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A SURVEY OF THE FOOT AND MOUTH DISEASE PROBLEM IN MEXICO

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At the request of the Texas Sheep and Goat Raisers Association, under a cooperative agreement with the Texas Agricultural Experiment Station, the writer made a 30-day survey of the foot and mouth disease situation in Mexico. This trip was undertaken to ascertain as completely as possible the present status of the problem in that country.

Between February 10 and March 10, 1948, the writer traveled from the Gulf of Mexico to the Pacific Ocean along either the northern quarantine line or the northern protective line and in the buffer zone between these lines. He saw and examined a herd of 111 cattle suffering from the disease in all stages at the village of Soledad, near Leon, in the state of Guanajuato. He spent several days in the area between the quarantine and protective lines on the Isthmus in the south where slaughter of exposed and contact animals was still in progress. He finally discussed the whole situation, both present and future, with both American and Mexican members at all levels of the joint Mexican-American Commission for Eradication of Foot and Mouth Disease. Traveling by air, train, automobile, jeep and "weapons carrier" (no picnic on a rough road), the writer believes that he secured a true picture of the situation as it exists, and can appreciate fully the magnitude of the problem.

He wants to thank sincerely all members of the Commission, both American and Mexican, for their full cooperation and many courtesies extended during his stay in Mexico.

Brief History of the Foot and Mouth Campaign

The diagnosis of foot and mouth disease among cattle in Mexico was made by U. S. Bureau of Animal Industry veterinarians (Drs. Shahan and Wardlaw) in December 1946. The disease was known to exist in six states at that time. Congress authorized cooperation with the Mexican Government to fight the disease through a joint Mexican-American Commission in February 1947, and made money available for the American operations the following month. American personnel began arriving in April, and by late May or early June the slaughter and disinfection program, agreed upon by both governments, was in operation. Difficulty in securing necessary machinery, particularly dirt-moving equipment for the carcass burial operations, hampered operations very appreciably.

From July until the slaughter program was suspended at the request of the Mexican Government on November 26, 1947, operations were conducted at an increasing tempo, except for the natural slow-down following the massacre of a Mexican veterinarian and a captain and 6 soldiers of the Mexican Army at the village of Senguio in Michoacan on September 1.

All told, better than half a million infected and exposed animals were slaughtered and buried and the premises disinfected during the time this program was in effect. It should be mentioned that a considerable number of animals (approximately 99,000 cattle, sheep, goats and swine) were slaughtered and buried by the

Mexican Government before participation by the American personnel.

After the slaughtering campaign was stopped, the American and Mexican veterinarians were transferred to daily inspection of susceptible animals, starting at the quarantine lines from the Gulf to the Pacific, to determine the exact extent of the buffer zone of "clean" animals and the country above the infection. These men are in touch with each other so that the inspections, repeated each week for three consecutive weeks before the areas and animals inspected were declared "clean, are as complete as possible.

Slaughter of infected and exposed animals in the buffer zone is still authorized to keep this area free of the disease and to reinforce the quarantine lines.

The lack of an intensive and extensive organized educational campaign about the disease and its effects on the economy of Mexico, particularly among the livestock owners and country people of the infected area, hampered the campaign from the start. Fear, ignorance and hostility on the part of many of the livestock owners (inspired in part by propaganda emanating from the political "outs") led them to drive their infected and exposed animals into hitherto clean country, or to hide them in caves and other recesses in the mountains until the slaughtering crews had passed. These practices contributed to the rapid spread of the disease and bogged down the slaughter campaign. In too many cases, the Commission personnel could not get on the outside of the infection, because infected and exposed animals were driven into clean areas and a new infection would "pop up" behind them within a few days after a slaughtering operation had been completed on what had been the outside edge of the infection. Of course, a campaign of education about the disease could not have obviated all the obstacles encountered, but certainly it would have helped. Such a campaign, with posters, movies, lectures and the like, has been "stepped up."

The lack of fair-to-good roads throughout much of the infected area hampered the campaign from the start. For the average American, accustomed to good roads in all parts of the country, it is difficult to realize the difficulties of travel in many regions of interior Mexico. Originally, foot and mouth disease spread in a westerly direction from near the city of Vera Cruz, where the first diagnosis was made in December 1946. This is the natural flow of traffic along the few good roads. Later it spread north and south through contact with infected and exposed animals. There are thousands of trails, especially through the mountains, but in too many places there are literally no roads.

The more or less communal system of grazing throughout the bigger part of the infected area was an important contribution to the spread of foot and mouth disease. The animals are corralled by the individual owners during the night, but during the day all the animals from one or more villages graze together on adjacent fields and pastures. This practice obviously favors rapid extension of the disease and makes an eradication campaign extremely difficult.

