and on the unbroken skin, hog cholera developed more readily than when virus was given alone.

Preliminary work of the authors (5) of the present paper indicated that *S. choleraesuis* infection either enhanced the virulence of hog cholera virus or interfered with the immunity to the virus when vaccinated swine were challenged with a simultaneous exposure to hog cholera virus and *S. choleraesuis* cultures. A subsequent publication by German workers (4) reported no synergistic activity between *S. choleraesuis* and hog cholera virus in breaking the immunity of native swine that had been vaccinated with two doses of crystal violet vaccine. However, there were losses in the groups that received both infectious agents. These losses were believed to be the result of poor immunity from vaccination rather than from any synergistic activity between the agents.

Following the initial findings of this Station, a series of experimental tests were set up to attempt to determine the effect of *S. choleraesuis* infection on immunity to hog cholera in swine that had been vaccinated with various commercial vaccines.

### PROCEDURE

Animals used in the experimental tests were produced from breeding stock maintained at the University of Missouri Veterinary Medical Research Farm. Sows and gilts were bred in late fall and pigs farrowed in April. The pigs were raised under optimal conditions of sanitation and nutrition and were weaned at six weeks of age. In some instances, the pigs were maintained in concrete pens until the experiment began; other times they were kept in bluegrass pasture. Vaccination with various commercial vaccines was performed when the pigs were approximately eight weeks of age.

In some instances the pigs were exposed to *S. choleraesuis* cultures at the time of vaccination for hog cholera to determine the effect of the exposure upon the developing antibodies to hog cholera. In other cases the exposure to *S. choleraesuis* cultures was performed when the immunity of pigs to hog cholera was challenged with virulent hog cholera virus to study the synergistic effect of *S. choleraesuis* and hog cholera virus on established immunity.

Organisms for the preparation of cultures of *S. choleraesuis* were obtained originally from the Agricultural Research Service, U.S. Department of Agriculture, and were designated as strain 5812 L. The cultures were maintained in lyophilized ampoules until needed. When used, the cultures were inoculated into flasks of beef heart and brain infusion broth and incubated for 24 hours. The resultant growth was reinoculated into further flasks of infusion broth and again incubated for 24 hours. The cultures thus obtained were used to expose experimental swine. Exposure was provided by mixing a measured amount of the culture with a small amount of ground feed. Each pig was isolated and fed this feed-culture mixture.

Virulent hog cholera virus used in the experiments also was obtained from the Agricultural Research Service of the U. S. Department of Agriculture and was procured fresh frozen each time used. Exposure to the virus was accomplish-

ed by injection of 1 ml. of freshly thawed virus intramuscularly into the ham.

Post exposure records were kept of all pigs for at least 14 days following exposure. Daily temperatures, clinical symptoms, and post mortem lesions were recorded in all instances. Temperature readings of 105° F or higher were considered significant in evaluation of reactions to infectious agents. Appropriate control pigs were used in each experiment to prove the virulence of the hog cholera challenge virus.

### EXPERIMENT 1

Thirty-six pigs were available for this experiment. They were raised under pasture conditions. At eight weeks of age 32 were vaccinated with a commercial modified live virus of swine origin<sup>1</sup> given in conjunction with 15 ml. of anti-hog cholera serum. Four remaining pigs were not vaccinated but were isolated from the herd and held for use as controls for later challenge.

Thirty days after vaccination the pigs were brought into isolation facilities and divided into four lots of eight pigs each. Lot 1 was fed minimal doses (0.05 ml and 0.1 ml) of a second 24-hour broth culture of *S. choleraesuis*. Lot 2 was fed the same dosage of *S. choleraesuis* and also injected intramuscularly with 1 ml of virulent hog cholera virus. Lot 3 was injected with 1 ml of hog cholera virus and received no other exposure. Lot 4 pigs were not exposed directly and were later used as contact-exposure pigs for Lot 2. Daily observations and temperatures were taken and recorded on all pigs for two weeks after exposure.

Two susceptible pigs were injected with 1 ml of virulent virus at the same time as the above groups to check on the effectiveness of the virus.

### Results and Discussion

All of the pigs in Lot 1 that were dosed with *S. choleraesuis* alone became ill on the second and third days after dosing and ran a temperature above 105° F. for one or two days (Appendix Table 1). However, all pigs promptly recovered from the effects of the exposure and were moved out of isolation at the end of 14 days.

All pigs in Lot 2 that were dosed with *S. choleraesuis* and injected with hog cholera virus sickened on the second and third days after exposure and continued to become progressively worse until their deaths on the eighth and ninth days after dosing (Appendix Table 2). All of these pigs developed typical symptoms and lesions of hog cholera plus complications with *S. choleraesuis*. Organisms of the genus *Salmonella* were isolated in large numbers and apparently in pure culture from the kidney, spleen, and liver of all of these pigs.

The pigs in Lot 3 that were injected with hog cholera virus alone had very erratic reactions. Seven out of the eight had temperatures of over 105° F on the third and fourth days after injection and proceeded to run a rather typical course of what appeared to be symptoms of hog cholera (Appendix Table 3). Three of

<sup>1</sup>MLV Hog Cholera Vaccine, Fort Dodge, Ia.

these seven eventually recovered after more than two weeks of illness. The remaining four died and had typical lesions of hog cholera. The eighth pig in this group showed no reaction from the infection throughout the experiment.

The pigs in Lot 4 that had not been directly exposed were placed in the pens with sick pigs of Lot 2 to determine if transmission of the syndrome could be accomplished. All eight pigs became ill within two or three days after exposure (Appendix Table 4) and six of them died. They had lesions of hog cholera complicated with salmonellosis. Two pigs recovered.

Two non-vaccinated control pigs that were injected with virulent virus became ill on the fourth day after injection and developed symptoms of hog cholera. These pigs did not run a typical course for the disease. They remained alive for three weeks after injection; at that point one finally died and the other was euthanized because of its moribund condition. Two more non-vaccinated pigs were used during the course of the experiment to establish the presence of hog cholera virus in pigs of Lot 2. This was done by drawing blood from pigs that were dying, filtering the blood through a Seitz filter and injecting the resultant fluid into the two non-vaccinated pigs. Both pigs developed symptoms of cholera, became moribund and were euthanized. At postmortem examination, there were typical lesions of hog cholera.

Apparently the hog cholera vaccine used in this experiment did not establish satisfactory immunity as evidenced by the loss of some pigs in Lot 3 which were challenged with virus alone. This circumstance made it difficult to evaluate the heavy losses in Lot 2. It did appear however that the presence of *Salmonella* contributed to the severity of illness and increased the death losses.

The use of different dosage levels of *Salmonella* did not appear to vary the reaction in any of the lots in which it was used.

## EXPERIMENT 2

Since results of Experiment 1 indicated a failure of the commercial vaccine used, to fully protect swine against a challenge dose of virus even without the presence of *S. choleraesuis*, a second experiment was set up for the two other commercial vaccines.

Fifty pigs were available for Experiment 2. At eight weeks of age they were divided into two groups of 24 pigs each. One group was vaccinated with a commercial virulent virus (restrictions had not yet been placed on the sale of virulent virus) and 30 ml of anti-hog cholera serum. The second group was vaccinated with a hog cholera vaccine of tissue culture origin<sup>2</sup> plus 15 ml of anti-hog cholera serum. Two non-vaccinated pigs were held in isolation for later use as controls on the virulence of the challenge virus.

Following vaccination the two groups of pigs were placed in separate pastures so there was no contact either direct or indirect between the two groups.

When the pigs were 12 weeks old both groups were brought in from pasture for challenge. They were distributed evenly into three lots so that each lot

<sup>2</sup>Alocine Hog Cholera Vaccine, Haver-Lockhart, Kansas City, Missouri.

contained eight pigs from each of the two original groups (chart 1). Pigs in Lot 1 were injected with 1 ml each of virulent virus intramuscularly and given no other treatment. Pigs in Lot 2 were fed 0.5 ml of a second 24-hour broth culture of *S. choleraesuis* and given no other treatment. Pigs in Lot 3 were injected with virus and on the same day exposed to *S. choleraesuis* in the same dosage as Lot 2. Daily temperatures were recorded and observations were made for 14 days after exposure.

CHART 1 - DIVISION OF PIGS FOR PURPOSE OF CHALLENGE

Lots	Immunizing Agents		Method of Exposure
	Tissue Culture Vaccine & Serum	Virulent Virus & Serum	
1	8	8	1 ml virus intramuscularly
2	8	8	0.5 ml <i>S. choleraesuis</i> culture in feed
3	8	8	1 ml virus intramuscularly plus 0.5 ml <i>S. choleraesuis</i> in feed

Two non-vaccinated control pigs were placed in isolation and each was given an intramuscular injection of 1 ml of virulent hog cholera virus to determine the potency of the virus used in the experiment.

### Results and Discussion

There were no apparent reactions in either group of Lot 1 pigs which received virus only. Temperatures remained within normal ranges (Appendix Table 5) and feed consumption did not diminish.

All pigs in Lot 2, which were fed cultures of *S. choleraesuis* had a rise in temperature the second or third day after exposure (Appendix Table 6) and developed a typical syndrome of salmonellosis, characterized by high temperatures, scouring, and anorexia. However, within three or four days the temperatures had returned to near normal and appetites had improved. Scouring continued intermittently for several days longer but eventually it discontinued and all pigs survived.

Pigs in Lot 3, which were exposed to both *S. choleraesuis* and hog cholera virus simultaneously, exhibited essentially the same symptoms as those in Lot 2 (Appendix Table 7). There were no losses.

Two non-vaccinated pigs which were injected with 1 ml each of virus developed typical symptoms of hog cholera and at necropsy had lesions indicative of hog cholera.

Since there was no significant difference in the reaction of pigs in the lot which was dosed with *Salmonella* alone and those in the lot simultaneously ex-



posed to both *Salmonella* and hog cholera virus, it was evident that the combined exposure did not cause a breakdown of the immunity produced by the two vaccines under study.

The increased dosage of *S. choleraesuis* culture over that used in Experiment 1 did not appear to increase the severity of *Salmonella* infection.

### EXPERIMENT 3

This experiment was similar to the previous one except that a different vaccine was used in immunizing a portion of the pigs.

Seventy-two pigs were raised under pasture conditions. At approximately eight weeks of age the pigs were assembled and divided into two groups of 36 pigs each. One group was vaccinated with a vaccine of rabbit origin<sup>3</sup> plus 10-15 ml of antiserum and the second group was vaccinated with a vaccine of tissue culture origin<sup>4</sup> plus 10-15 ml of antiserum. The two groups were then returned to pasture but were maintained in separate pastures which permitted no direct contact or common drainage.

Thirty days after vaccination the two groups were brought in from pasture for challenge. They were divided evenly into three lots so that each lot contained 12 pigs from each of the two original groups. Exposure was provided as outlined in Chart 2.

CHART 2 - DIVISION OF PIGS FOR PURPOSE OF CHALLENGE

Lots	Immunizing Agents		Method of Exposure
	Rabbit origin Vaccine	Tissue Culture Vaccine	
1	12	12	1 ml Virus Intramuscularly
2	12	12	0.3 ml <i>S. choleraesuis</i> Culture
3	12	12	1 ml Virus Intramuscularly plus 0.3 ml <i>S. choleraesuis</i> Culture

Two non-vaccinated control pigs were placed in a separate isolation pen and injected intramuscularly with 1 ml each of virulent hog cholera virus to determine the virulence of the virus.

Daily temperatures and observations were made on all exposed pigs for a period of 14 days following exposure.

### Results and Discussion

Of the pigs in Lot 1 which were exposed to virus alone, only three developed a temperature of 105° F or higher which could be attributed to the ex-

<sup>3</sup>Swivax Hog Cholera Vaccine, Pitman-Moore Co., Indianapolis, Ind.

<sup>4</sup>Alocine Hog Cholera Vaccine, Haver-Lockhart, Kansas City, Mo.

posure (Appendix Tables 8 and 9). Two of these had been vaccinated with a vaccine of rabbit origin and one had been vaccinated with a vaccine of tissue culture origin.

Among the pigs of Lot 2 which had been exposed to *Salmonella* cultures alone, all except two developed temperatures of 105° F or higher within two or three days after exposure (Appendix Tables 10 and 11). There was some inappetence and scouring among the pigs but within three or four days most of the temperatures had returned to normal and no further clinical signs of illness appeared.

The pigs of Lot 3 which had been exposed to both the virus and *Salmonella* cultures developed much the same type of reaction as those exposed to *Salmonella* alone (Appendix Tables 12 and 13). However, they also quickly recovered and experienced no further difficulty.

The two control pigs which had been injected with virulent virus developed typical signs of hog cholera and upon necropsy had lesions of hog cholera.

The results of this experiment verified the findings of Experiment 2. Pigs that acquire strong immunity to hog cholera following vaccination can withstand challenge with hog cholera virus and *Salmonella* infection given singly or in combination.

#### EXPERIMENT 4

Another group of pigs, which had been used earlier on a *Salmonella* enteritis experiment, became available later in the year for further tests.

There were 56 of these pigs which had been raised in concrete-floored pens. They had been vaccinated at eight weeks of age with a vaccine of rabbit origin<sup>5</sup> plus 10 to 15 ml antiserum. They had been exposed to *Salmonella* cultures at ten weeks of age but had all recovered from clinical evidence of the disease.

When these pigs reached 21 weeks of age they were divided into two lots of 28 pigs each. The pigs in Lot 1 were exposed to virulent hog cholera virus by intramuscular injection of 1 ml of virus. The pigs in Lot 2 were injected with 1 ml of virus and, in addition, were fed 0.3 ml of a broth culture of *S. choleraesuis*. Daily temperatures were taken and observations were made on all the pigs for 14 days following the exposures.

#### Results and Discussion

Of the 28 pigs in Lot 1, which were challenged with hog cholera virus alone, 10 developed temperatures of 105° F or higher for one or more days (Appendix Table 14) and three died with symptoms and lesions characteristic of hog cholera. Cultures of the spleen, liver, and kidneys of each of these pigs yielded bacterial infections. One infection was predominately *Salmonella*, a second *Streptococci*, and the third *Pasteurella*.

Among the 28 pigs in Lot 2 which had been challenged with hog cholera virus and exposed to *S. choleraesuis* simultaneously, 22 developed temperatures of

<sup>5</sup>Swivax Hog Cholera Vaccine, Pitman-Moore Co., Indianapolis, Ind.

105° F or higher and three died (Appendix Table 15). These three pigs also had symptoms and lesions of hog cholera plus extensive damage in the gut indicative of *Salmonella* infection. *Salmonella* organisms were readily isolated from various internal organs as well as from the gut of all three.

The immunity produced by the hog cholera vaccine used with these pigs apparently did not completely protect against a standard challenge although it was the same commercial brand of vaccine used in Experiment 3 wherein immunity was adequate. The chief difference between these experiments was that the pigs in Experiment 4 had been maintained on concrete floors all of their lives and had previously been exposed to *Salmonella* infection. The earlier *Salmonella* exposure had been given near the time of vaccination against hog cholera and might conceivably have interfered with the development of strong immunity.

On the basis of the limited test of this experiment there was no indication that *Salmonella* infection acted in a synergistic manner with hog cholera virus to increase the mortality in the lot receiving simultaneous exposure.

