United States Department of Agriculture
Agricultural Research Administration
Bureau of Animal Industry

January 29, 1948

SUPPLEMENT NO. 11

to

SUMMARY OF DEVELOPMENTS

in the

MEXICAN OUTBREAK OF FOOT-AND-MOUTH DISEASE

With Supplementary Information
on United States Cooperation
in Control Measures

Since the outbreak of foot-and-mouth disease in Mexico and the consequent threat of the introduction of the disease into the United States, in addition to all the protective measures that can be taken in the event of an outbreak of the disease in this country, considerable attention has been given to research on this disease by the United States Government. The desirability and need for research by the United States have been recognized by many segments of the livestock industry and professional groups. A Foot-and-Mouth Disease Research Advisory Committee appointed by the Bureau of Animal Industry, consisting of Dr. W. A. Hagan, Dean of the Veterinary School, Cornell University; Dr. R. A. Kelser, Dean of the School of Veterinary Medicine, University of Pennsylvania; Dr. R. E. Shope of the Rockefeller Institute;and Dr. J. Traum, Professor of Veterinary Science, University of California, strongly recommends that a long-time research program be started by the United States and that it be conducted under the jurisdiction of the United States on United States territory, at some suitable location.

On January 26 and 27, the Subcommittee on Foot-and-Mouth Disease of the House Committee on Agriculture held hearings to consider legislation to enable the department to conduct research in the United States or elsewhere on foot-and-mouth disease, and other animal diseases which in the opinion of the Secretary of Agriculture constitute a threat to the livestock industry of the United States. There are attached two of the statements that were made to the subcommittee. Other witnesses appeard, some favoring the legislation and others opposing it. Additional hearings will be held at a later date to be announced by the subcommittee.

STATEMENT CONCERNING RESEARCH ON FOOT-AND-MOUTH DISEASE

Submitted January 26, 1948, to Subcommittee on Foot-and-Mouth Disease by B. T. Simms

Research with this disease should consist of two types of work, i.e., that which can be done immediately and a long-range program.

I. Research Which Is Being Undertaken Immediately

The immediate program is already set up under authority already granted. It consists of work in both Europe and Mexico. Qualified research men will be sent to laboratories engaged in foot-and-mouth disease research in England, Holland, Denmark, Switzerland, and possibly other countries. These men will engage in cooperative work with the investigators in the various institutions, and will also become familiar with the problems concerned with foot-and-mouth disease research and methods of procedure in the various institutions. In this investigational work, experimental animals, including cattle, swine, and guinea pigs, will be used, and the appropriate share of such expenses incurred, including special equipment used in this investigational work, will be paid by the United States Department of Agriculture.

The work will cover:

1. Determination of the types of the viruses existing in Mexico through animal experimentation and serological means;

2. Methods of preparing vaccines from Mexican and European strains and the testing of such vaccines;

3. Studies on diagnostic procedures; and

4. Chemical, physical, serological, and immunological investigation on viruses.

The Mexican phase of the immediate research program will include:

1. Tests in Mexican cattle of presently available European vaccines against Mexican virus, and the purchase and administration of small lots of presently available European vaccines for use on a field experimental basis in Mexico; and

2. The preparation of vaccines in Europe from Mexican strains of virus, and the experimental testing of such vaccines on Mexican cattle in Mexico.

II. Long-Range Research Program on Foot-and-Mouth Disease

The events of the past year, with respect to the spread of foot-and-mouth disease in Mexico, make it highly desirable and necessary that the Department establish a long-range research program covering all phases of the disease. No work has been initiated in this country in the past because the disease was not

present, and because of the fear of possible spread of the disease if research work were carried on within the confines of the United States. However, the disease is now prevalent in an adjoining country, and therefore is a direct threat to our livestock industry. Furthermore, air travel has made it possible for people to come to this country from any continent within a very short while. We have thus lost the protection of distance. Therefore, we should begin without delay a well-rounded research program that will supply us with the necessary information for protecting our livestock interests.

The establishment of research activities with foot-and-mouth disease within the borders of this country may give rise to misgivings because of the fear of possible spread of the disease from the base of such activities. The experience of British and other laboratories has demonstrated, however, that such research, if properly safeguarded, can be conducted without fear of spread. We believe furthermore that it is not practical to establish the base of research activities in a foreign country or on some isolated island off the coast. A location on United States territory will insure complete control of the program by the Department.