#### The Disease

The infection occurring in Mexico is mild and the mortality has been low, probably not averaging over 2-3 percent since the beginning of the outbreak. The tests carried out by acknowledged authorities in England and Europe have shown that the Mexican virus is a strain of Type A, which seems to be a variant of the standard Vallee Type A. So far, neither of the other two types of foot and mouth virus, O and C, has been found in Mexico.

Typically, the great majority of the animals recovered from the disease within about 18 days. Loss of weight and sharp reduction of the milk flow in lactating cows during the acute (early) stages, coupled with lameness (inability to walk very much), and difficulty in eating and grazing due to sores formed around the hoof-head and in the mouth during the later stages of the infection, caused an extremely large loss in milk and meat production.

Probably the slaughter campaign would have been much more successful if the malignant type of the disease, carrying a mortality of 30-40 percent especially in calves, had occurred, since such a high death loss would have helped convince the owners that rapid and complete eradication by the slaughter method were necessary.

Although foot and mouth disease was observed in swine, sheep and goats, the greatest part of the infection occurred in cattle, with the mortality running higher in calves than in mature animals. Practically all of the infection in sheep and goats was mild; a few herds of hogs suffered severe infection, and the mortality in these particular herds was fairly high.

The writer examined a herd of 111 infected cattle near the village of Soledad in Guanajuato during the third week of February. The owner stated that he had lost only three animals since the first case appeared in the herd. At the time of examination the infection had been present among these animals for 15 days. Examination showed all stages of the disease -- from early vesicles (blisters) on the skin at the hoofhead and in the mouth to healed lesions (small scars). It is interesting to note that this herd was located only about 15 miles from the village of San Francisco de Rincon, where slaughter crews were working in November 1947 when the slaughter campaign was stopped.

The spread of the disease has slowed up substantially since the cessation of this campaign. This is probably due to two causes: (1) The disease has reached the peak and the incidence of spread to healthy animals is slowing down. It is well to remember, however, that this infection does not disappear completely as long as there are susceptible animals to keep it going. (2) The movement of infected and exposed animals into "clean" country ahead of the slaughtering crews largely ceased with the suspension of slaughtering operations.

Vesicular stomatitis (mal de yerba), a virus-caused disease of cattle, hog horses and mules, occurs annually in several parts of the foot and mouth disease infected area. The mouth lesions of these two diseases cannot be distinguished clinically, and the presence of mouth lesions among horses and mules (not susceptible to foot and mouth) as well as among the cattle on the same premises does not necessarily mean that only the stomatitis infection is present in the cattle. There is always the possibility that the virus of foot and mouth disease is also there. In all probability, some animals suffering only from stomatitis were slaughtered, but such a procedure was the only safe method under the circumstances.

### The People

Some of the livestock owners, more especially the smaller ones throughout a large part of the infected area, are illiterate. In addition, few newspapers reach the literate of the remote villages, largely because of their isolated location and the difficulties of transportation. Many of the Indians in the remote mountain villages do not speak Spanish, but only an Indian dialect, a fact which further complicates the pursuit of the campaign.



Many of these folk have little conception of disease, particularly contagious disease, and the measures necessary to combat and control such plagues as foot and mouth disease. Naturally, many of the owners bitterly resented the slaughtering of their work oxen and their meat and milk-producing animals, especially when the disease was mild and the death loss from it was very low. The payment of fair prices for these animals does not obviate the fact that in many instances the people of the villages are deprived of a means of tilling their land and raising their crops. The mules and harness distributed by the Commission did not take the place of the slaughtered oxen in the eyes of many of the owners.

This, of course, merely emphasizes the need for an extensive campaign of education on all phases of the disease and the measures necessary to control and eventually eradicate it.

### The Infected Area

All told, the area with foot and mouth disease covers about one-third of the land area of Mexico, extending through the middle and southern parts of the country from the Gulf to the Pacific. Fourteen states and the Federal District make up this area.

The best estimates that the writer could get varied from 12,000,000 to 15,000,000 head as the susceptible livestock population in this area, about one-third being cattle and the rest swine, sheep and goats. This does not include susceptible wild animals such as deer and the javelina; deer are not plentiful, but reports indicate that there are many javelininas, especially in the lower coastal regions.

The topography of the infected regions includes swampy, subtropical jungles and near-jungle coastal country, with annual rainfall varying from 60 to 100 inches, and high mountainous regions, mountain valleys and plateaus, and high, rolling semi-plains where the annual rainfall is about 14 to 16 inches. Included in this area is some of the roughest country on the North American continent.

The absence of roads and the presence of literally thousands of trails, especially in the mountains, adds to the difficulties of fighting the disease.