### EXPERIMENT 5

In view of our experience in the previous experiment, Experiment 5 was designed to determine the effect of *S. choleraesuis* infection on antibody production for hog cholera by exposing swine to *Salmonella* organisms at the time of vaccination for hog cholera. In addition, the experiment was designed to evaluate the efficacy of a commercial feed additive in modifying the possible interference of *Salmonella* infection with antibody production for hog cholera.

Seventy-two pigs were utilized for the experiment. Following weaning at six weeks, the pigs were divided into four lots of 24 pigs each. Lots 1 and 2 were immediately placed on full feed containing a prophylactic level of a commercial furazolidone<sup>6</sup> and the pigs in Lots 3 and 4 were given full feed without treatment. Two weeks later the pigs were given further treatment as follows:

**Lot 1.** Twenty-four pigs on prophylactic levels of furazolidone were vaccinated with 2 ml of a hog cholera vaccine of rabbit origin<sup>7</sup> and 15 ml of anti-hog cholera serum. In addition, they were each given 0.3 ml of a broth culture of *S. choleraesuis* mixed with a small amount of feed.

**Lot 2.** Twenty-four pigs on prophylactic levels of furazolidone were vaccinated with the same hog cholera vaccine as Lot 1 but not given *Salmonella* cultures.

**Lot 3.** Twenty-four pigs that did not have medication in their feed were vaccinated with the hog cholera vaccine of rabbit origin and 15 ml anti-hog cholera serum; in addition, each pig was given 0.3 ml of a broth culture of *S. choleraesuis* on the feed.

<sup>6</sup>nf-180, Hess & Clark, Ashland, Ohio

<sup>7</sup>Swivax Hog Cholera Vaccine, Pitman-Moore Co.

*Lot 4.* Twenty-four pigs that did not have medication in their feed were vaccinated with the vaccine of rabbit origin and 15 ml anti-hog cholera serum but were not given *Salmonella* cultures.

Daily temperatures were taken for a period of 10 days after vaccination and observations were made for three weeks following. At the end of the observation period the pigs were moved out of isolation into pastures, but those which had received *Salmonella* cultures were not placed in the same pastures as pigs which had not been exposed.

Sixty days later the pigs were brought back into isolation pens and given a challenge dose of 1 ml each of virulent hog cholera virus intramuscularly. Daily temperatures were taken and observations recorded on all pigs for 14 days after injection. Suitable controls were maintained to establish the virulence of the virus.

### Results and Discussion

Pigs which were exposed to *Salmonella* cultures at the time of vaccination for hog cholera, had an increase in body temperature within 48 hours (Appendix Tables 16 & 18). They began scouring within 72 hours after exposure. Within the next few days all of the pigs in both pens exhibited typical symptoms of salmonellosis.

Pigs in Lot 1, which were on a prophylactic level of furazolidone, apparently suffered less reaction than pigs in Lot 3. Only one pig died in Lot 1 whereas six pigs died in Lot 3. Post-mortem lesions in pigs that died were characteristic of *Salmonella* infection, but there was no evidence of hog cholera lesions either grossly or microscopically.

The increased reaction to *Salmonella* exposure over that in previous experiments was believed to be due in part to rearing the pigs in confinement without access to soil or pasture. Another possibility is that the pigs were younger at the time of exposure and may have been more susceptible from this standpoint.

Pigs in Lots 2 and 4, which were vaccinated with a hog cholera vaccine of rabbit origin and anti-hog cholera serum, but were not exposed to *Salmonella* cultures, did not show evidence of reaction during the observation period (Appendix Tables 17 and 19).

Sixty days later, at the time of challenge of the above groups of pigs with virulent hog cholera virus, the pigs in Lot 3 again had the greatest reaction (Appendix Table 22). Of the pigs still remaining in this group, five developed a temperature of 105° F or higher after inoculation and one pig died. Only one pig in Lot 1 had a temperature of 105° F or higher following inoculation and there were no death losses (Appendix Table 20). Among the pigs in Lots 2 and 4 which had not previously been exposed to *Salmonella* cultures, two pigs in Lot 2 and one pig in Lot 4 developed temperatures of 105° F or higher following inoculation with virulent hog-cholera virus (Appendix Tables 21 & 23) but there were no deaths in these groups.

Post-mortem examination of the pig which died in Lot 3 revealed lesions characteristic of both salmonellosis and hog cholera. There was extensive necrotic enteritis in the large intestine and a fibrinonecrotic exudate in the stomach. The submaxillary and mesenteric lymph nodes had peripheral hemorrhages and there were several minute petechiae on the kidney. Extensive broncho-pneumonia was also present and probably contributed to the death of the pig.

Susceptible control pigs inoculated with the challenge virus developed typical symptoms of hog cholera and at death had lesions characteristic of the disease.

There was some evidence of increased morbidity and mortality following virus challenge in pigs of Lot 3 which had been exposed to *Salmonella* at the time of vaccination and had not had the benefit of the drug additive. However, since the majority of the pigs in this lot survived challenge without reaction, this finding was not considered to be indicative of an interference phenomenon. Some of the pigs in the lot were severely stunted from the previous exposure to *Salmonella* and undoubtedly would have been more susceptible to any other type of stress or infectious agent.

## EXPERIMENT 6

This experiment was designed to study the combined effect of *Salmonella* infection and hog cholera virus exposure in pigs that had been vaccinated with an inactivated hog cholera vaccine<sup>8</sup> and to evaluate a feed additive for controlling the possible synergistic action of the two infectious agents. Our purpose in making the trial with an inactivated vaccine was to determine if synergism might be more pronounced with the lower level of immunity produced by such a vaccine.

Seventy-five pigs were available for the experiment. They had been reared in confinement in pens of concrete construction until the beginning of treatment.

Original plans called for vaccination of all pigs with crystal violet vaccine at eight weeks of age, but upon challenge of representative pigs with virulent hog cholera virus, the pigs were found to be resistant, presumably from colostral antibodies.

A subsequent challenge of representative pigs indicated a disappearance of this passive immunity and we proceeded with the vaccination. The ages of pigs at the time of vaccination varied from 9½ weeks to 10½ and 12½ weeks of age. All were given a 5ml dose of crystal violet vaccine subcutaneously. Following vaccination, the pigs were placed on bluegrass pastures for a period of six weeks. At the end of this period, they were brought back into isolation and divided into three lots on the basis of age at vaccination, weight, and litter designation. Treatment of each lot was as follows:

*Lot 1* contained 25 pigs which were injected intra-muscularly with 1 ml virulent hog cholera virus. On the same day they were fed an infective dose of *S. choleraesuis* organisms with a small amount of feed.

<sup>8</sup>Crystal Violet Glycerol vaccine furnished by the National Animal Disease Laboratory, Ames, Iowa.

*Lot 2* contained 25 pigs which were given the same exposure as *Lot 1*. The only variation was that this group had been placed on feed containing furazolidone<sup>9</sup> one week prior to exposure. The pigs continued on this medication for three weeks following exposure.

*Lot 3* contained 25 pigs which were injected with virus but given no other treatment. This lot served as a control for the other two lots.

Four non-vaccinated pigs of the same age and breeding were placed in an isolation pen and each was inoculated with 1 ml of virus to determine the virulence of the virus.

### Results and Discussion

Within 48 hours after inoculation of pigs in *Lots 1* and *2* with *Salmonella* cultures and virulent hog cholera virus, 66% of the pigs in each lot had temperatures of 105° F or higher (Appendix Tables 24 & 25). Within the next 48 hours all pigs except one pig in *Lot 1* and four pigs in *Lot 2* had temperature increases. Only three pigs in *Lot 3*, which received virus only, had a temperature rise within 48 hours (Appendix Table 26). However, by the fourth day all but three pigs of *Lot 3* had temperatures of 105° F or higher.

Clinical symptoms appeared in all three lots by the fourth day with severe scouring predominating in *Lots 1* and *2* and weakness and inappetance in *Lot 3*. Death losses were quite high in all three groups. By the end of two weeks post inoculation, 80% of the pigs in *Lot 1*, 76% of *Lot 2*, and 84% of *Lot 3* had died.

Lesions of hog cholera were evident in all pigs that died and those which had received *S. choleraesuis* organisms in addition to virus, also had lesions of *Salmonella* enteritis.

The apparent failure of crystal violet vaccine to protect the pigs in this experiment was believed to be associated with a high level of antibody for hog cholera in the pigs at time of vaccination. The dams of these pigs had been used on an experiment the year before involving a challenge of their immunity with live virus. Apparently this had caused the sows to carry high antibody levels for hog cholera at farrowing time and transmit this to their offspring. Though a representative number of these pigs proved susceptible to a standard challenge dose of hog cholera virus prior to vaccination, there appeared to be sufficient resistance to prevent immunization with an inactivated vaccine.

Because of the high mortality rate in all three lots, it was impossible to evaluate the synergistic effect, if any, of *Salmonella* infection when given to pigs at the time of challenge with hog cholera virus.

### CONCLUSIONS

According to evidence presented in this publication, pigs that are immunized against hog cholera with a product that will protect against a standard challenge dose of virulent hog cholera virus, will not lose that protection when *Salmonella*

<sup>9</sup>nf-180, Hess and Clark, Ashland, Ohio

*choleraesuis* exposure is given simultaneously with the challenge. However, there was evidence that *Salmonella* infection increased the severity of reaction at challenge in pigs that were not completely protected against hog cholera. This was believed to be an additive effect rather than a synergistic activity between the two infectious agents.

*S. choleraesuis* infection induced at time of vaccination with a hog cholera vaccine of rabbit origin did not significantly interfere with establishment of immunity to hog cholera. Slight differences in morbidity and mortality at challenge were considered to be a result of stunting of some pigs from a previous exposure to *Salmonella* infection.

#### REFERENCES

1. Dunne, H. W.: Breaks Following Vaccination with Attenuated Hog Cholera Vaccines. J.A.V.M.A., 138, (1961): 311-316.
2. Hell, Henry: Early Research and Present-Day Problems in Hog Cholera Immunization. J.A.V.M.A., 91, (1937): 544-550.
3. Hughes, Richard W., and Gustafson, Donald P.: Some Factors that may Influence Hog Cholera Transmission. Am. J. Vet. Res., 21, (1960): 464-471.
4. Pehl, K. H., and Benndorf, E.: Influence of Acute Infection with *Salmonella choleraesuis* or Piglet Influenza Virus on Immunity to Swine Fever Produced by Crystal Violet Vaccine. Arch. Exp. Vet. Med., 16, (1962): 211-223.
5. Rodabaugh, D. E., Elder, Cecil, and Wright, H. B.: Factors Influencing Immunity in Hog Cholera Vaccination. J.A.V.M.A., 136, (1960): 617-621.
6. Spence, J. H.: Problems Confronting a Practitioner in the Application of the Immunizing Treatment Against Hog Cholera. J.A.V.M.A., 84, (1934): 399-420.
7. Steel, E. R.: Some Troubles Met in Immunizing Against Hog Cholera. J.A.V.M.A., 63, (1923): 52-59.
8. U.S. Bureau of Animal Industry: Second Annual Report, (1885): 184-246.
9. U.S. Bureau of Animal Industry: 45th Annual Report, (1928): 20.

## APPENDIX

TABLE 1 - TEMPERATURES\* OF PIGS DOSED WITH S. CHOLERAESUIS ALONE (LOT 1, EXPERIMENT 1)

Pig No.	Days Post-Inoculation															Remarks
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
5	3.0	2.0	3.4	<u>6.8</u>	4.2	2.8	<u>5.4</u>	2.0	2.4	2.0	1.6	1.6	1.0	2.0	1.6	Survived
6	3.0	2.4	3.0	<u>7.4</u>	2.8	1.6	4.0	2.0	2.4	2.4	2.0	2.4	3.2	4.0	4.4	"
7	4.0	3.6	2.8	<u>6.4</u>	1.8	2.6	3.8	1.0	2.6	1.8	1.8	2.0	3.5	4.0	<u>5.2</u>	"
12	4.4	3.6	<u>5.4</u>	<u>7.2</u>	4.2	<u>5.0</u>	3.8	2.6	4.0	2.6	<u>5.4</u>	3.0	3.0	4.0	<u>6.6</u>	Euthanized**
17	3.0	3.4	<u>6.0</u>	<u>5.4</u>	4.2	<u>2.0</u>	4.0	2.6	3.6	2.2	<u>2.0</u>	2.2	1.4	2.0	<u>1.2</u>	Survived
21	3.0	3.2	<u>7.0</u>	<u>5.8</u>	3.8	4.6	4.0	2.8	3.4	2.2	3.0	2.8	2.0	1.6	3.2	"
25	3.6	2.4	2.2	<u>5.8</u>	<u>5.2</u>	3.8	3.4	3.4	2.0	2.0	3.0	1.0	1.6	2.0	2.2	"
29	2.6	2.6	3.0	<u>6.0</u>	<u>3.2</u>	1.6	3.6	2.6	2.8	2.0	3.0	3.2	2.0	2.6	1.2	"

Significant temperatures are underlined for convenience in evaluating results.

\* Temperatures are recorded as the number of degrees over 100° F.

\*\* Because of abscess. No lesions of Salmonellosis.



TABLE 2 - TEMPERATURES\* OF PIGS DOSED WITH *S. CHOLERAESUIS* AND INOCULATED WITH HOG COLERA VIRUS  
(LOT 2, EXPERIMENT 1)

Pig No.	Days Post-Inoculation														Remarks	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13		14
10	3.2	4.4	3.2	<u>6.6</u>	<u>6.4</u>	<u>6.2</u>	<u>6.8</u>	<u>6.8</u>	--	--	--	--	--	--	--	Died 8 days p.i.
15	3.0	3.8	<u>5.4</u>	<u>6.0</u>	<u>6.2</u>	<u>7.2</u>	<u>7.8</u>	<u>6.6</u>	<u>7.6</u>	--	--	--	--	--	--	Died 9 days p.i.
16	3.2	3.8	<u>6.0</u>	<u>6.0</u>	<u>6.4</u>	<u>6.4</u>	<u>6.8</u>	<u>7.6</u>	--	--	--	--	--	--	--	Died 8 days p.i.
18	4.2	3.8	<u>6.0</u>	<u>7.8</u>	<u>8.0</u>	<u>7.0</u>	<u>7.4</u>	<u>8.4</u>	--	--	--	--	--	--	--	Died 8 days p.i.
23	3.4	3.0	<u>4.0</u>	<u>6.6</u>	<u>6.0</u>	<u>7.0</u>	<u>7.6</u>	<u>7.8</u>	--	--	--	--	--	--	--	Died 8 days p.i.
30	4.2	3.6	<u>6.2</u>	<u>7.0</u>	<u>7.2</u>	<u>5.4</u>	<u>6.2</u>	<u>6.4</u>	--	--	--	--	--	--	--	Euthanized 8 days p.i.
37	4.2	3.0	<u>4.8</u>	<u>7.2</u>	<u>7.0</u>	<u>7.2</u>	<u>7.4</u>	<u>7.6</u>	--	--	--	--	--	--	--	Died 8 days p.i.
39	3.8	<u>5.6</u>	<u>5.2</u>	<u>7.6</u>	<u>6.8</u>	<u>6.6</u>	<u>7.0</u>	<u>7.2</u>	<u>5.2</u>	--	--	--	--	--	--	Died 9 days p.i.