Since foot-and-mouth disease is the most easily transmitted of all the infections which attack livestock the utmost precautions must be taken in any laboratory in which work with it is done. Specially designed buildings or quarters are necessary. We have set up certain criteria which we believe should be met in the location of facilities which will be used for research operations on foot-and-mouth disease. It is desirable that the laboratory be isolated as far as possible from contact with domestic and wild animals that may be susceptible to foot-and-mouth disease. It should be removed from as much human traffic as possible. It would also be desirable to locate this laboratory in close proximity to other medical research centers. We have done considerable exploring for suitable locations. Isolated islands, while having certain advantages, have the disadvantage in that a great amount of handling is required of any material needed in research and also presents a very serious problem from the standpoint of personnel. It would be difficult to recruit and retain a sufficient number of trustworthy workers in extreme isolation for any extended period of time. The importance of the project and the part that the personnel will play, not only in carrying out experimental work but also in taking the necessary steps to prevent the escape of the virus from its confines, are such that the personnel should be very carefully selected. Special provision should be made so that the proper type of worker is employed and that those endangering the safety of the project be summarily removed. Satisfactory arrangements to this end should be made with the Civil Service Commission at an early date.

The program undertaken at such a laboratory should include the following:

1. Fundamental research on the virus itself including its physical, chemical, and biological properties and its relations to other viruses.

2. Studies of modes of transmission including carrier animals, wildlife, etc.

3. Attempts at development of better diagnostic methods.

4. Studies of the different strains of the virus and their relations to one another.

5. Attempts to develop more effective and less expensive vaccines.

6. Efforts to develop more efficient methods of disinfecting contaminated premises and areas.

STATEMENT BY DR. I. A. GALLOWAY, DIRECTOR AND SCIENTIFIC SECRETARY
RESEARCH INSTITUTE, BRITISH FOOT-AND-MOUTH DISEASE RESEARCH COMMITTEE

The control of foot-and-mouth disease is an international responsibility and it is highly desirable that there should be free interchange of ideas and views. The task is heavy and the laboratories are few but all should be willing to give of their best. You may ask, and with reason, what special attributes I possess to justify my expressing an opinion on problems connected with foot-and-mouth disease or diseases associated with causative agents or viruses with similar general characteristics to the virus of that disease. I can say only that I have been associated with, and extremely interested in, research into such virus diseases in general and foot-and-mouth disease in particular for some 25 years and for the last 8 or 9 years I have been held entirely responsible for everything that goes wrong in the Research Institute of the British Foot-and-Mouth Disease Research Committee.

You may consider that this is not a very good background and that such a person might have "gone stale" and that it might be better to seek the opinions of someone who could view the problem in better perspective, one who had not had "his nose so close to the grindstone." That, however, is for you to judge. The extenuating circumstances are that I have, on occasion, had an opportunity to have a glimpse at the outside world and to appreciate the activities of other laboratory workers in the same field. At intervals over a period of years dating from 1925, I have paid visits to research centers engaged on the foot-and-mouth disease problem, research centers installed on the mainland, "set-ups" in the precincts of a town, or again built on islands, islands which started as such but which, owing to ultimate appreciation of the difficulties attendant on the carrying out of prolonged research of this type may have become transformed into peninsulas with artificially produced isthmuses by virtue of the construction of suspension bridges, islands which at certain seasons of the year become connected with the mainland by a sheet of ice rather than remaining separated from it by a sheet of water, and finally a research center on a small peninsula. I have thus been in a fairly good position to appreciate not only the trials and torments of those engaged on this problem but also the points which must be considered in setting up a new research center to study the disease.

Now, with regard to this great scourge, the United States of America is in a similar position to that in which Great Britain found herself some 30 to 40 years ago. As the result of what has transpired during the last 18 months, the threat of the possible introduction of foot-and-mouth disease into the United States, which is always present, has become more imminent. This change of situation, fraught with great danger, has been created by the occurrence of the disease in Mexico with the nearer approach of the infection to United States territory. Now three or four decades ago Great Britain had to consider exactly the same type of problem that your officials are obliged to consider now. Officials in Great Britain, after deliberations initiated by public criticism, decided to explore the possibility of carrying out research on the disease with a view to devising means, whether by protective inoculation with vaccines or other procedures whereby it might be rendered less harmful to the livestock industry. Owing to a certain amount of opposition, especially from stock owners, to any proposal for the setting up of a research center on the mainland of Great Britain,

first consideration was given to the possibility of carrying out experiments on the disease in India. Some officials were sent out to explore the possibility but they soon came to the conclusion that, owing to the apparent variable susceptibility of cattle in India, arising either from the resistance of different breeds or due to the fact that the disease was endemic in the country and that the animals tested had acquired resistance by having passed through the disease before, there was no assurance that early and rapid progress could be made there in a direction which would be of immediate service to stock owners in Great Britain itself. Later on, with the same restrictive concepts in view, an attempt was made to pursue experiments on the disease on a boat moved off the coast of England. This shows to what extent scientists against their better judgment are obliged to yield to uninformed opinion. This fantastic project was soon abandoned as being quite impracticable and the floating swan assumed the attributes of a white elephant.

