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A Resume of The New Hog-Cholera Vaccine

Dr. W. S. Gochenour*

Veterinarians who have had experience with the new Allied Brand of desiccated rabbit-origin hog cholera vaccine (swivax) are beginning to realize that if properly used, it makes possible the eventual elimination of widespread cholera outbreaks.

Prior to 1951, thirteen years of patient research had been undertaken at the Pitman-Moore laboratories of Allied Laboratories, Inc., at Zionsville, Indiana, in search of such a cholera-control agent. In the summer of that year, these laboratories introduced such a vaccine.

Field experiments have not only proved its effectiveness as an immunizing agent, but have also provided evidence that other important advantages are inherent in it. For example:

(1) Since swivax is of rabbit origin, it avoids any danger of transmitting other swine diseases to the herd being vaccinated.

(2) Initial tests indicate swivax offers promise of protection against the field variants of hog cholera isolated in 1949 by the Bureau of Animal Industry.

(3) It does not create new foci of infection.

(4) It does not contaminate premises.

(5) Being a single-injecton treatment, it is economical and labor saving.

(6) Because the swivax virus strain has undergone hundreds of serial passages in rabbits, it has been modified to the point that simultaneous use of serum with this vaccine is unnecessary.

An important clue to the development of the vaccine came from war-time research on the control of rinderpest in cattle, by James A. Baker (then a Captain in the Veterinary Corps). He and his associates demonstrated a successful method of passing rinderpest virus alternately through calves and rabbits, and predicted that the same technique could be applied to hog cholera. Preliminary work on hogs and rabbits by Dr. Baker and other research workers stimulated the Allied research group to attempt a modification of the virus of hog cholera — passing it alternately through pigs and rabbits.

Simple as this procedure may appear to be, a vast amount of work and investigation was necessary to bring it to the present point of clinical value. Hundreds of serial passages of virus had to be made. Numerous lots of modified virus had to be tested repeatedly, both under controlled laboratory conditions and in the field. As the tests became more encouraging each year, quantity production methods had to be devised, and equipment designed to satisfy exacting production requirements.

Since then the vaccine has had critical tests both under laboratory conditions and in the field. Thus, prior to marketing, extensive field tests, covering 21,000 head of swine, were conducted in Indiana, Illinois, Ohio, Missouri, Virginia and New Jersey. The results of these tests support the original premise of the Allied research group — that there could be developed a single-dose immunizing agent which can

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produce solid immunity against cholera and at the same time not endanger untreated animals in the same herd.

Swivax is not just another hog cholera vaccine. It is not produced by chemical killing or inactivation — processes which merely weaken natural hog-cholera virus, both as to pathogenicity and antigenicity. The virus used in the preparation of swivax is modified through more than 200 animal passages outside the natural host. Consequently, it is, in a sense, a new form of hog-cholera virus, and a fully active one. This modified virus can not cause pigs to acquire hog-cholera, yet it is fully capable of solidly immunizing the pig against the disease.

As with all veterinary biological products, production of the vaccine is under license by the Bureau of Animal Industry and must conform to its regulations. The most important considerations are safety and potency tests. These consist of cultural tests, laboratory animal inoculations and pig vaccinations. In the latter, known susceptible pigs are vaccinated with each lot of vaccine produced. These pigs must remain free of untoward reactions. After an appropriate interval, they, along with an appropriate number of controls, are then challenged with virulent hog-cholera virus to prove the establishment of a satisfactory immunity.

Both the new vaccine and many of the processes required for its production are unique. The processing includes a series of exceedingly delicate operations, some of which required the development of totally new types of equipment and technique.

One of the principal factors in the quality control of the product consists of maintaining a constant check on the concentration of the virus. This is accomplished by a series of titrations conducted on the rabbit-origin inoculating virus, each lot of newly harvested production virus, each lot of frozen virus just prior to desiccation, and each lot of the final desiccated product.

This maintenance of the virus concentration throughout and following a variety of delicate production procedures is complicated by the need to store the seed virus in the frozen state under an unvarying temperature until its injection into rabbits and maintenance of the same unvarying conditions from harvesting to sharp-freezing.

The vaccine is dried from the frozen state under high vacuum which is obtainable only with high capacity mechanical pumps boosted by diffusion or oil ejector pumps. Since the temperature of the vapor condenser must be lower than that of the product being dried, temperatures as low as —80°C. are necessary.