Significant temperatures are underlined for convenience in evaluating results. p.i.=post-inoculation.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 3 - TEMPERATURES\* OF PIGS INOCULATED WITH HOG CHOLERA VIRUS ALONE (LOT 3, EXPERIMENT 1)

Pig No.	Days Post-Inoculation														Remarks	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13		14
2	2.0	3.4	3.0	4.0	<u>5.0</u>	<u>6.4</u>	<u>6.0</u>	<u>5.6</u>	<u>6.4</u>	<u>6.0</u>	<u>5.6</u>	<u>6.0</u>	<u>7.4</u>	4.2	<u>5.2</u>	Recovered
3	2.4	2.6	3.0	3.2	<u>5.4</u>	<u>6.4</u>	4.2	<u>5.8</u>	<u>7.2</u>	<u>6.2</u>	<u>7.0</u>	<u>7.0</u>	<u>5.2</u>	<u>6.0</u>	<u>5.8</u>	Recovered
9	2.0	3.6	3.0	3.2	<u>2.0</u>	<u>2.6</u>	2.8	3.6	3.0	2.2	4.4	4.0	3.0	4.0	3.0	No reaction
14	2.6	4.2	4.2	<u>6.0</u>	<u>6.8</u>	4.4	<u>6.0</u>	3.6	5.2	5.4	4.0	4.0	3.0	<u>6.0</u>	2.4	Recovered
19	3.0	3.6	3.2	4.0	4.0	<u>6.8</u>	<u>5.2</u>	<u>7.0</u>	<u>6.4</u>	<u>6.2</u>	<u>6.0</u>	<u>5.8</u>	<u>5.4</u>	4.4	4.0	Died 17 days p.i.
24	2.2	4.0	3.4	3.2	4.4	<u>6.0</u>	3.6	<u>7.0</u>	<u>6.0</u>	<u>5.6</u>	<u>5.6</u>	<u>5.6</u>	<u>6.0</u>	<u>7.0</u>	<u>5.8</u>	Euthanized 22 days p.i.
27	2.8	3.4	3.0	4.2	<u>6.0</u>	<u>6.2</u>	<u>5.0</u>	<u>6.0</u>	<u>6.6</u>	<u>5.6</u>	<u>6.6</u>	<u>6.0</u>	<u>6.0</u>	<u>6.8</u>	<u>6.2</u>	Died 26 days p.i.
31	3.2	3.0	3.8	4.0	<u>5.8</u>	<u>6.6</u>	<u>5.0</u>	<u>6.6</u>	<u>6.0</u>	<u>6.0</u>	<u>6.4</u>	<u>5.2</u>	--	--	--	Died 12 days p.i.

Significant temperatures are underlined for convenience in evaluating results.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 4 - TEMPERATURES\* OF PIGS PEN-EXPOSED TO PIGS IN PEN 2 (LOT 4, EXPERIMENT 1)

Pig No.	Days Post-Exposure														Remarks	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13		14
1	3.4	3.4	1.8	<u>6.8</u>	<u>6.2</u>	<u>5.0</u>	3.6	2.4	4.0	3.4	3.4	2.0	2.8	2.4	2.6	Recovered
4	2.4	2.2	2.4	<u>6.8</u>	<u>6.4</u>	<u>6.2</u>	<u>7.0</u>	<u>6.0</u>	<u>5.0</u>	<u>6.4</u>	<u>6.0</u>	4.6	4.6	0.0	--	Died 14 days p.e.
13	2.2	2.6	<u>6.2</u>	<u>5.6</u>	<u>5.2</u>	<u>5.0</u>	<u>6.0</u>	<u>6.0</u>	<u>6.0</u>	<u>5.4</u>	<u>7.8</u>	<u>6.0</u>	<u>5.2</u>	<u>6.0</u>	6.2	Died 15 days p.e.
20	3.4	4.4	3.2	<u>7.0</u>	<u>6.8</u>	<u>7.4</u>	<u>7.0</u>	<u>7.4</u>	<u>6.0</u>	--	--	--	--	--	--	Died 9 days p.e.
26	<u>6.0</u>	<u>5.8</u>	2.8	3.2	<u>7.0</u>	<u>6.0</u>	<u>7.0</u>	<u>6.2</u>	<u>7.4</u>	<u>5.2</u>	--	--	--	--	--	Died 10 days p.e.
28	3.2	2.6	<u>6.8</u>	<u>8.0</u>	<u>5.4</u>	4.6	<u>7.2</u>	<u>6.3</u>	<u>5.5</u>	<u>6.8</u>	<u>7.6</u>	<u>7.6</u>	<u>0.0</u>	--	--	Died 12 days p.e.
32	1.0	3.4	2.0	<u>6.4</u>	3.0	3.0	<u>7.4</u>	1.8	3.5	3.0	2.6	1.4	2.0	2.8	2.6	Recovered
36	4.6	<u>5.0</u>	3.4	<u>6.4</u>	<u>6.8</u>	<u>7.8</u>	4.4	<u>6.2</u>	<u>7.4</u>	<u>7.8</u>	<u>6.4</u>	--	--	--	--	Died 11 days p.e.

Significant temperatures are underlined for convenience in evaluating results. p.e.=post-exposure.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 5 - TEMPERATURES\* OF PIGS INOCULATED WITH VIRUS ALONE (LOT 1, EXPERIMENT 2)

Pig No.	Days Post-Inoculation															Remarks	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
48	3.6	2.4	2.0	2.4	2.0	2.2	2.0	1.6	1.2	2.0	2.0	1.0	1.6	2.0	2.0	Survived " } " } " } " } " } " } " } " }	Serum and virus vaccination
50	3.2	3.0	3.5	2.5	1.6	1.8	2.0	1.6	1.0	1.4	1.0	1.2	0.0	1.0	0.0		
52	2.0	3.0	1.4	0.8	2.0	1.6	3.0	1.4	1.6	2.0	2.2	2.0	0.4	1.6	2.6		
53	2.0	1.8	1.0	2.2	1.2	2.2	1.8	2.0	1.2	1.6	2.0	2.0	0.6	1.4	1.4		
58	4.0	3.4	2.2	0.2	1.2	1.0	1.0	1.4	0.6	0.6	1.6	1.6	0.0	1.0	2.0		
62	2.0	0.4	0.0	2.0	1.2	1.0	2.6	0.2	0.0	2.2	2.0	1.0	0.0	1.0	0.0		
67	3.4	1.0	1.0	2.0	2.0	2.0	2.4	4.2	1.0	2.2	1.4	1.0	1.0	0.0	1.0		
68	2.4	1.0	0.2	1.2	0.6	1.4	1.2	1.2	0.0	1.6	1.0	1.2	0.0	2.0	1.0		
75	2.0	1.4	0.0	2.0	1.0	1.6	2.0	0.6	2.2	1.6	1.6	1.4	0.0	3.0	3.6	" } " } " } " } " } " } " } " }	Vaccine of tissue culture origin
84	3.0	3.0	2.0	0.8	2.0	1.0	1.0	1.6	0.0	2.0	2.2	2.0	1.0	0.4	0.4		
88	3.4	1.6	2.0	1.6	2.4	1.6	2.0	1.0	1.4	1.6	2.0	1.4	1.0	1.8	1.4		
93	2.8	1.0	2.4	2.0	1.0	1.2	2.4	1.2	1.2	1.8	1.2	2.0	0.4	2.0	2.6		
100	2.0	1.6	1.0	1.8	1.0	2.0	1.4	0.0	0.8	1.2	1.0	2.0	0.0	1.0	3.0		
102	2.0	2.0	1.4	0.6	2.4	1.2	2.4	1.6	0.4	1.8	2.4	1.0	1.0	2.0	1.2		
103	2.4	1.4	0.0	1.2	2.0	2.0	3.8	1.0	0.8	2.0	2.0	1.2	1.2	1.4	0.6		
104	3.2	1.2	0.2	1.0	3.4	1.8	3.0	1.6	0.0	1.0	2.2	1.6	1.0	2.0	0.0		

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 6 - TEMPERATURES\* OF PIGS DOSED WITH S. CHOLERAESUIS ALONE (LOT 2, EXPERIMENT 2)

Pig No.	Days Post-Inoculation															Remarks	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
41	2.0	1.2	<u>5.8</u>	4.0	3.4	<u>5.2</u>	3.4	3.4	2.6	2.6	2.2	2.8	2.2	1.4	0.8	Survived	} Serum and virus vaccination
44	2.8	2.0	<u>5.8</u>	2.0	3.8	4.4	2.4	2.4	3.0	2.0	1.0	2.2	2.0	1.6	2.6	"	
46	2.4	1.0	<u>4.0</u>	<u>6.0</u>	4.0	3.8	2.4	2.2	3.8	3.0	1.0	1.2	0.6	2.4	3.0	"	
47	2.4	1.4	<u>6.0</u>	<u>3.0</u>	1.6	3.2	2.6	2.2	2.4	1.8	2.0	1.0	2.0	1.0	2.0	"	
49	2.0	1.8	<u>5.8</u>	3.6	4.0	<u>5.4</u>	<u>5.0</u>	4.0	3.6	3.0	3.0	3.4	2.2	2.4	2.0	"	
61	3.0	4.0	<u>5.6</u>	4.4	3.0	<u>5.2</u>	<u>3.2</u>	3.0	2.6	0.0	2.8	2.4	2.4	2.0	2.6	"	
72	2.7	2.8	<u>6.6</u>	<u>5.2</u>	4.2	<u>6.8</u>	<u>6.6</u>	3.2	2.2	2.0	1.6	2.6	1.6	1.8	2.0	"	
73	3.4	2.6	<u>6.4</u>	<u>5.4</u>	4.0	4.4	3.4	1.4	0.6	1.0	2.0	1.6	2.6	1.8	3.0	"	
59	3.2	2.4	<u>5.4</u>	<u>3.0</u>	4.0	4.0	4.0	2.0	3.8	2.4	3.0	2.6	1.0	1.0	2.0	"	
81	4.0	0.6	<u>4.6</u>	4.2	4.0	4.4	3.0	3.0	4.4	3.0	3.6	1.0	2.0	3.0	3.0	"	
83	3.0	2.2	<u>7.0</u>	<u>5.2</u>	4.8	<u>6.0</u>	4.2	4.4	<u>5.0</u>	4.0	3.4	2.4	2.6	2.0	3.0	"	
85	2.0	1.0	<u>5.0</u>	<u>3.0</u>	3.0	<u>3.8</u>	3.0	2.0	<u>3.8</u>	2.6	3.0	1.6	1.6	2.0	0.0	"	
86	3.6	2.2	<u>3.0</u>	<u>5.0</u>	<u>5.4</u>	<u>5.0</u>	3.4	3.0	3.0	4.0	2.6	2.4	2.0	2.0	3.0	"	
87	3.8	2.6	<u>5.2</u>	<u>4.6</u>	<u>4.4</u>	<u>5.6</u>	3.4	4.0	2.4	2.2	3.0	3.0	2.0	2.4	3.4	"	
95	3.4	1.4	<u>4.6</u>	<u>6.4</u>	4.4	<u>5.4</u>	4.0	4.0	4.0	--	2.6	2.8	2.0	0.2	0.0	"	
96	3.0	2.6	1.8	<u>6.2</u>	3.6	4.2	3.6	3.4	3.0	1.6	<u>6.4</u>	1.4	4.0	2.4	2.0	"	

Significant temperatures are underlined for convenience in evaluating results.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 7 - TEMPERATURES\* OF PIGS INOCULATED WITH VIRUS AND DOSED WITH  
S. CHOLERAESUIS SIMULTANEOUSLY (LOT 3, EXPERIMENT 2)

Pig No.	Days Post-Inoculation														Remarks	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13		14
42	1.4	3.8	4.4	3.0	3.2	3.6	3.2	2.0	1.2	2.0	2.0	1.0	0.0	1.6	1.6	Survived
43	2.2	3.6	4.4	<u>5.0</u>	4.8	3.2	4.0	3.8	2.4	2.2	2.4	1.8	2.0	2.2	0.6	"
51	3.0	2.4	<u>5.0</u>	<u>3.8</u>	3.4	2.0	2.2	2.0	2.0	1.8	2.0	3.0	2.8	2.2	0.4	"
56	2.4	2.6	<u>6.8</u>	4.6	3.8	4.0	2.8	3.0	3.2	4.0	3.4	2.0	2.2	3.0	2.0	"
60	3.0	1.2	<u>5.2</u>	3.4	3.8	4.0	3.8	4.0	3.8	4.0	3.2	3.8	2.2	1.0	1.0	"
64	1.4	1.2	<u>5.0</u>	4.0	4.2	<u>5.0</u>	3.0	3.2	<u>5.0</u>	4.0	3.0	2.0	1.0	2.0	1.0	"
69	3.4	3.0	4.4	4.8	<u>5.4</u>	<u>5.6</u>	4.0	4.4	<u>3.2</u>	4.6	4.6	3.4	3.4	0.4	3.0	"
77	4.0	3.8	<u>6.8</u>	<u>5.0</u>	<u>5.0</u>	<u>3.2</u>	4.0	<u>5.0</u>	2.4	3.0	2.0	0.6	2.6	1.0	3.0	"
71	1.4	3.0	<u>5.8</u>	<u>5.8</u>	<u>5.0</u>	4.4	4.4	2.0	2.2	3.2	3.2	2.4	2.8	3.0	2.4	"
78	3.2	2.6	4.6	4.0	<u>5.0</u>	4.2	3.0	3.6	3.2	4.0	2.6	2.8	1.0	1.2	2.4	"
79	2.4	3.8	<u>5.2</u>	4.4	<u>3.6</u>	2.4	3.0	0.8	3.2	3.6	3.2	2.0	2.0	1.0	0.8	"
80	2.6	2.4	<u>6.0</u>	<u>5.4</u>	<u>5.0</u>	3.4	<u>6.4</u>	4.4	1.8	2.4	<u>5.4</u>	3.0	3.0	3.2	2.4	"
82	3.0	1.6	<u>6.8</u>	<u>6.2</u>	<u>5.4</u>	<u>5.4</u>	3.0	3.0	2.4	3.0	3.0	3.0	2.0	1.0	2.4	"
97	3.0	3.2	<u>5.4</u>	4.8	<u>5.8</u>	<u>5.0</u>	3.6	4.4	3.4	3.0	2.0	2.4	3.0	3.4	1.0	"
98	3.0	4.2	<u>1.4</u>	<u>7.0</u>	<u>6.6</u>	<u>5.0</u>	<u>5.4</u>	4.4	3.2	4.6	4.4	3.0	3.2	1.4	2.0	"
99	3.2	<u>5.2</u>	4.0	<u>6.8</u>	<u>6.8</u>	<u>5.2</u>	4.6	<u>5.4</u>	3.2	2.2	3.0	2.0	2.4	2.4	1.6	"

Significant temperatures are underlined for convenience in evaluating results.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 8 - TEMPERATURES\* OF PIGS VACCINATED WITH RABBIT ORIGIN VACCINE  
AND INOCULATED WITH VIRUS ALONE (LOT 1, EXPERIMENT 3)