In some regions, the cattle run wild in the coastal jungles during the dry season and are seen and corralled only when they come back into the mountains during the coastal rainy season. The numberless trails and caves in the mountainous areas make early the driving and hiding of infected and susceptible animals. And until convinced that the disease is serious in its effect on the economy of the country and that eradication is necessary, too many of the livestock owners will continue these practices to avoid losing their animals. Obviously, "cleaning" an area of foot and mouth disease infection is extremely difficult, if not practically impossible, under present conditions.

### The Quarantine Lines

There are really two northern lines. (1) One line starts at Tampico on the Gulf, some 244 airline miles south of Brownsville, Texas, and runs in a general westerly direction through the northern tip of the State of Vera Cruz, thence through the southern parts of the States of San Luis Potosi, Zacatecas and Mayarit, and ends at the town of Puerta Vallarta, Nayarit, on the Pacific, a total distance of about 570 miles.

At the time of the writer's departure it was thought that this line would be dropped down and straightened when the final tests for freedom from foot and mouth disease infection had been completed on the three premises in the State of Aguas Calientes, and the one premise in the State of Zacatecas where outbreaks had occurred and the animals had been slaughtered, buried and the premises disinfected.

(2) The protective line, starts at Tamiahua, Vera Cruz, on the Gulf, 68 miles south of Tampico, and roughly parallels the northern line at an average distance of 20 miles (in many places much more than this), and ends some 20 miles south of Puerto Vallarta, Nayarit, on the Pacific.

The country between these two lines -- the buffer zone -- is free of foot and mouth disease; in fact, the infection is a good many miles below the protective line. A letter received from a member of the Commission in Mexico City states that a small outbreak near the town of Tamazunchale on the protective line, about 80 miles west of Tamiahua and some 279 miles south of the nearest Texas point, has been stamped out by slaughter and disinfection.

In establishing the lines, full advantage was taken of natural barriers such as mountains, canyons, and the like. For instance, the area west from Zacateca to the Pacific is reputed to contain some of the roughest country on the North American continent, and the deep Bolonis river canyons and the Ameca river gorge are utilized to form part of the line. The few possible crossings leading out of some of these gorges can be guarded and all traffic through them examined.

Fortunately, the natural flow of traffic, especially animal traffic, is in a southerly direction so that there is little danger of animals being transported north. Many trails lead through parts of the buffer zone, but the traffic on them is local -- back and forth between villages -- and offers little danger so far as the spread of the disease is concerned. The few automobile roads (about 3) and rail roads leading north through these lines are being guarded, and all traffic examined and disinfected.

Soldiers are stationed in groups along this line, sometimes at 10-kilometer distances, and sometimes much farther apart. They are supposed to patrol in pairs between these stations 24 hours a day, but this patrolling leaves much to be desired. For example, some 80 soldiers were counted between Valles and San Luis Potosi, a distance of approximately 122 miles, but only 3 pairs of them were actually on patrol. And between Tampico and Valles, about 75 miles, only 2 pairs were seen on patrol; other soldiers were at their stations but not out on patrol.

Ten disinfection stations were spotted along the north line to take care of all through traffic. Automobiles, busses, trucks and trains are disinfected, also the under carriage, wheels, fenders and inside of freight cars carrying animal products. Passengers and pedestrians must walk through the foot vats (vados). Four such stations were located along the protective line, at villages where small local roads led north through this line. It is well to mention that a large part of this line runs through areas where there are few, if any, real roads. These stations were being checked and strengthened at the time of the writer's departure.

Strenuous efforts are being made to have a total of 8,000 soldiers, preferably cavalry troops, stationed at 10-kilometer intervals along each of these two lines, and a continuous 24-hour patrol maintained.

Both of these lines need strengthening very much, especially continuous night and day patrolling. Proposed fences, to be erected where good natural barriers

are lacking, cannot be depended upon too much, even though they are regularly and continuously patrolled by alert, efficient soldiers. The proposed barbed wire fence (the right-of-way had been partially cleared and construction was to start at the time of the writer's departure) between Tamiahua on the Gulf and Tamazunchale on the protective line, a distance of about 80 miles through semi-tropical country, will be a deterrent to some of the animals, but it most certainly will need to be efficiently and continuously patrolled if it is to serve its purpose. In this area, the nearest foot and mouth infection is on the south side of the Tuxpan river, about 25 miles south of this fence line.

The natural southerly flow of traffic, especially in animals, from just below the buffer zone was probably as much or more responsible for the failure of the disease to spread farther north than were the quarantine lines. But efficient, well-manned and well-patrolled quarantine lines can insure, so far as is possible with a slippery, virus-caused disease such as foot and mouth, against its further spread to the north.