Once the vaccine is dried, it must be sealed under high vacuum and stored under refrigeration. The final containers are sealed in a specially designed vacuum sealer. Each vial is then tested for vacuum and must contain less than one-fifteen-thousandths of an atmosphere of gas.

To make possible the quantity-production of so carefully safeguarded a product, a team of biologists, efficiency engineers, mechanical engineers and construction experts collaborated in the designing and erection of a building at the Pitman-Moore Biological Laboratories. This new building not only makes it possible to produce large quantities of the vaccine but does so under conditions which enable the scientists at those laboratories to guarantee the unwavering quality of the product.

Concerning the administration of the vaccine, there is one point that should be emphasized: Since satisfactory results depend upon injecting a live virus, vaccines of this type are produced in a dried form to maintain their effectiveness. Obviously, they must be properly restored to the liquid state and so handled as to assure the injection of a potent product. Contamination by even minute amounts of disinfectants, or other materials used to clean and sterilize syringes, may destroy their immunizing value.

The administration of the new vaccine is, therefore, an operation requiring the professional skill of a veterinarian. His judgment and diagnostic ability are just as important in the successful control of hog cholera by means of such a vaccine as when older methods are used. For instance, an incorrect diagnosis of diseases that resemble cholera can lead to costly
delays in beginning the proper treatment. Similarly, failure to recognize the presence of parasites, other infections or nutritional deficiencies, can nullify the advantages of the new method of vaccination. Furthermore, swivax must be used promptly after it is restored. Any use of "leftover" supplies will not only be useless, but could prove dangerous.

Similar disappointments will result from a disregard of the specific instructions for proper storage of the vaccine, sterilization of instruments, and technique of administration. The vaccine should not be administered to exposed or sick animals. In breeding stock and other swine held beyond the normal marketing period, revaccination is recommended.

A single intramuscular dose of 2 cc of the vaccine administered to healthy swine has been shown to provide adequate protection against the disease seven days following vaccination.

Swivax is recommended for the immunization of healthy swine, only, against cholera. Work is in progress to determine to what extent the vaccine can be used in exposed and infected herds. Intensive studies are being conducted to determine the duration of immunity as well as the degree of immunity that can be produced in suckling pigs, in those vaccinated shortly after weaning, and in pigs that have recently been treated with serum.

In this connection, it seems wise to emphasize the fact that neither swivax nor any other hog-cholera-vaccine is a "miracle drug" and as such will eliminate all swine disease problems. It is particularly important that swine-raisers should not be permitted to expect too much of the new product. It is by far the best and safest immunizing agent yet developed for the prevention of hog cholera, but its use will not compensate for errors in judgment or technique used in its administration. Certainly, it is no product for indiscriminate administration. It is unfortunate that certain overly enthusiastic reports in the lay press appear to have given the wrong impression. Hog cholera must still be included among the diseases that cause serious economic problems in swine production throughout the world.

Since the disease can spread wherever swine are raised, it is of particular concern in those areas in which the commercial production of pork is a major industry.

One important factor which has favored the spread of the disease has been the indiscriminate use of live, virulent virus by persons not sufficiently indoctrinated with the need for its cautious handling. The increasing use of the modified live-virus vaccine should go far toward eliminating this danger. Its widespread use should, indeed, serve to set up a wall of resistance to the natural virulent hog cholera virus, blocking its spread and eventually virtually eliminating the threat of widespread hog-cholera outbreaks.

The first charity hospital in the U.S. was founded in New Orleans in 1736, when a sailor, Jean Louis, bequeathed 10,000 livres to that city for the construction of an institution to care for the sick.

In this country today, antibiotic feed supplements constitute a multimillion dollar business. Conservative estimates by Chemical Industries place the value of antibiotic feed supplements at about $30 000,000 for the coming year. Mechanism of their growth-promoting effects still is obscure but apparently related to antibiotic activity. Swine and poultry derive the most benefit. The greatest growth-stimulation occurs during early life and gradually levels off with approaching maturity.

Biologic effects are produced whenever ionizing radiations are absorbed by a living organism. The reaction which occurs as the result of the irradiation may be insignificant in that no recognizable injury is apparent during the natural life of the recipient; the effects may be insidious and appear only after a lapse of many years; or they may be catastrophic, with death resulting in a few days to weeks from overwhelming sepsis, hemorrhage, and general toxicity. Thus the term "radiation injury" represents a number of clinical or subclinical manifestations which have exposure to ionizing radiation as a common etiology.