Pig No.	<u>Days Post-Inoculation</u>														Remarks	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13		14
1	3.2	3.4	2.0	1.6	2.2	2.0	2.8	2.4	2.4	2.0	2.0	0.6	2.0	1.2	1.4	Survived
10	3.2	3.6	2.6	2.2	2.0	2.2	2.0	2.6	2.4	2.4	2.0	1.6	2.0	2.4	1.6	"
16	3.6	3.8	2.6	1.6	1.6	2.0	2.0	2.8	1.8	1.6	2.0	1.2	1.8	1.2	0.8	"
21	4.0	3.0	3.0	2.4	2.4	1.6	2.8	3.8	2.4	1.6	2.4	2.2	1.2	2.0	1.6	"
24	3.0	2.2	2.6	2.4	3.0	3.8	2.8	3.0	2.0	2.6	1.4	1.6	2.2	3.8	2.8	"
36	<u>5.0</u>	3.6	3.0	2.6	2.4	2.2	2.8	3.0	2.8	3.0	1.6	1.8	2.0	2.0	2.6	"
39	<u>4.4</u>	3.0	3.0	2.6	4.0	3.0	3.2	2.6	3.0	2.4	0.6	2.0	4.6	3.0	2.0	"
46	4.0	2.6	3.6	1.4	3.6	2.4	4.6	1.8	4.0	4.2	<u>7.6</u>	<u>5.6</u>	<u>6.2</u>	4.2	3.4	"
57	3.6	4.2	2.8	1.8	3.0	2.8	3.2	2.0	2.0	2.0	<u>1.2</u>	2.0	<u>1.0</u>	1.4	2.0	"
58	3.8	3.6	3.4	2.0	3.2	2.6	2.4	3.6	3.4	2.4	2.0	2.0	1.8	2.4	1.6	"
66	4.0	<u>5.0</u>	2.0	1.6	2.4	1.6	2.4	2.2	3.4	2.4	2.0	2.4	1.4	2.2	1.4	"
69	3.4	<u>5.0</u>	1.6	1.4	1.2	1.2	1.6	3.8	2.4	2.6	1.2	2.2	1.0	1.8	1.6	"

Significant temperatures are underlined for convenience in evaluating results.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 9 - TEMPERATURES\* OF PIGS VACCINATED WITH A TISSUE CULTURE VACCINE AND INOCULATED WITH VIRUS ALONE (LOT 1, EXPERIMENT 3)

Pig No.	Days Post-Inoculation														Remarks	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13		14
4	<u>5.0</u>	2.8	2.8	2.8	2.2	2.0	2.0	2.6	1.6	2.0	1.6	1.6	1.8	2.0	1.8	Survived
6	3.4	3.2	2.8	2.4	2.6	3.2	3.0	3.6	2.0	2.0	2.4	2.0	0.4	1.4	1.6	"
14	3.8	3.0	3.0	2.2	3.0	2.0	3.2	3.0	2.0	2.0	3.2	2.4	3.2	1.8	2.0	"
22	3.6	2.4	3.2	1.8	2.0	2.6	1.6	2.0	1.6	1.8	4.0	2.4	2.0	1.4	2.0	"
31	3.4	3.0	2.0	2.6	2.8	2.0	3.0	3.2	3.4	2.0	1.0	1.4	2.0	2.2	1.4	"
35	3.8	3.6	3.8	2.8	3.0	1.8	3.0	3.6	2.0	2.4	1.0	2.0	2.2	1.0	2.4	"
41	3.6	3.2	3.4	2.4	3.0	<u>5.6</u>	4.0	4.2	2.2	3.0	2.6	2.4	1.6	2.6	2.4	"
49	4.0	3.2	3.4	2.4	2.0	<u>3.0</u>	3.2	3.4	2.4	2.0	2.0	2.0	2.0	1.8	2.0	"
59	4.2	3.6	3.0	2.6	2.4	2.2	3.0	3.6	1.4	1.6	2.0	3.0	3.8	4.0	2.2	"
62	2.6	3.2	3.8	1.8	2.8	3.2	2.2	2.0	2.2	2.0	1.0	1.4	2.6	2.4	2.6	"
73	3.2	3.2	2.8	2.8	2.6	1.8	2.0	3.2	2.0	2.0	2.2	1.8	1.4	2.0	1.6	"
78	<u>5.0</u>	3.0	1.8	2.6	3.0	3.0	2.4	3.0	3.2	3.0	1.4	2.4	1.8	2.0	4.0	"

Significant temperatures are underlined for convenience in evaluating results.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 10 - TEMPERATURES\* OF PIGS VACCINATED WITH RABBIT ORIGIN VACCINE  
AND EXPOSED TO S. CHOLERAESUIS ALONE (LOT 2, EXPERIMENT 3)

Pig No.	Days Post-Inoculation															Remarks
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
3	3.0	3.4	<u>7.6</u>	<u>7.6</u>	<u>5.4</u>	4.0	2.8	2.6	2.8	3.0	2.0	2.4	2.6	2.0	2.2	Survived
8	3.4	3.0	3.4	4.6	<u>6.0</u>	1.0	3.2	3.0	1.6	2.0	2.0	0.8	1.6	2.0	1.8	"
13	2.4	3.2	<u>5.0</u>	<u>5.0</u>	<u>3.4</u>	3.2	1.8	2.2	1.8	2.2	2.0	2.0	1.4	2.6	2.4	"
19	3.2	3.0	<u>7.4</u>	<u>7.2</u>	<u>5.6</u>	4.2	4.0	4.6	4.0	3.0	2.6	4.2	1.8	2.6	2.2	"
27	4.0	3.4	<u>4.0</u>	<u>7.2</u>	<u>4.6</u>	<u>5.4</u>	4.2	4.0	2.0	2.8	2.0	2.0	3.0	2.4	2.4	"
30	2.6	3.0	<u>5.0</u>	<u>7.4</u>	<u>8.4</u>	<u>4.0</u>	4.0	4.6	3.4	3.0	3.0	3.4	3.6	2.4	2.6	"
42	4.6	4.0	<u>3.2</u>	<u>7.6</u>	<u>4.2</u>	2.8	2.8	3.2	3.2	2.6	2.0	1.0	2.6	2.6	0.4	"
48	2.8	3.8	<u>6.2</u>	<u>5.0</u>	<u>6.4</u>	2.4	3.0	2.0	3.0	2.8	3.0	2.6	2.2	2.0	2.0	"
56	4.2	4.2	<u>7.4</u>	<u>4.2</u>	<u>3.2</u>	<u>5.6</u>	3.8	2.8	5.4	2.4	3.4	2.8	<u>5.0</u>	2.2	1.4	"
61	2.8	4.2	<u>8.0</u>	<u>5.6</u>	<u>5.0</u>	<u>3.0</u>	1.2	3.0	3.2	1.6	2.2	1.4	1.6	1.4	1.6	"
65	4.2	4.0	<u>3.6</u>	<u>6.6</u>	<u>6.6</u>	<u>5.0</u>	3.4	4.4	3.0	2.2	2.8	2.4	2.4	2.0	2.8	"
70	2.8	4.2	<u>7.2</u>	<u>5.8</u>	<u>6.8</u>	<u>4.2</u>	2.6	2.0	2.4	3.8	2.2	1.0	1.4	2.4	1.8	"

Significant temperatures are underlined for convenience in evaluating results.

\* Temperatures are recorded as the number of degrees over 100° F.



TABLE 11 - TEMPERATURES\* OF PIGS VACCINATED WITH TISSUE CULTURE VACCINE AND DOSED WITH S. CHLOERAESUIS ALONE (LOT 2, EXPERIMENT 3)

Pig No.	Days Post-Exposure														Remarks	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13		14
5	3.2	2.8	4.0	<u>6.4</u>	4.2	4.2	4.0	3.0	3.0	3.0	2.4	2.2	2.0	2.6	1.6	Survived
11	3.0	3.0	3.4	<u>7.6</u>	2.4	3.6	2.6	2.0	2.6	1.6	2.0	2.0	1.8	2.2	2.2	"
15	2.4	2.8	3.0	2.8	<u>6.4</u>	2.4	<u>5.8</u>	1.4	2.4	2.4	2.2	2.0	2.2	2.4	1.6	"
23	3.4	3.2	3.8	<u>6.4</u>	<u>3.6</u>	3.2	2.4	2.2	2.6	1.6	2.0	2.0	1.4	2.0	2.2	"
26	5.0	3.2	<u>7.4</u>	4.8	<u>5.2</u>	4.8	3.2	3.6	4.6	4.0	3.2	3.0	2.6	2.0	1.8	"
37	3.2	3.6	<u>7.0</u>	4.8	6.8	4.2	3.4	<u>5.2</u>	<u>5.0</u>	2.2	3.8	4.0	3.2	3.2	2.4	"
47	2.8	3.0	<u>8.2</u>	<u>6.8</u>	<u>6.4</u>	<u>6.2</u>	4.6	<u>6.0</u>	4.2	3.8	3.4	3.4	2.0	3.0	2.4	"
50	4.4	4.8	<u>3.2</u>	<u>3.0</u>	<u>4.0</u>	<u>3.2</u>	2.8	<u>3.2</u>	3.0	2.4	2.4	3.0	3.0	2.6	3.2	"
52	4.4	3.4	3.0	2.6	4.4	3.0	3.0	3.6	2.6	2.8	1.6	0.6	2.2	2.2	2.4	"
67	3.6	3.2	<u>7.0</u>	<u>5.2</u>	4.8	<u>5.4</u>	3.6	3.6	2.4	2.2	2.6	1.4	1.0	2.4	2.0	"
74	2.2	2.2	<u>8.0</u>	<u>7.0</u>	<u>7.0</u>	<u>4.2</u>	2.0	3.6	3.0	2.0	2.0	2.8	2.4	2.4	2.0	"
76	4.4	3.4	<u>5.0</u>	<u>7.4</u>	4.8	<u>5.8</u>	2.6	3.8	2.0	1.8	2.4	1.0	1.6	2.4	2.2	"

Significant temperatures are underlined for convenience in evaluating results.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 12 - DAILY TEMPERATURES\* OF PIGS VACCINATED WITH RABBIT ORIGIN VACCINE AND SIMULTANEOUSLY EXPOSED TO VIRUS AND *S. CHOLERAESUIS* (LOT 3, EXPERIMENT 3)

Pig No.	Days Post-Exposure														Remarks	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13		14
7	3.4	3.4	<u>8.0</u>	<u>5.6</u>	4.6	3.8	2.8	3.4	2.4	3.8	2.6	4.8	2.0	1.8	2.0	Survived
12	3.2	3.0	<u>3.2</u>	<u>5.8</u>	4.6	2.2	1.6	2.0	2.4	2.0	1.8	0.4	1.2	2.8	1.4	"
18	2.6	<u>5.8</u>	<u>5.8</u>	<u>5.8</u>	<u>6.0</u>	4.6	3.8	4.0	3.6	2.2	3.0	3.2	3.0	3.0	2.0	"
20	<u>5.2</u>	3.4	3.0	2.4	<u>5.0</u>	3.0	3.0	3.0	2.6	2.0	2.0	2.0	2.0	2.2	2.0	"
28	<u>3.8</u>	3.4	<u>7.8</u>	<u>6.0</u>	<u>6.0</u>	4.2	3.0	2.6	2.6	1.8	1.0	2.2	1.8	3.2	<u>5.2</u>	"
38	3.6	4.2	<u>4.0</u>	<u>6.2</u>	<u>4.2</u>	4.0	3.4	3.2	2.2	1.2	2.4	1.2	1.8	2.2	3.0	"
54	4.2	4.2	<u>8.2</u>	<u>5.8</u>	<u>6.0</u>	3.4	3.2	4.0	4.2	4.0	2.4	2.0	2.2	2.8	2.6	"
55	<u>5.0</u>	<u>5.0</u>	<u>8.0</u>	<u>3.6</u>	<u>5.4</u>	4.8	4.0	3.0	3.4	3.6	2.0	2.6	2.0	2.2	1.4	"
63	<u>5.2</u>	4.8	3.2	3.6	3.8	4.8	4.2	3.2	2.4	2.4	1.2	3.2	2.2	2.6	2.0	"
64	<u>3.4</u>	3.6	<u>8.2</u>	<u>6.2</u>	<u>6.6</u>	<u>5.0</u>	4.2	2.8	4.0	3.2	3.0	3.4	3.8	3.2	3.6	"
71	2.8	4.4	<u>8.0</u>	<u>6.4</u>	<u>5.0</u>	<u>4.2</u>	3.8	3.8	3.2	2.4	3.0	2.4	3.0	3.0	2.4	"
72	<u>6.8</u>	<u>6.2</u>	<u>3.8</u>	3.4	<u>6.0</u>	2.6	2.6	2.4	1.6	2.2	1.6	1.6	1.4	1.2	1.8	"

Significant temperatures are underlined for convenience in evaluating results.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 13 - TEMPERATURES\* OF PIGS VACCINATED WITH TISSUE CULTURE VACCINE AND SIMULTANEOUSLY EXPOSED TO VIRUS AND S. CHOLERAESUIS (LOT 3, EXPERIMENT 3)

Pig No.	Days Post-Exposure														Remarks	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13		14
2	3.4	3.0	<u>8.0</u>	<u>7.2</u>	<u>5.0</u>	4.0	4.4	2.6	2.0	2.2	1.6	1.2	2.0	2.0	1.4	Survived
9	2.6	2.0	<u>4.8</u>	<u>6.8</u>	<u>3.2</u>	<u>5.6</u>	3.0	2.8	2.4	2.6	1.8	2.0	1.8	2.4	2.0	"
17	4.2	3.6	<u>3.6</u>	<u>6.2</u>	3.4	<u>4.8</u>	2.4	3.0	1.6	1.6	2.0	1.4	2.2	2.4	2.2	"
25	4.0	3.4	<u>8.0</u>	<u>6.6</u>	4.4	3.4	4.2	3.4	3.2	2.4	<u>5.0</u>	2.0	2.0	2.2	2.6	"
32	4.0	3.4	<u>7.6</u>	<u>5.8</u>	<u>6.2</u>	<u>5.2</u>	3.8	3.6	3.4	3.2	<u>1.6</u>	2.8	2.0	2.2	2.0	"
40	<u>5.2</u>	4.2	<u>8.4</u>	<u>5.6</u>	<u>5.4</u>	<u>5.0</u>	2.6	3.0	3.0	2.2	2.2	2.8	2.2	2.8	2.2	"
44	<u>3.8</u>	3.0	<u>7.2</u>	<u>6.4</u>	<u>5.2</u>	<u>5.4</u>	3.2	3.0	2.0	1.8	0.6	2.8	1.4	2.0	2.2	"
51	4.0	4.0	3.0	<u>5.6</u>	1.0	4.6	3.2	3.2	2.2	2.4	1.2	1.4	2.8	1.8	1.2	"
53	<u>6.0</u>	3.8	3.2	2.4	2.6	3.8	3.0	3.4	2.0	0.4	1.2	2.0	1.0	2.2	3.0	"
68	<u>2.8</u>	4.4	3.4	1.8	<u>5.4</u>	<u>5.0</u>	1.4	3.0	3.0	1.8	1.0	1.0	0.4	2.2	2.2	"
75	<u>5.2</u>	4.4	4.0	3.6	<u>5.2</u>	<u>5.0</u>	4.2	3.6	3.0	0.6	2.4	2.2	2.4	2.2	2.0	"
77	<u>4.0</u>	4.0	<u>8.8</u>	<u>7.2</u>	<u>4.2</u>	<u>5.4</u>	4.2	4.0	3.4	2.2	3.0	3.0	2.6	2.0	2.4	"