It was not so justifiable to pass over lightly the suggestion which has come up again and again of installing a research station on a small island rather than on the mainland. One can fully appreciate the qualms of some, especially stock owners, who may visualize the research center becoming a greater menace than the potential risks of introduction of the disease from "over the border," in other words the fear that the attempted cure might be worse than the disease. Suffice to say at this point that, although it is easy to understand that the uninitiated could indulge in the entertainment of such fears, provided all the necessary special precautionary measures are taken as regards provision of structural protective systems, control of specially trained personnel with bathing and changing regulations and the wearing of protective clothing, air-conditioning, disinfection, and the suitable safe disposal of infective effluent and animal excreta, research on this highly infectious and contagious disease can be carried out with a great margin of security on the mainland.

It must be appreciated that although the measure of security against spread of the disease given by the installation of a research institute on an island may appear appreciably greater at least on paper than if the institute is on the mainland it may in actual fact not be so and any apparent advantages are heavily outweighed by the many disadvantages and high impracticability for a long-time policy of research. It would take too long to elaborate on this question here.

The question of research on foot-and-mouth disease on a small island received early consideration in England but finally in 1924 a committee was appointed and it was decided that a research center for the purpose should be set up on the mainland. The Pirbright Research Institute of the British Foot-and-Mouth Disease Research Committee is situated in a country district in the county of Surrey about 30 miles from London. There is a restriction order in force to prohibit the grazing of susceptible farm animals in close proximity to the institute. There are about half a dozen small dairy herds within between 1/2 and 2 mile range so that the immediate vicinity is but sparsely populated with cattle and other susceptible farm stock. There are a number of larger dairy herds with 5 or 6 miles. In spite of this fact, owing to the stringent rules in force, there has never been any evidence that any outbreaks of foot-and-mouth disease in the area have been due to escape of infection from the institute.

Foot-and-mouth disease cannot be considered as being endemic in Great Britain. It is introduced from outside at irregular intervals and cases occur sporadically; this fact and the geographical position provide conditions which are conducive to the adoption of a "stampingout" policy (that is, the rapid elimination of affected animals, disinfection, and application of a stand-still order). Nevertheless it has always been realized that in those untoward circumstances which might arise in which this policy broke down, it might be necessary to consider other methods of control such as vaccination either alone or judiciously combined with slaughter. Such are in application in other countries which are less favorably placed.

For this and another reason it was considered essential that research on foot-and-mouth disease should be pursued in Great Britain. The other reason was that it was felt that any results of experiments and tests would be useful to other countries in which the disease is endemic and when those countries used them in methods of controlling and preventing the disease in livestock this would have the general effect of diminishing the amount of infection about and thus the risk of introducing the disease into Great Britain. Under the exigencies of war or in circumstances in which it was not possible for any reason to keep pace with the rapid spread of infection, a stamping-out policy which involved slaughter of farm stock and disinfection alone, to the exclusion of other preventive measures, such as vaccination by itself or combined with slaughter of susceptible farm stock, would have to be abandoned.

Now the United States of America at the present juncture cannot afford to view the position with complacency and adopt the slogan "it can't happen here." The urgency of the situation must not be forgotten for the enemy is at the gates; "yet a little sleep, a little slumber, a little folding of the hands to sleep so shall thy poverty come as one that travelleth and thy want as an armed man." Let us now assume that full agreement has been reached or, since this is a goal not easy to attain, that at least the weight of opinion is in favor of the urgent necessity of setting up an institute of sufficient capacity for long term investigations on foot-and-mouth disease, or if occasion arose, other diseases of a similar nature which might threaten the livestock industry of the United States; and on territory of sufficient acreage to allow of some extension should accommodation of one sort or another be ultimately required.