The southern quarantine line, about 175 miles in length, starts at the Gulf and runs along the Tonalá river, the boundary between Vera Cruz and Tabasco, for about 50 miles, then follows the boundary between the states of Chiapas and Oaxaca through high mountain country with no real roads, to the Pacific. The southern protective line follows the Isthmus Railroad from the Gulf to the Pacific, a distance of about 142 miles. This forms a good barrier since there are no roads through the region.

The distance between these lines averages about 50 miles. The northern part of this area is largely subtropical, swampy jungle, with most of the villages located along river banks. Here all travel is by boat.

At the time of the writer's visit to part of this area, slaughter operations were being actively pursued, the idea being to clean out the area between the two lines and make the railroad the definitive quarantine line. (Articles in the newspapers a few days ago, April 5, 1948, stated that one of the men attached to the Commission had been killed by gunshot wounds and that the slaughtering operations had been suspended indefinitely).

#### The Present Campaign

So far as the writer can see, the present program is aimed to control and contain the disease within its present limits, with the idea of eventually shrinking -- through continued inspection, vaccination and slaughter (at present confined to outbreaks in the buffer zones) -- the size of the infected areas. It does not at present envision eradication of the disease.

Briefly, the present program is: (1) Inspection of all cattle south from the buffer zone until the generalized, country-wide belt of infection is reached. In any isolated outbreaks encountered before the general infection belt is reached, the animals are to be slaughtered and a five-kilometer deep circle of susceptible animals around the outbreak are to be vaccinated. (2) When the general belt of infection is reached, the veterinarians will back up 40 kilometers (25 miles) and vaccinate all susceptible animals down to the infection, thus giving a solid 25-mile belt of immunized animals clear across the country. Not the least difficult aspect of this phase of the program is to get all the susceptible animals "rounded up" and vaccinated. (3) After this, it is expected that vaccination will be carried into the infected area by a sort of infiltration method -- vaccinating a "finger" of animals here and there, thus eventually extending the belt of vaccinated animals



farther south (and farther north from the southern line). Realizing the need for revaccination at approximately six-month intervals, since the best vaccines available do not confer immunity for appreciably longer than that period, the enormity of the task can be appreciated.

At the end of the second week in March, some 12,195 cattle and 5 hogs had been vaccinated around Magdalena, Jalisco, some 110 miles from the western end of the northern protective line, and 9,539 cattle and 1,177 smaller animals near Cerro Azul on the same line in the Gulf coastal region generally known as the Huasteca. In this work only the intradermal vaccine, of Argentine origin, had been used.

#### Disinfection

The disinfection program -- as it concerns automobile, bus, train and aeroplane travel -- is continuing with increased efficiency and intensity. All cars, trucks, busses and train cars are disinfected before leaving infected territory. Airplanes are fumigated and the under carriages are disinfected. All passengers are obliged to walk through small footbaths (sawdust soaked with the disinfecting solution) upon entering and leaving the cars, busses, and the like. It is worth mentioning that the American tourist is not the easiest person in the world to convince that he should walk through the foot bath and have the undercarriage and floorboards of his automobile disinfected. This indicates that an educational campaign on the disastrous effect of a foot and mouth disease outbreak on the economy of the United States should be vigorously pursued on this side of the border.

The baggage of the passenger is not disinfected -- a weak point in the program. There is always a possibility, slight as a general rule but present nonetheless, that the virus of the disease may be carried on such baggage. Disinfection of autos, trucks, busses and the feet of the passengers, is not all that it should be especially during the night hours. Constant efforts to remedy this situation are being made.

#### Vaccine and Vaccine Production

At the time of the writer's departure, the vaccines were being imported from Argentina and Europe, 25,000 doses having been received and used, and 50,000 doses were on order. Both these types were made with either Argentine or European strains of the virus. The Mexican strain has been shipped to European laboratories and vaccine made from that strain will be used as soon as it becomes available.

Plans for Mexican production of the vaccine, under supervision of the Commission, were going forward, utilizing remodeled buildings temporarily for this work. A complete modern unit for the production of vaccine and the conduct of some research on the disease is planned as soon as a good location can be secured, buildings erected and equipment installed.

Since the disease is well established in about one-third of Mexico and will be there for years, it is obvious that the possibilities of its being carried into the United States is ever present. This continuing threat emphasizes the imperative need for the immediate establishment by this country of an intensive research program on foot and mouth disease, employing the best qualified scientists available.

Our knowledge of the disease, peculiarities of the virus cause, carrier animals and the like, is far from complete. Attempts to develop more efficient and more dependable vaccines must be made.