Significant temperatures are underlined for convenience in evaluating results.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 14 - TEMPERATURES\* OF PIGS VACCINATED WITH RABBIT ORIGIN VACCINE AND INOCULATED WITH VIRUS ALONE (LOT 1, EXPERIMENT 4)

Pig No.	Days Post-Inoculation															Remarks
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
21	2.0	2.6	2.4	2.0	0.6	2.4	2.6	1.6	2.0	1.0	2.4	2.0	2.2	1.2	2.0	Survived
22B	2.0	1.6	2.6	3.4	1.2	2.6	1.2	2.6	1.6	1.2	1.0	1.6	1.0	1.0	1.6	"
28	2.2	1.0	0.6	2.6	2.0	3.2	2.2	2.4	1.0	1.4	2.4	2.4	1.0	1.4	1.4	"
35	2.8	3.6	2.2	4.4	3.2	2.0	2.4	3.6	1.6	1.8	1.2	3.0	3.0	3.0	2.8	"
38	2.4	2.6	1.2	<u>6.0</u>	4.0	3.2	2.2	3.0	2.2	2.4	2.0	2.2	2.4	3.6	1.6	"
39	2.4	3.6	3.2	<u>6.0</u>	3.8	3.4	3.4	3.0	2.4	2.2	2.0	2.2	1.6	2.0	2.0	"
49	2.0	1.0	2.0	<u>2.2</u>	3.4	3.0	2.4	2.8	2.2	2.0	3.4	2.0	2.6	2.4	2.2	"
52	3.0	3.0	2.6	<u>6.4</u>	<u>6.6</u>	<u>7.0</u>	<u>5.4</u>	<u>5.6</u>	<u>5.2</u>	4.6	2.4	--	--	--	--	Died 11 days p.i.
57	3.2	3.6	2.8	<u>4.2</u>	<u>4.4</u>	<u>3.8</u>	<u>2.6</u>	<u>3.0</u>	<u>3.2</u>	2.6	4.2	3.0	2.6	2.8	2.6	Survived
58	1.2	2.6	2.0	2.6	3.0	2.6	2.6	2.6	3.0	3.0	1.4	3.4	2.4	3.6	4.0	"
59	2.0	1.6	2.0	2.0	3.6	2.4	2.4	1.8	2.6	3.0	2.8	2.2	1.6	2.2	1.6	"
65	1.0	2.2	3.0	3.4	3.0	2.4	2.2	2.4	1.6	2.4	0.4	2.2	2.6	3.2	2.8	"
67	3.8	2.4	4.4	3.6	3.8	3.0	3.2	1.2	2.6	3.0	3.2	2.4	2.8	2.6	3.6	"
70	2.2	<u>5.0</u>	4.0	<u>6.0</u>	3.6	1.0	3.4	3.2	3.0	3.0	3.8	2.4	2.4	2.6	3.0	"
76	2.4	<u>1.6</u>	3.6	<u>3.0</u>	3.2	4.0	3.8	2.4	2.0	1.2	2.0	2.0	2.6	2.2	3.0	"
80	1.8	2.8	4.0	3.2	3.0	2.4	1.4	2.4	2.0	2.0	2.6	2.0	2.6	2.4	1.6	Survived
84	2.6	2.6	4.0	3.4	3.0	3.6	3.2	2.8	3.0	2.6	2.2	3.4	2.4	2.6	2.8	"
87	3.8	3.2	3.2	3.0	3.2	3.0	3.2	2.2	3.0	2.0	1.4	2.6	1.8	1.8	0.8	"
88	3.4	0.8	3.0	3.8	4.2	3.0	2.4	3.2	2.6	2.0	3.8	3.0	1.8	2.6	1.8	"
90	1.4	0.0	1.6	3.0	3.2	3.6	2.4	2.6	2.1	2.2	3.0	2.4	1.2	2.0	1.6	"
91	3.8	2.6	2.4	3.8	3.2	2.0	4.2	2.0	3.2	2.2	3.0	2.8	2.4	4.4	3.4	"
92	2.8	3.0	3.2	<u>6.2</u>	<u>7.0</u>	<u>5.4</u>	<u>5.0</u>	<u>5.6</u>	<u>5.0</u>	<u>5.8</u>	<u>6.6</u>	<u>5.4</u>	--	--	--	Died 12 days p.i.
96A	2.2	3.6	4.4	<u>6.6</u>	<u>7.2</u>	<u>6.8</u>	<u>4.2</u>	<u>4.8</u>	<u>5.6</u>	<u>5.6</u>	<u>3.8</u>	<u>3.4</u>	3.0	4.0	0.2	Survived
96B	2.6	<u>5.0</u>	<u>6.0</u>	<u>5.0</u>	<u>5.4</u>	<u>6.6</u>	4.0	3.8	3.0	2.0	3.2	3.0	3.2	3.2	0.6	"
98	<u>5.4</u>	<u>3.6</u>	4.0	<u>5.6</u>	<u>6.0</u>	4.0	<u>7.2</u>	4.6	<u>5.6</u>	<u>5.2</u>	3.0	4.4	3.0	3.0	--	Died 14 days p.i.
100	<u>3.6</u>	4.0	4.0	4.8	3.0	3.8	<u>2.0</u>	1.6	<u>3.0</u>	<u>2.6</u>	2.0	2.4	2.4	3.2	1.2	Survived
101	2.2	4.0	4.0	<u>5.0</u>	<u>6.6</u>	<u>5.2</u>	<u>5.0</u>	4.0	3.4	2.6	3.0	2.0	3.2	4.0	2.8	"
103	3.2	3.6	4.6	<u>5.2</u>	3.6	<u>5.4</u>	<u>2.6</u>	2.8	2.6	2.6	4.2	2.0	1.2	3.0	3.0	"

Significant temperatures are underlined for convenience in evaluating results. p.i.=post-inoculation.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 15 - TEMPERATURES\* OF PIGS VACCINATED WITH RABBIT ORIGIN VACCINE AND SIMULTANEOUSLY EXPOSED TO VIRUS AND S. CHOLERAESUIS (LOT 2, EXPERIMENT 4)

Pig No.	Days Post-Exposure														Remarks		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13		14	
12	4.8	1.8	6.0	4.0	2.4	4.2	3.2	3.0	3.2	3.2	3.2	4.2	2.8	2.8	2.4	Survived	
20	1.6	4.2	<u>5.8</u>	3.2	3.0	3.0	1.2	3.0	2.8	3.2	2.2	2.4	3.2	2.4	2.8	Survived	
22A	2.8	1.6	2.0	4.0	3.8	2.6	3.0	2.6	3.0	3.0	2.8	3.0	2.2	3.2	2.0	"	
23	1.6	1.6	2.8	3.2	5.6	6.0	4.8	4.6	4.2	--	--	--	--	--	--	Died 9 days p.e.	
25	2.6	1.6	1.4	2.0	<u>2.4</u>	2.4	2.0	2.6	1.4	1.0	3.4	1.8	1.8	2.0	1.6	Died 9 days p.e.	
26	1.2	3.4	<u>5.0</u>	6.4	<u>6.4</u>	<u>6.2</u>	6.0	4.4	<u>5.2</u>	4.0	1.0	3.4	1.8	2.0	1.6	Survived	
27	0.4	2.6	<u>3.8</u>	3.2	1.8	4.2	1.8	2.6	2.0	2.2	3.0	1.6	3.2	1.4	1.4	Died 10 days p.e.	
34	3.4	3.4	4.0	4.2	3.2	2.8	2.8	2.6	1.8	2.4	2.6	2.2	0.8	1.4	1.4	Survived	
36	4.2	2.8	5.6	4.8	5.2	4.6	4.4	2.8	1.4	2.4	1.7	2.8	2.4	1.6	1.2	"	
53	3.8	3.8	3.4	<u>6.0</u>	<u>6.4</u>	<u>7.2</u>	7.6	5.8	4.8	7.4	5.0	4.4	2.6	3.4	2.8	3.2	"
55	2.0	4.0	<u>2.0</u>	4.0	<u>4.0</u>	<u>4.0</u>	4.0	1.2	1.0	<u>2.0</u>	1.8	2.4	1.2	1.0	2.2	"	
56	2.2	2.2	5.4	3.6	4.6	3.6	4.6	2.6	2.8	2.4	2.4	3.0	2.4	1.8	1.6	"	
60	2.8	3.4	<u>3.6</u>	3.4	4.2	2.6	3.0	2.2	2.4	2.0	3.0	2.4	2.6	3.0	2.2	"	
61	3.8	3.0	4.2	3.0	4.0	4.0	5.0	3.2	2.6	2.4	3.8	3.0	1.8	2.2	2.4	"	
63	3.2	2.0	4.6	6.0	5.0	6.0	4.0	4.2	4.8	3.0	2.2	3.0	1.4	3.0	2.2	"	
68	3.6	4.2	5.4	<u>7.0</u>	<u>7.0</u>	<u>7.2</u>	6.8	2.6	2.6	4.4	0.0	4.4	0.0	--	--	Died 11 days p.e.	
69	3.6	4.2	3.6	4.8	3.6	5.0	2.8	1.6	2.0	2.4	3.4	3.2	2.4	3.2	2.6	Survived	
71	2.4	5.8	4.0	7.6	6.2	6.6	4.6	3.6	3.4	2.4	3.2	2.6	2.0	2.6	1.0	"	
72	3.4	3.0	3.6	6.0	4.8	6.6	4.8	6.2	4.8	3.4	4.6	4.0	3.4	1.0	1.4	3.0	
74	3.0	3.0	<u>3.0</u>	<u>5.6</u>	<u>6.0</u>	<u>4.2</u>	<u>6.0</u>	<u>4.2</u>	<u>3.8</u>	<u>2.0</u>	4.2	4.6	3.0	3.0	3.4	"	
75	4.0	4.0	1.0	<u>2.2</u>	<u>3.4</u>	4.0	4.0	<u>5.2</u>	<u>3.8</u>	3.0	3.6	4.2	2.6	3.0	3.4	"	
77	3.0	3.0	3.0	<u>6.6</u>	<u>5.4</u>	5.0	4.8	4.0	3.0	3.2	3.4	2.4	1.8	2.6	3.4	"	
78	3.2	3.2	<u>5.2</u>	<u>5.6</u>	<u>6.4</u>	<u>6.6</u>	6.4	3.4	3.0	3.0	3.0	5.2	2.8	1.4	0.4	"	
79	3.4	3.4	1.6	<u>3.4</u>	<u>4.4</u>	<u>5.2</u>	4.0	3.4	4.0	2.0	3.0	2.4	1.6	3.6	0.4	"	
81	3.2	3.2	1.6	2.8	5.2	4.6	3.6	3.0	2.4	1.2	2.4	3.6	2.4	3.0	2.0	"	
83	3.4	3.4	2.2	<u>6.4</u>	<u>7.0</u>	<u>6.8</u>	5.8	5.2	5.6	4.2	2.0	0.6	2.0	3.0	3.2	"	
94	4.0	2.2	4.2	<u>5.4</u>	<u>5.0</u>	<u>5.0</u>	2.6	3.4	3.6	2.2	4.2	3.8	2.2	3.4	3.6	"	
97	3.4	4.0	2.2	4.2	<u>5.4</u>	<u>5.0</u>	1.8	2.4	2.6	2.2	2.0	4.2	2.0	3.0	1.4	"	

\* Temperatures are recorded as the number of degrees over 100° F. Significant temperatures are underlined for convenience in evaluating results. p.e.=post-exposure.

TABLE 16 - TEMPERATURES\* OF MEDICATED PIGS FOLLOWING VACCINATION AND EXPOSURE TO S. CHOLERAESUIS (LOT 1, EXPERIMENT 5)

Pig No.	Days Post-Vaccination											Remarks
	0	1	2	3	4	5	6	7	8	9	10	
2	4.0	4.2	<u>7.4</u>	<u>6.8</u>	<u>6.2</u>	<u>5.6</u>	<u>5.0</u>	<u>6.2</u>	<u>6.6</u>	<u>6.6</u>	<u>5.4</u>	Survived
10	4.0	3.8	<u>8.0</u>	<u>7.0</u>	<u>6.2</u>	<u>7.8</u>	<u>5.8</u>	<u>6.4</u>	<u>6.4</u>	<u>7.0</u>	<u>6.2</u>	"
15	4.0	3.4	<u>6.4</u>	<u>7.0</u>	<u>6.6</u>	<u>6.4</u>	4.8	4.2	<u>5.4</u>	4.8	3.6	"
17	4.4	3.0	<u>8.0</u>	<u>7.6</u>	<u>6.6</u>	<u>5.0</u>	3.8	<u>5.2</u>	4.4	<u>5.2</u>	3.6	"
21	4.0	3.0	<u>6.8</u>	<u>7.0</u>	<u>5.8</u>	<u>5.4</u>	<u>5.4</u>	<u>6.6</u>	<u>5.6</u>	4.6	<u>5.8</u>	"
28	4.4	3.6	<u>6.0</u>	<u>6.8</u>	<u>6.2</u>	<u>5.0</u>	4.8	<u>5.0</u>	<u>5.0</u>	4.6	4.8	"
33	3.8	3.4	<u>7.0</u>	<u>6.4</u>	<u>6.0</u>	<u>5.0</u>	3.2	<u>5.6</u>	4.6	3.8	3.8	"
41	4.0	2.6	<u>8.4</u>	<u>6.0</u>	<u>6.0</u>	<u>6.0</u>	3.6	4.6	4.4	<u>5.0</u>	4.0	"
43	3.8	3.2	<u>7.4</u>	<u>6.4</u>	<u>7.0</u>	<u>7.0</u>	<u>7.2</u>	4.6	<u>6.6</u>	<u>6.0</u>	4.6	"
47	3.6	3.8	<u>7.0</u>	<u>5.2</u>	<u>6.2</u>	<u>5.6</u>	4.4	4.4	4.8	4.4	4.0	"
53	3.6	3.8	<u>6.8</u>	<u>5.6</u>	<u>6.2</u>	<u>5.4</u>	4.2	3.6	4.0	3.8	4.2	"
57	3.8	2.6	<u>2.4</u>	<u>6.4</u>	<u>5.6</u>	4.4	2.4	2.4	1.6	4.4	2.4	"
62	3.6	2.0	<u>8.0</u>	<u>7.4</u>	<u>7.4</u>	<u>6.6</u>	4.6	<u>5.8</u>	<u>5.2</u>	<u>5.6</u>	<u>5.4</u>	"
67	4.0	3.0	<u>7.0</u>	<u>6.0</u>	<u>6.8</u>	<u>5.0</u>	<u>6.2</u>	<u>6.2</u>	<u>6.4</u>	<u>5.6</u>	<u>4.8</u>	"
73	3.6	4.6	<u>8.0</u>	<u>6.8</u>	<u>6.4</u>	<u>6.4</u>	4.2	4.4	<u>6.0</u>	3.8	4.4	"
75	4.0	3.8	<u>7.4</u>	<u>6.0</u>	<u>6.6</u>	<u>6.4</u>	4.6	<u>5.6</u>	3.4	<u>5.8</u>	3.0	Survived
82	4.0	3.0	<u>7.6</u>	<u>6.4</u>	<u>5.0</u>	<u>5.2</u>	2.8	3.6	4.0	0.4	4.4	"
86	4.0	3.6	<u>8.0</u>	<u>7.6</u>	<u>6.2</u>	<u>5.6</u>	4.8	3.4	<u>5.0</u>	2.8	4.6	"
91	3.6	2.0	<u>8.0</u>	<u>6.6</u>	4.8	3.8	4.4	<u>5.0</u>	4.6	4.0	3.6	"
95	4.0	3.2	<u>7.0</u>	<u>6.4</u>	<u>5.4</u>	4.6	3.0	4.4	<u>5.0</u>	4.2	4.6	"
98	4.0	3.4	<u>5.4</u>	<u>5.0</u>	<u>5.6</u>	4.8	3.0	3.4	<u>4.4</u>	4.0	4.4	"
114	4.0	2.8	<u>8.0</u>	<u>7.0</u>	<u>5.6</u>	<u>5.6</u>	4.6	<u>5.4</u>	<u>6.2</u>	<u>5.0</u>	<u>5.4</u>	Died 3 weeks p.v.
119	3.4	3.0	<u>7.0</u>	<u>6.2</u>	<u>5.8</u>	4.8	3.2	4.2	<u>5.4</u>	4.6	4.0	Survived
122	4.0	4.0	<u>6.4</u>	<u>6.0</u>	<u>6.0</u>	4.2	4.8	4.0	2.0	3.6	4.0	"