Then it is apparent to all that the next step requires a considerable amount of careful reflection and that step is the selection of a suitable site. Let us suggest that within the limitations of human wisdom we come "as a prophet new inspired" to visualize its location. Such a site should not be only imaginary when considered in relation to the geographical attributes of the United States and there are no doubt wise counsellors attendant upon us with charts, maps, compasses, and the like. The spot which would provide ideal conditions is on a seaboard and preferably on a small peninsula rather than on an island. So that the matter may be clear in our minds, the definitions of a peninsula given in the Webster's Collegiate Dictionary are as follows: A portion of land nearly surrounded by water and joined to a larger body (the body in this case is the United States) by a neck or isthmus or alternately any piece of land jutting out into the sea. Our site should preferably be on a portion of land which would conform rather to the first definition as regards position than to the second

and in any case the narrower the isthmus the better. The portion of land itself should be an area in which the population with cattle and other susceptible farm stock is of a low order. The site selected should be within reasonable distance of a large town in which there is a university and other research institutes, schools and colleges so that the members of the scientific staff engaged on the research can commune with their fellow workers in similar and other fields of study. The proximity to the sea or at least to an efficient sewer system would facilitate the safe disposal of disease-infected effluent and manure after suitable preliminary disinfectant treatment. The fact that the sea would be a means of approach to this favored location would be an advantage in those dire, but one hopes rare, circumstances which might arise and make it well-nigh impossible or at least inadvisable to use transport by land for bringing susceptible experimental animals to the research, or what might under the stress of disease spread have become a vaccine-producing, center. In the offing there should be schooling facilities, medical and dental treatment, social amenities, and diversions. So much for the site.

Now it is perhaps not fully appreciated how costly research on foot-and-mouth disease is and it would perhaps be as well if some stress was placed on this. The eight samples of virus had been collected in Mexico from different centers of infection and these were transported to the Research Institute of the British Foot-and-Mouth Disease Research Committee at Pirbright. It was necessary to examine these in great detail in order to determine whether there was only one type of infective agent involved, to investigate the characteristics of the virus and to carry out at the same time vaccination experiments. In this work 527 cattle have been used to date at an average price of $104 per head plus 477 guinea pigs at a cost of about $800, making a total cost of $55,000. Now this money was expended in investigating just one problem. It is necessary to carry out the studies on cattle, and working with these is costly, not only in respect of the animals themselves but in providing suitable accommodations for them. Elaborate experimental units have to be specially constructed to house the experimental animals so as to obviate the possibility not only of virus escaping from the institute and being carried to livestock outside, but in order to avoid accidental infections within the confines of the institute which would vitiate the results of experiments. These are exceedingly costly, as air-conditioning should be provided to include air sterilization; all the feeding arrangements have to be specially constructed, separate passage ways, impervious walls and flooring must be provided; bathing and changing units for personnel must be erected. As the staff have to wear special clothes inside the institute and special rubber kit on entering the units where the experimental cattle are kept, there must be a laundry unit for the sterilization and cleansing of the clothing; disinfection tanks must be provided for the virus-infected effluent, and suitable installations made for the disinfection of manure; and there must be incineration for burning animals, as well as a small canning plant so as to salvage such meat as may be suitable for food.

Now it has been the experience at Pirbright that owing to insufficient accommodation for housing experimental animals and insufficient facilities, progress is relatively slow. There are so many problems which have to be tackled, when considering the setting up of a new research institute for the purpose under discussion, it should be appreciated at the start that

it is no use tackling the problem half heartedly. As only those who have worked intensively on foot-and-mouth disease can assess, the investigations are costly if reliable information is to be forthcoming and gratifying results produced. It is exceedingly costly by virtue of all the special demands which are made in this type of research for efficient control and disinfection and it must be, of necessity, planned on a long-term basis.

Although by experiments on small experimental animals much useful information can be obtained about the disease, in the light of our present state of knowledge, extensive experiments on cattle are very necessary.

There must also be rat-proof fencing, changing rooms and baths for personnel at the entrance to the experimental units, all these additional to all the laboratories, services, administrative offices, a library, etc., which are required in the usual type of bacteriological research. There have to be large buildings for storing cattle for long-term duration of resistance tests after vaccination and also similar housing for cattle immune to the different types of virus. There are at least three different types of virus, and recovery from infection with one will not prevent an animal becoming infected with the second or third type; these type-resistant cattle are used for distinguishing the types of virus recovered from outbreaks in the field. The existence of the three types of virus requires the attendance of a specially selected and trained staff. Let it be reiterated that the research has to be planned on a long-term basis and the provision of accommodations must be liberal and adequate to insure that the work is not held up by bottlenecks. Some major experiments in cattle may take 2 to 3 months to complete and the cattle concerned have to be under examination in closed units during this time. If only a limited number of units are provided, it is not difficult to see how the rate of progress must be diminished.