Significant temperatures are underlined for convenience in evaluating results. p.v.=post-vaccination.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 17 - TEMPERATURES\* OF MEDICATED PIGS FOLLOWING VACCINATION (LOT 2, EXPERIMENT 5)

Pig No.	Days Post-Vaccination											Remarks
	0	1	2	3	4	5	6	7	8	9	10	
3	4.8	3.6	3.6	3.4	4.8	4.0	4.0	3.6	3.6	3.2	3.0	Survived
8	4.8	3.6	3.8	3.6	2.8	4.2	3.4	3.4	3.0	2.6	3.6	"
12	4.2	4.2	4.0	4.0	4.4	4.0	3.0	3.0	3.0	2.4	2.0	"
25	4.2	3.2	4.0	4.2	3.6	4.4	4.0	3.6	3.4	3.0	4.2	"
31	4.0	4.0	3.4	3.0	4.6	3.0	3.4	2.4	3.2	2.4	3.4	"
34	4.2	3.0	4.0	3.6	3.2	3.4	2.2	2.8	2.8	3.0	3.4	"
36	4.2	3.4	3.4	3.6	3.0	3.6	2.2	3.6	2.4	3.6	3.6	"
38	4.0	2.6	3.0	4.0	4.4	3.6	3.6	3.0	3.6	4.0	4.0	"
46	5.0	3.8	4.4	4.0	4.6	4.0	4.2	3.0	<u>5.0</u>	4.2	3.6	"
54	4.0	3.4	3.8	4.6	4.2	4.0	2.4	4.0	<u>3.8</u>	4.2	2.8	"
60	3.8	2.6	3.0	3.0	4.0	2.6	2.4	3.0	2.4	1.4	3.8	"
65	4.6	2.6	4.0	4.0	4.0	3.6	3.4	3.6	3.8	3.0	2.8	"
66	4.0	3.4	4.4	4.0	3.0	4.0	2.6	3.6	3.8	4.0	4.0	"
70	3.6	2.6	4.0	3.4	4.2	3.8	3.4	3.2	2.0	2.2	4.0	"
78	4.2	3.6	4.4	2.8	4.0	3.0	2.4	2.4	2.4	2.2	3.2	Survived
81	4.4	3.6	4.0	3.4	3.6	3.0	3.8	4.0	3.2	3.0	3.4	"
84	3.8	3.0	3.4	3.4	4.2	2.8	1.4	3.2	2.4	2.6	2.4	"
89	4.0	2.0	1.0	3.0	3.6	2.6	2.2	2.8	2.6	1.6	2.6	"
96	4.2	3.4	<u>5.0</u>	4.4	4.2	3.8	3.0	3.8	3.2	4.2	3.0	"
101	3.8	4.2	<u>4.0</u>	3.6	3.0	3.4	2.8	3.2	2.4	2.0	2.4	"
109	4.0	2.8	4.0	3.4	3.0	2.8	2.6	3.0	2.6	3.0	2.0	"
112	3.6	2.8	3.0	3.0	3.0	2.8	2.4	2.2	2.8	2.6	2.8	"
115	<u>5.0</u>	2.6	4.0	4.0	4.2	3.8	4.0	4.0	3.4	3.8	3.4	"
128	<u>5.0</u>	3.0	4.0	4.2	4.2	3.6	4.6	3.6	3.6	3.6	3.2	"

\*Temperatures are recorded as the number of degrees over 100°.

Significant temperatures are underlined for convenience in evaluating results.

TABLE 18 - TEMPERATURES\* OF NON-MEDICATED PIGS FOLLOWING VACCINATION AND EXPOSURE TO *S. CHOLERAESUIS* (LOT 3, EXPERIMENT 5)

Pig No.	Days Post-Vaccination											Remarks
	0	1	2	3	4	5	6	7	8	9	10	
5	4.0	4.0	<u>7.0</u>	<u>5.2</u>	<u>5.4</u>	4.8	3.8	3.4	4.2	3.2	3.4	Survived
11	3.6	3.4	<u>8.0</u>	<u>6.0</u>	<u>5.0</u>	4.0	3.8	4.4	4.4	3.6	2.6	"
16	3.8	2.8	<u>7.0</u>	<u>6.2</u>	<u>6.0</u>	4.8	4.0	4.6	3.6	4.0	2.8	"
20	4.0	3.0	<u>8.0</u>	<u>7.4</u>	<u>6.4</u>	4.4	3.0	4.4	3.2	3.6	3.6	Died 3 weeks p.v.
22	3.2	3.0	<u>8.0</u>	<u>5.0</u>	<u>5.2</u>	4.2	2.8	4.0	3.0	3.8	3.0	Survived
29	4.0	2.0	<u>7.4</u>	<u>6.2</u>	4.6	4.4	4.4	4.8	4.0	3.8	<u>5.6</u>	"
35	4.0	3.0	<u>6.0</u>	<u>8.2</u>	<u>7.6</u>	<u>5.2</u>	4.0	4.0	3.8	3.8	4.4	Died 3 weeks p.v.
42	4.4	3.6	<u>8.0</u>	<u>6.8</u>	<u>5.4</u>	4.4	3.4	4.0	4.0	3.6	3.6	Died 2 weeks p.v.
44	4.8	4.0	<u>8.0</u>	<u>6.0</u>	<u>6.4</u>	<u>5.6</u>	2.6	<u>5.6</u>	4.4	3.6	3.4	Survived
52	4.0	4.0	<u>6.0</u>	<u>6.4</u>	<u>6.4</u>	<u>5.8</u>	3.8	<u>5.2</u>	<u>6.0</u>	4.0	4.6	"
55	4.2	2.8	<u>7.8</u>	<u>5.4</u>	4.4	4.0	3.2	4.4	4.2	3.6	1.8	"
58	4.8	2.6	<u>9.0</u>	<u>6.4</u>	<u>5.6</u>	<u>5.0</u>	4.0	4.0	4.0	3.8	4.0	"
63	4.4	3.2	<u>6.4</u>	<u>7.2</u>	4.2	4.6	4.0	3.6	4.0	2.8	3.6	"
68	4.4	2.6	<u>6.0</u>	<u>5.6</u>	4.8	3.4	2.8	3.6	2.4	4.4	3.4	"
74	4.0	3.6	<u>7.4</u>	<u>7.2</u>	<u>6.0</u>	4.4	3.6	4.6	3.4	2.4	4.0	Survived
76	4.0	3.8	<u>8.0</u>	<u>7.0</u>	<u>5.8</u>	<u>6.8</u>	<u>5.0</u>	<u>5.0</u>	<u>5.0</u>	4.4	3.2	"
85	4.4	3.6	<u>7.6</u>	<u>5.0</u>	4.2	3.8	3.6	4.4	3.6	3.6	4.0	"
88	3.4	2.4	<u>7.2</u>	<u>6.0</u>	3.2	3.0	2.6	4.0	3.6	1.6	2.0	Died 1 week p.v.
93	4.0	3.6	<u>7.2</u>	<u>8.4</u>	<u>6.6</u>	<u>6.2</u>	<u>5.4</u>	4.0	4.2	4.6	<u>5.0</u>	Survived
100	4.4	2.6	<u>7.6</u>	<u>6.0</u>	<u>5.4</u>	3.8	3.0	3.8	3.4	3.0	3.4	Died 3 weeks p.v.
107	3.8	3.0	<u>7.6</u>	<u>7.2</u>	<u>7.2</u>	<u>5.4</u>	4.8	<u>5.0</u>	<u>5.0</u>	4.4	4.2	Survived
117	3.6	2.0	<u>6.4</u>	<u>5.6</u>	4.8	3.4	1.4	3.6	3.6	2.8	3.4	"
120	3.6	2.8	<u>7.4</u>	<u>7.0</u>	4.2	<u>5.0</u>	3.0	<u>5.0</u>	4.0	<u>5.0</u>	3.4	"
123	4.2	2.2	<u>6.0</u>	<u>6.0</u>	<u>5.2</u>	<u>6.2</u>	2.6	3.0	4.0	2.0	1.8	Died 2 weeks p.v.

\* Temperatures are recorded as the number of degrees over 100° F. p.v.=post-vaccination.

Significant temperatures are underlined for convenience in evaluating results.



TABLE 19 - TEMPERATURES\* OF NON-MEDICATED PIGS FOLLOWING VACCINATION (LOT 4, EXPERIMENT 5)

Pig No.	Days Post-Vaccination										Remarks	
	0	1	2	3	4	5	6	7	8	9		10
1	4.0	3.4	4.4	4.0	3.4	3.6	4.2	3.4	3.4	3.6	3.2	Survived
19	4.8	3.2	4.4	3.6	3.4	4.4	4.2	3.4	3.4	3.6	2.6	"
24	4.0	3.4	3.4	4.2	3.6	2.8	3.6	3.6	3.8	3.0	3.6	"
27	4.0	2.8	4.0	4.2	2.0	2.8	3.6	3.6	3.8	3.0	2.6	"
30	<u>5.2</u>	2.8	4.0	3.6	4.6	3.6	2.4	3.2	3.4	3.8	3.8	"
32	<u>4.2</u>	3.4	3.0	3.2	3.6	3.8	1.0	2.8	3.0	3.0	3.0	"
37	4.4	3.2	3.8	3.0	2.6	4.2	2.2	2.8	2.8	2.4	2.4	"
45	5.0	2.6	3.4	2.6	2.6	2.8	2.4	3.0	2.6	3.2	3.4	"
48	<u>4.4</u>	3.6	4.0	4.4	3.2	4.2	3.4	3.4	2.8	3.4	3.4	"
56	3.0	2.4	2.8	2.6	2.6	2.8	2.0	2.2	3.0	2.6	3.0	"
64	4.8	3.2	4.0	3.8	3.0	3.6	4.2	3.2	3.2	3.6	3.6	"
69	4.0	4.0	4.2	3.6	3.6	4.0	3.0	3.4	3.6	3.4	3.4	"
73	4.0	3.6	4.0	3.8	4.4	4.2	2.8	3.2	4.0	3.8	3.4	"
77	4.4	2.6	3.4	3.2	1.6	3.6	3.0	2.4	2.8	2.6	1.8	"
87	4.0	2.6	3.6	4.2	3.6	4.8	3.6	2.4	2.8	3.8	4.0	"
90	4.6	3.0	4.4	3.2	3.6	4.4	2.6	1.6	3.6	3.8	3.8	"
92	<u>5.0</u>	3.0	3.6	4.0	4.0	4.2	4.0	3.6	3.4	3.8	3.0	"
94	<u>5.0</u>	3.4	4.4	3.2	3.6	3.4	3.6	2.4	3.6	3.4	3.2	Survived
99	<u>5.0</u>	4.6	4.2	3.4	3.6	3.8	3.8	2.2	3.6	3.2	2.8	"
106	<u>4.0</u>	2.4	2.8	3.0	3.0	4.2	1.6	1.8	2.6	1.6	1.6	"
111	4.2	2.6	3.6	3.8	3.6	3.8	3.4	2.6	2.6	3.2	2.4	"
121	4.0	1.6	2.4	3.0	2.8	3.6	2.0	2.0	1.6	1.8	2.4	"
124	4.6	3.0	3.4	4.0	3.6	4.2	3.2	4.0	3.8	3.6	3.4	"
129	5.0	3.2	4.0	3.4	3.2	3.6	4.0	3.6	3.2	3.8	2.8	"

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 20 - TEMPERATURES\* OF PIGS OF LOT 1 FOLLOWING CHALLENGE WITH VIRUS (EXPERIMENT 5)

Pig No.	Days of Post-Inoculation														Remarks	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13		14
2	3.6	3.2	3.4	3.4	3.0	2.6	2.6	2.4	4.8	2.4	2.6	3.2	2.2	2.6	1.4	Survived
10	4.2	3.6	4.0	3.2	4.0	3.6	2.8	3.8	3.6	3.4	3.8	4.4	4.8	4.4	2.4	"
15	4.6	3.2	3.0	3.4	3.6	3.0	1.6	2.6	3.2	3.2	2.8	2.6	2.8	3.8	2.0	"
17	3.2	3.8	4.0	4.0	4.0	3.0	2.6	3.0	1.8	3.0	3.4	3.6	3.6	3.6	2.8	"
21	3.8	4.2	3.8	4.4	3.2	3.2	3.2	3.8	1.6	2.0	4.0	2.6	4.0	1.0	2.0	"
28	2.8	3.6	4.0	4.0	3.4	3.2	2.0	4.0	3.8	2.4	3.0	2.6	3.6	2.0	2.4	"
33	3.6	4.8	<u>5.2</u>	<u>5.2</u>	4.0	4.2	2.0	3.0	3.4	2.8	2.8	3.4	3.8	2.0	2.6	"
41	3.6	4.2	4.0	<u>3.6</u>	4.0	4.0	2.2	3.6	2.4	3.0	3.6	3.6	2.4	3.0	2.2	"
43	4.0	2.6	3.8	3.4	2.0	2.8	1.0	3.4	3.6	3.0	3.2	3.0	2.4	3.2	2.0	"
47	3.4	3.8	4.6	3.2	3.0	2.4	2.6	3.4	3.8	3.2	3.2	3.0	3.6	3.4	2.0	"
53	3.8	4.2	2.6	4.8	3.6	3.2	2.2	2.2	2.0	1.8	4.2	3.6	2.4	1.8	2.0	"
57	3.2	4.0	3.6	4.0	1.8	3.4	2.0	3.6	2.2	2.2	2.0	2.2	3.8	2.0	2.8	"
62	3.0	4.0	4.6	4.0	4.0	3.4	2.0	4.8	2.8	3.0	3.6	2.4	4.6	3.4	1.6	"
67	3.0	3.8	3.2	3.4	2.4	4.0	1.0	3.6	3.6	3.4	3.0	1.6	2.4	2.4	1.2	"
73	3.4	4.2	4.0	3.6	3.0	2.6	2.2	3.6	2.2	3.2	3.0	2.4	3.0	2.0	1.8	"
75	4.0	4.4	4.4	4.0	4.0	2.6	2.6	3.0	2.8	1.6	3.8	2.0	4.0	3.4	1.6	Survived
82	3.4	4.2	4.4	4.2	3.6	3.6	2.6	2.8	3.0	3.4	3.4	4.0	3.0	2.6	3.4	"
86	3.2	4.2	4.6	3.0	3.4	4.0	3.0	3.2	3.0	4.0	4.0	3.0	3.6	3.0	1.2	"
91	5.0	3.8	4.4	4.4	3.6	4.0	3.4	4.4	2.6	4.4	4.4	3.0	3.2	3.8	2.6	"
95	4.2	4.2	4.4	3.6	4.0	4.2	2.2	3.6	3.0	3.0	4.6	3.8	4.6	3.2	2.6	"
98	4.0	4.4	4.4	3.8	3.2	4.6	1.2	3.6	2.0	4.0	4.0	3.0	3.0	1.6	2.0	"
119	4.2	4.6	3.6	3.6	4.0	3.0	2.2	3.4	3.4	4.6	3.4	3.0	4.8	3.0	1.8	"
122	2.6	4.0	4.0	2.6	2.8	2.8	1.8	3.0	3.2	2.6	1.2	4.4	4.0	3.0	1.6	"

Significant temperatures are underlined for convenience in evaluating results.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 21 - TEMPERATURES\* OF PIGS OF LOT 2 FOLLOWING CHALLENGE WITH VIRUS (EXPERIMENT 5)

Pig No.	Days Post-Inoculation														Remarks	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13		14
1	1.6	2.6	1.0	3.0	3.0	0.6	1.0	2.0	2.4	2.8	2.8	2.2	2.0	1.6	2.0	Survived
19	3.8	4.0	3.0	3.2	2.4	4.0	3.4	4.4	3.4	3.6	3.6	2.4	4.0	1.8	1.0	"
24	2.8	2.0	1.8	1.2	1.4	1.4	0.8	1.0	1.6	1.4	1.6	0.6	1.6	0.8	1.0	"
27	2.6	2.4	2.0	3.0	1.6	0.4	2.0	0.6	1.6	2.0	3.6	1.0	1.2	1.4	1.0	"
30	2.8	2.8	2.0	2.0	1.0	1.2	2.0	1.0	2.0	1.8	2.0	1.8	2.6	2.4	1.6	"
32	2.8	2.6	2.4	2.2	2.6	2.4	2.4	1.2	1.6	2.0	0.6	1.4	1.2	1.2	1.4	"
37	1.6	2.8	2.0	2.2	0.8	3.2	1.8	1.6	1.6	1.0	2.0	1.4	1.4	1.6	1.2	"
45	2.0	2.2	2.4	2.0	1.6	1.4	0.8	2.2	1.6	1.8	2.0	1.6	0.6	1.2	2.0	"
48	2.6	2.0	2.6	2.0	2.4	2.0	1.8	1.4	0.8	1.8	1.0	1.6	2.0	1.8	1.2	"
56	3.2	2.4	2.8	2.8	2.2	2.2	2.2	3.0	3.2	4.0	3.4	3.0	2.6	1.8	1.8	"
64	3.6	3.0	2.6	2.6	0.4	1.4	2.6	1.0	2.4	1.0	1.8	1.6	1.2	1.2	2.0	"
69	2.4	3.2	2.4	3.0	4.2	2.2	3.2	2.4	2.8	4.2	3.2	2.4	2.6	2.6	2.8	"
73	3.0	2.8	2.8	2.6	2.0	1.6	2.2	2.0	1.6	2.2	2.4	1.8	0.6	1.4	1.2	"
77	3.6	4.0	3.2	3.2	2.2	2.6	3.2	2.2	3.0	3.2	3.0	3.0	2.8	2.6	2.0	"
87	2.8	3.6	3.8	3.8	2.4	3.0	3.0	3.2	3.0	2.6	3.8	1.6	2.0	2.2	2.0	"
90	2.6	4.6	4.6	3.8	3.0	3.0	3.6	2.6	4.2	2.0	4.0	3.0	2.4	2.0	1.2	Survived
92	3.0	3.0	3.6	3.4	4.0	2.6	4.6	3.8	4.0	4.4	5.4	4.0	2.0	3.0	3.2	"
94	4.0	4.0	4.8	4.2	3.6	4.0	3.0	2.8	4.0	3.8	3.0	4.0	2.4	3.0	3.0	"
99	4.4	2.0	2.6	1.8	1.2	3.6	2.6	2.0	2.0	1.4	1.4	1.6	1.2	1.2	1.0	"
106	3.6	3.8	3.6	2.8	2.0	2.6	3.6	2.8	3.0	2.2	2.0	2.6	2.0	2.2	2.6	"
111	3.0	3.4	3.0	2.8	2.0	2.4	3.2	3.0	2.6	4.2	4.0	2.2	2.4	2.6	2.4	"
121	3.2	4.0	3.6	3.4	2.0	2.8	2.6	3.6	4.0	2.4	2.0	1.8	1.6	2.4	2.6	"
124	4.0	4.2	<u>5.6</u>	4.0	3.2	4.0	4.6	4.2	3.8	4.0	3.4	3.0	3.0	2.2	2.8	"
129	4.2	3.8	<u>3.8</u>	2.2	<u>5.2</u>	3.0	<u>5.0</u>	3.4	1.8	2.8	3.8	3.4	4.0	3.6	1.0	"

Significant temperatures are underlined for convenience in evaluating results.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 22 - TEMPERATURES\* OF PIGS OF LOT 3 FOLLOWING CHALLENGE WITH VIRUS (EXPERIMENT 5)

Pig No.	Days Post-Inoculation															Remarks
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
5	3.8	4.2	3.2	3.4	3.4	4.0	2.4	2.4	2.4	3.4	3.8	2.2	3.0	3.0	2.0	Survived
11	3.2	3.4	2.6	3.2	3.0	3.8	1.6	3.6	2.8	3.0	2.6	2.0	3.0	2.6	2.0	"
16	4.4	3.0	4.0	3.0	3.6	3.0	0.6	2.4	3.0	4.0	3.6	1.2	2.8	2.0	2.0	"
22	2.0	3.0	4.2	1.6	2.6	1.6	1.2	2.2	3.6	2.6	3.2	1.6	3.2	2.8	2.2	"
29	4.6	4.8	<u>5.4</u>	4.6	4.6	<u>5.4</u>	2.6	3.8	2.8	3.6	3.6	2.6	4.0	3.0	1.6	"
44	2.8	4.4	<u>3.4</u>	3.2	3.0	<u>3.0</u>	1.2	3.0	3.4	3.2	2.8	3.0	3.0	3.0	2.0	"
55	4.0	<u>5.0</u>	4.2	4.0	3.6	4.0	3.2	3.0	3.4	3.6	3.6	3.4	3.6	3.2	2.4	"
58	3.6	<u>3.6</u>	4.0	3.4	3.0	3.2	2.4	3.4	3.0	2.8	3.6	4.0	3.4	3.0	2.8	"
63	3.8	4.6	4.4	3.6	2.0	3.6	1.4	3.2	3.4	3.2	3.8	3.6	2.8	3.8	3.0	"
68	4.2	<u>5.0</u>	<u>5.2</u>	4.0	4.0	3.6	0.0	4.0	3.6	3.0	<u>5.6</u>	3.8	4.0	0.8	2.6	"
74	3.4	<u>3.0</u>	<u>3.2</u>	3.6	3.2	3.2	2.2	3.4	2.8	2.2	<u>3.6</u>	3.4	2.2	2.2	2.0	"
76	4.6	4.0	3.6	3.6	3.4	3.8	2.2	2.8	3.0	3.4	3.4	4.0	3.8	3.0	2.0	"
85	3.6	4.0	5.0	3.8	3.2	2.8	2.0	3.8	2.4	3.0	3.6	3.0	3.6	3.6	2.0	"
93	3.6	4.4	4.6	3.6	3.4	2.4	2.6	3.4	3.0	3.0	3.0	3.2	3.0	3.0	1.6	"
107	3.8	<u>6.0</u>	<u>5.4</u>	3.6	3.2	<u>5.2</u>	<u>7.6</u>	<u>5.4</u>	4.2	2.8	--	--	--	--	--	Died 10 days p.i.
117	3.8	<u>4.8</u>	<u>4.6</u>	4.0	3.4	<u>3.0</u>	<u>2.6</u>	<u>3.2</u>	2.4	2.6	4.0	2.4	3.0	2.8	1.6	Survived
120	4.0	4.0	4.8	3.6	3.2	2.8	3.0	2.8	3.2	4.0	3.2	2.0	2.6	3.2	1.2	"

Significant temperatures are underlined for convenience in evaluating results. p.i.=post-inoculation.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 23 - TEMPERATURES\* OF PIGS OF LOT 4 FOLLOWING CHALLENGE WITH VIRUS (EXPERIMENT 5)

Pig No.	Days Post-Inoculation															Remarks
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
3	2.0	1.8	2.0	1.4	1.0	2.0	1.4	1.4	1.2	1.6	1.8	0.8	1.6	0.8	1.4	Survived
8	2.4	1.6	1.6	0.4	0.6	1.8	0.0	0.8	2.0	0.8	1.6	0.8	1.4	1.8	1.6	"
12	3.4	4.4	4.8	<u>5.6</u>	3.4	3.2	<u>5.0</u>	2.6	3.4	2.6	2.8	2.2	2.4	2.8	2.8	"
25	2.6	1.8	2.6	<u>2.2</u>	1.6	0.0	<u>2.0</u>	1.6	2.4	1.4	1.6	0.2	0.4	0.6	1.2	"
31	2.6	2.6	3.4	4.6	2.4	2.8	1.0	2.6	2.2	1.8	2.2	1.6	2.2	2.4	1.0	"
34	1.6	2.4	2.6	4.6	4.4	2.4	2.2	0.4	1.4	1.4	1.2	1.6	1.2	1.4	1.4	"
36	4.0	4.6	3.4	2.8	2.8	2.0	2.4	3.0	2.8	3.2	2.6	2.6	2.6	2.6	1.4	"
38	3.0	1.6	1.8	2.0	1.4	2.0	3.0	1.0	1.2	1.2	1.0	0.6	1.8	1.4	1.0	"
46	2.6	2.8	1.6	1.8	0.4	1.6	1.4	1.8	2.0	0.4	2.0	1.0	1.4	1.0	1.2	"
54	3.6	2.6	2.0	3.0	1.6	1.2	3.0	1.4	2.8	1.6	1.4	1.0	1.6	1.6	2.4	"
60	2.6	2.4	2.0	2.6	1.4	2.0	1.0	2.2	2.0	2.6	3.0	1.0	1.8	2.0	2.0	"
65	2.4	2.4	3.8	3.2	4.0	3.2	3.0	3.0	3.4	3.8	3.6	3.0	3.0	2.8	2.6	"
66	4.4	3.2	2.6	2.6	2.4	2.0	2.2	2.4	3.0	1.2	2.4	2.6	1.0	1.6	2.4	"
70	2.8	3.6	4.2	3.6	3.2	4.0	2.8	2.8	2.6	4.0	3.6	2.2	2.6	2.8	2.0	"
78	3.0	3.4	2.4	2.8	3.6	4.0	3.2	4.2	3.4	3.6	3.8	4.0	2.6	3.6	3.4	Survived
81	3.6	3.6	3.8	3.6	3.4	3.0	2.8	3.2	4.2	3.8	3.2	2.6	2.6	2.4	2.6	"
84	2.8	3.6	2.6	4.0	3.0	2.2	1.8	2.0	2.4	3.0	2.6	2.4	2.2	2.4	2.4	"
89	3.4	3.2	4.0	3.4	3.8	4.4	1.2	2.8	2.6	2.8	3.6	2.6	2.0	3.0	2.4	"
96	3.0	3.0	3.6	3.6	4.0	3.0	3.8	3.6	4.2	3.6	3.8	3.4	2.8	2.8	2.8	"
101	2.0	3.0	2.4	2.8	1.6	1.6	1.4	2.2	2.0	1.2	1.6	1.6	0.6	1.4	1.6	"
109	2.4	2.0	2.4	2.8	1.6	1.6	1.8	1.2	1.6	1.4	1.6	0.2	1.4	2.0	1.4	"
112	3.0	4.2	4.2	3.6	3.6	2.0	2.6	3.4	3.4	2.4	3.4	2.6	1.8	2.4	2.8	"
115	2.4	2.4	1.8	2.6	1.6	1.4	2.4	1.4	2.2	2.0	2.0	2.0	1.4	1.0	0.6	"
128	3.8	4.0	2.8	4.4	3.4	4.0	4.8	4.4	3.4	3.0	2.6	2.4	0.2	2.0	2.4	"

Significant temperatures are underlined for convenience in evaluating results.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 24 - TEMPERATURES\* OF NON-MEDICATED PIGS CHALLENGED WITH VIRUS AND SIMULTANEOUSLY GIVEN *S. CHOLERAESUIS* (LOT 1, EXPERIMENT 6)

Pig No.	Days Post-Exposure														Remarks	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13		14
65	2.8	2.4	4.4	<u>5.6</u>	<u>6.8</u>	4.6	4.0	3.0	2.0	2.8	2.0	2.6	1.6	2.4	1.0	Survived
69	1.8	3.0	<u>5.8</u>	<u>6.2</u>	<u>6.4</u>	<u>6.2</u>	<u>8.0</u>	<u>5.0</u>	<u>6.2</u>	<u>7.4</u>	<u>6.6</u>	<u>5.8</u>	2.6	--	--	Died 12 days p.e.
72	2.2	2.0	<u>4.2</u>	4.8	<u>6.4</u>	<u>6.0</u>	4.4	3.8	<u>5.2</u>	4.8	2.6	3.6	2.6	2.2	1.4	Survived
75	2.4	3.8	<u>6.4</u>	<u>5.6</u>	<u>6.8</u>	<u>6.6</u>	<u>6.8</u>	<u>6.8</u>	--	--	--	--	--	--	--	Died 8 days p.e.
85	2.8	2.8	<u>4.0</u>	4.8	<u>6.0</u>	<u>5.0</u>	4.0	3.2	3.0	3.8	3.0	2.0	2.4	2.8	3.0	Survived
87	3.0	3.6	3.0	<u>6.6</u>	<u>6.2</u>	<u>5.8</u>	<u>5.0</u>	<u>5.0</u>	3.0	3.4	3.0	0.0	2.0	3.0	1.2	"
89	3.4	3.2	3.4	<u>3.2</u>	3.6	3.6	3.0	3.0	3.0	2.8	3.6	3.0	2.2	2.8	1.2	"
95	2.8	4.4	3.8	<u>5.4</u>	<u>6.2</u>	<u>6.6</u>	<u>5.8</u>	3.2	2.8	3.8	--	--	--	--	--	Died 10 days p.e.
98	2.4	3.8	3.8	<u>6.0</u>	<u>7.0</u>	<u>7.0</u>	<u>6.4</u>	<u>5.0</u>	4.2	--	--	--	--	--	--	Died 9 days p.e.
103	3.0	3.0	<u>6.0</u>	<u>7.4</u>	<u>6.6</u>	<u>5.6</u>	<u>5.8</u>	2.8	<u>5.0</u>	--	--	--	--	--	--	Died 8 days p.e.
110	2.0	4.4	<u>4.2</u>	<u>7.0</u>	<u>7.4</u>	--	--	--	--	--	--	--	--	--	--	Died 5 days p.e.
115	1.0	4.2	<u>6.2</u>	<u>7.0</u>	<u>6.2</u>	5.4	--	--	--	--	--	--	--	--	--	Died 6 days p.e.
118	4.4	3.2	<u>5.6</u>	<u>6.2</u>	<u>6.4</u>	<u>5.6</u>	<u>5.2</u>	--	--	--	--	--	--	--	--	Died 7 days p.e.
121	1.8	3.0	<u>7.8</u>	<u>6.2</u>	4.6	--	--	--	--	--	--	--	--	--	--	Died 5 days p.e.
124	2.2	4.8	<u>6.4</u>	<u>7.8</u>	<u>6.0</u>	<u>6.2</u>	<u>6.6</u>	<u>5.4</u>	1.0	--	--	--	--	--	--	Died 9 days p.e.
127	2.0	4.6	<u>6.6</u>	<u>7.0</u>	<u>6.0</u>	4.2	--	--	--	--	--	--	--	--	--	Died 6 days p.e.
130	1.8	3.6	<u>7.2</u>	<u>6.2</u>	<u>5.4</u>	<u>6.2</u>	--	--	--	--	--	--	--	--	--	Died 6 days p.e.
133	2.0	2.2	<u>5.0</u>	<u>7.0</u>	<u>6.4</u>	<u>5.4</u>	<u>5.0</u>	--	--	--	--	--	--	--	--	Died 6 days p.e.
136	<u>5.0</u>	<u>5.0</u>	<u>4.6</u>	<u>5.2</u>	2.6	--	--	--	--	--	--	--	--	--	--	Died 5 days p.e.
139	<u>2.0</u>	<u>2.8</u>	<u>6.2</u>	<u>6.8</u>	<u>5.8</u>	<u>7.6</u>	<u>6.0</u>	<u>5.0</u>	--	--	--	--	--	--	--	Died 8 days p.e.
145	2.0	3.4	<u>6.6</u>	<u>6.8</u>	<u>6.2</u>	<u>7.0</u>	<u>5.2</u>	--	--	--	--	--	--	--	--	Died 6 days p.e.
148	2.4	4.0	<u>6.2</u>	<u>6.4</u>	--	--	--	--	--	--	--	--	--	--	--	Died 4 days p.e.
151	1.8	4.4	<u>5.0</u>	<u>6.2</u>	4.2	--	--	--	--	--	--	--	--	--	--	Died 5 days p.e.
155	3.0	4.0	<u>6.6</u>	<u>7.2</u>	<u>6.0</u>	3.4	--	--	--	--	--	--	--	--	--	Died 5 days p.e.
159	4.6	4.0	<u>7.4</u>	<u>8.0</u>	<u>6.8</u>	<u>6.4</u>	--	--	--	--	--	--	--	--	--	Died 6 days p.e.

Significant temperatures are underlined for convenience in evaluating results. p.e.=post-exposure.

\* Temperatures are recorded as the number of degrees over 100° F.

TABLE 25 - TEMPERATURES\* OF MEDICATED PIGS CHALLENGED WITH VIRUS AND SIMULTANEOUSLY GIVEN S. CHOLERAESUIS (LOT 2, EXPERIMENT 6)

Pig No.	Days Post-Exposure														Remarks	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13		14
64	2.0	3.6	<u>6.2</u>	<u>6.8</u>	<u>5.8</u>	3.0	<u>5.0</u>	--	--	--	--	--	--	--	--	Died 7 days p.e.**
68	1.8	2.6	<u>6.6</u>	<u>7.0</u>	<u>6.0</u>	<u>5.2</u>	<u>5.6</u>	<u>5.0</u>	4.2	3.2	0.0	--	--	--	--	Died 11 days p.e.
71	2.4	2.4	<u>3.2</u>	<u>4.8</u>	<u>6.2</u>	4.6	<u>5.0</u>	<u>2.8</u>	2.8	3.0	3.0	2.6	3.0	2.0	3.4	Survived
74	2.4	1.6	3.0	2.4	<u>4.6</u>	3.8	<u>6.0</u>	<u>6.0</u>	4.4	4.0	4.2	3.4	2.6	3.6	3.4	Survived
77	2.8	2.4	3.4	4.4	<u>7.0</u>	<u>6.2</u>	<u>7.0</u>	<u>4.4</u>	<u>6.8</u>	4.6	--	--	--	--	--	Died 10 days p.e.
88	3.4	2.6	2.2	3.4	<u>4.8</u>	4.8	4.4	<u>6.0</u>	3.8	3.4	1.0	1.4	1.2	3.2	2.4	Survived
92	4.0	1.8	3.6	4.4	3.4	3.8	4.0	<u>4.0</u>	3.0	3.2	2.6	2.8	3.0	3.2	2.2	Survived
97	2.8	3.0	3.6	2.6	4.3	4.4	4.2	2.8	3.4	4.6	2.2	2.4	2.0	2.6	2.4	Survived
102	2.2	2.0	<u>5.2</u>	<u>6.8</u>	<u>6.6</u>	<u>7.8</u>	<u>7.6</u>	<u>6.4</u>	<u>6.8</u>	<u>7.8</u>	1.8	--	--	--	--	Died 11 days p.e.
105	2.6	2.6	<u>5.6</u>	<u>6.6</u>	<u>6.0</u>	<u>6.8</u>	<u>7.6</u>	<u>5.8</u>	--	--	--	--	--	--	--	Died 8 days p.e.
109	3.4	3.2	<u>6.0</u>	<u>6.8</u>	<u>6.4</u>	<u>7.0</u>	--	--	--	--	--	--	--	--	--	Died 6 days p.e.
114	3.0	4.4	<u>7.2</u>	<u>5.2</u>	3.8	--	--	--	--	--	--	--	--	--	--	Died 5 days p.e.
117	2.8	4.2	<u>6.0</u>	<u>6.2</u>	<u>6.2</u>	5.4	<u>5.0</u>	3.8	3.8	3.4	3.4	2.8	3.0	3.6	2.8	Survived
120	3.0	2.0	<u>5.4</u>	<u>6.6</u>	<u>6.6</u>	<u>5.6</u>	<u>5.0</u>	<u>6.4</u>	<u>6.0</u>	--	--	--	--	--	--	Died 8 days p.e.
123	2.2	3.2	<u>7.0</u>	<u>6.2</u>	<u>5.6</u>	<u>6.0</u>	--	--	--	--	--	--	--	--	--	Died 6 days p.e.
126	3.8	3.6	<u>7.8</u>	<u>7.6</u>	<u>6.8</u>	<u>6.4</u>	<u>6.8</u>	--	--	--	--	--	--	--	--	Died 7 days p.e.
129	3.0	3.0	<u>7.4</u>	<u>6.6</u>	<u>6.4</u>	<u>7.4</u>	<u>7.6</u>	<u>5.0</u>	--	--	--	--	--	--	--	Died 9 days p.e.
132	3.0	3.0	<u>6.0</u>	<u>7.4</u>	<u>5.8</u>	4.6	--	--	--	--	--	--	--	--	--	Died 6 days p.e.
135	3.0	3.2	<u>6.8</u>	<u>6.6</u>	<u>6.8</u>	<u>5.4</u>	<u>7.0</u>	--	--	--	--	--	--	--	--	Died 7 days p.e.
138	2.6	3.8	<u>4.6</u>	<u>6.6</u>	<u>6.8</u>	<u>5.8</u>	<u>5.0</u>	--	--	--	--	--	--	--	--	Died 7 days p.e.
142	3.2	3.2	<u>7.4</u>	<u>7.8</u>	<u>5.2</u>	<u>6.6</u>	--	--	--	--	--	--	--	--	--	Died 6 days p.e.
146	3.0	4.0	<u>6.0</u>	<u>7.6</u>	<u>5.6</u>	<u>5.4</u>	--	--	--	--	--	--	--	--	--	Died 5 days p.e.
150	2.8	3.8	<u>4.6</u>	<u>6.8</u>	<u>6.4</u>	<u>7.2</u>	<u>7.4</u>	--	--	--	--	--	--	--	--	Died 7 days p.e.
153	3.0	<u>5.0</u>	<u>7.2</u>	<u>7.0</u>	<u>7.2</u>	<u>7.0</u>	<u>7.4</u>	<u>6.8</u>	--	--	--	--	--	--	--	Died 8 days p.e.
157	3.0	2.6	<u>7.4</u>	<u>6.0</u>	<u>7.4</u>	<u>8.0</u>	<u>6.8</u>	<u>5.8</u>	--	--	--	--	--	--	--	Died 8 days p.e.

Significant temperatures are underlined for convenience in evaluating results. p.e.=post-exposure.

\* Temperatures are recorded as the number of degrees over 100° F. \*\* Because of abscess. No lesions of Salmonellosis.

TABLE 26 - TEMPERATURES\* OF NON-MEDICATED PIGS CHALLENGED WITH VIRUS ALONE. (LOT 3, EXPERIMENT 6)

Pig No.	Days Post-Inoculation														Remarks	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13		14
67	1.0	3.2	4.0	<u>6.0</u>	<u>6.2</u>	<u>6.0</u>	<u>8.0</u>	<u>5.0</u>	<u>5.0</u>	<u>5.4</u>	<u>5.0</u>	4.8	4.4	<u>5.4</u>	<u>7.8</u>	Died 16 days p.i.
70	2.0	3.2	2.6	<u>5.0</u>	<u>5.2</u>	<u>3.2</u>	<u>6.8</u>	<u>2.8</u>	--	--	--	--	--	--	--	Died 8 days p.i.
73	2.0	4.4	4.0	<u>6.0</u>	<u>6.4</u>	<u>5.0</u>	<u>6.0</u>	<u>5.0</u>	--	--	--	--	--	--	--	Died 7 days p.i.
76	1.8	3.0	2.0	<u>3.8</u>	<u>5.6</u>	<u>5.0</u>	<u>5.0</u>	<u>1.8</u>	--	--	--	--	--	--	--	Died 8 days p.i.
90	2.0	3.0	2.6	4.2	<u>3.6</u>	<u>3.0</u>	<u>4.0</u>	<u>3.0</u>	2.8	3.8	3.6	3.2	1.8	2.6	3.6	Survived
93	1.0	2.0	3.2	1.6	<u>6.8</u>	<u>4.6</u>	<u>7.0</u>	<u>6.0</u>	<u>6.0</u>	<u>5.0</u>	<u>6.0</u>	<u>7.4</u>	--	--	--	Died 12 days p.i.
99	2.0	4.0	<u>5.2</u>	<u>5.2</u>	<u>6.0</u>	<u>6.2</u>	<u>5.0</u>	<u>5.0</u>	1.0	1.2	3.2	4.2	4.0	3.2	4.0	Died 15 days p.i.
104	1.8	4.0	<u>3.4</u>	<u>5.4</u>	<u>5.4</u>	<u>5.6</u>	<u>5.4</u>	<u>3.0</u>	4.2	2.2	4.0	3.6	3.2	3.6	4.2	Survived
106	2.4	3.6	3.6	<u>5.0</u>	<u>6.0</u>	<u>5.4</u>	<u>5.4</u>	<u>4.0</u>	3.8	4.6	<u>6.0</u>	<u>5.0</u>	4.2	4.0	4.0	Survived
108	3.0	4.0	<u>5.4</u>	<u>7.6</u>	<u>7.0</u>	<u>6.4</u>	<u>8.0</u>	<u>7.0</u>	<u>7.2</u>	<u>7.8</u>	1.0	--	--	--	--	Died 11 days p.i.
112	1.4	2.6	4.2	<u>6.0</u>	<u>7.0</u>	<u>5.6</u>	<u>7.4</u>	<u>7.0</u>	<u>5.0</u>	<u>5.4</u>	3.2	--	--	--	--	Died 11 days p.i.
116	1.8	3.4	3.2	<u>5.8</u>	<u>7.0</u>	<u>5.2</u>	<u>5.0</u>	--	--	--	--	--	--	--	--	Died 7 days p.i.
119	2.0	2.4	2.8	<u>7.0</u>	<u>6.8</u>	4.2	4.0	<u>5.0</u>	--	4.6	<u>7.4</u>	<u>5.2</u>	<u>6.2</u>	3.4	--	Died 14 days p.i.
122	1.8	1.6	2.6	<u>5.6</u>	<u>7.2</u>	<u>7.0</u>	<u>5.4</u>	<u>6.0</u>	<u>5.4</u>	4.6	<u>5.0</u>	<u>6.6</u>	<u>5.4</u>	<u>5.2</u>	4.0	Survived
125	3.8	2.6	2.4	1.0	3.8	<u>5.6</u>	<u>6.2</u>	<u>6.0</u>	<u>5.4</u>	<u>6.8</u>	<u>6.0</u>	<u>6.4</u>	--	--	--	Died 12 days p.i.
128	3.0	4.4	3.6	<u>6.6</u>	<u>6.4</u>	<u>7.2</u>	<u>7.0</u>	<u>7.4</u>	<u>6.0</u>	<u>5.0</u>	<u>5.8</u>	--	--	--	--	Died 11 days p.i.
131	2.0	2.4	3.6	<u>5.8</u>	<u>8.4</u>	<u>6.6</u>	<u>7.0</u>	<u>7.0</u>	<u>5.0</u>	4.4	1.0	--	--	--	--	Died 11 days p.i.
134	2.4	3.6	4.0	<u>5.4</u>	<u>6.6</u>	<u>7.6</u>	<u>6.0</u>	<u>5.4</u>	4.2	4.6	4.0	--	--	--	--	Died 11 days p.i.
137	1.2	3.6	3.6	<u>5.4</u>	<u>7.0</u>	<u>7.6</u>	<u>7.0</u>	<u>5.4</u>	<u>5.0</u>	4.0	--	--	--	--	--	Died 10 days p.i.
141	1.4	3.8	2.8	4.6	<u>6.4</u>	<u>5.8</u>	<u>7.0</u>	<u>6.0</u>	<u>8.0</u>	<u>5.8</u>	--	--	--	--	--	Died 10 days p.i.
144	1.8	3.0	4.0	<u>6.6</u>	<u>7.4</u>	<u>6.4</u>	<u>7.8</u>	<u>7.0</u>	3.8	<u>5.8</u>	4.0	4.4	--	--	--	Died 12 days p.i.
149	2.2	4.0	3.0	4.0	<u>5.8</u>	<u>6.0</u>	<u>8.0</u>	<u>7.8</u>	<u>7.8</u>	<u>8.0</u>	2.0	--	--	--	--	Died 11 days p.i.
152	2.2	4.4	2.4	5.4	<u>7.4</u>	<u>5.6</u>	<u>7.0</u>	<u>7.2</u>	<u>6.0</u>	<u>8.6</u>	4.0	3.2	--	--	--	Died 12 days p.i.
156	2.0	4.0	<u>5.0</u>	<u>5.8</u>	<u>6.0</u>	<u>7.0</u>	<u>6.4</u>	<u>7.0</u>	<u>7.0</u>	<u>5.4</u>	3.0	--	--	--	--	Died 11 days p.i.
160	2.0	4.4	2.8	3.8	4.0	<u>7.2</u>	<u>6.0</u>	<u>7.8</u>	<u>8.0</u>	<u>6.8</u>	<u>6.4</u>	<u>5.4</u>	3.4	4.0	<u>5.6</u>	Died 15 days p.i.

Significant temperatures are underlined for convenience in evaluating results. p.i.=post-inoculated.

\* Temperatures are recorded as the number of degrees over 100° F.