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NECROBACILLOSIS IN SWINE

By ROBERT GRAHAM

NECROBACILLOSIS is a specific infectious disease of domestic animals which in certain localities constitutes a serious menace to swine raising. It is commonly known in pigs as canker sore mouth, infectious sore mouth, bull nose, or sniffles.

The intestinal form of necrobacillosis, or necrotic enteritis, is sometimes mistaken for hog cholera, but the injection of anti-hog-cholera serum is of no avail in combating necrobacillosis in any form.

Efficient control of the disease is based upon isolation and prompt treatment of affected animals, cleaning and disinfection of hog houses and feeding places, and rotation of pastures.

Mild cases of certain types of the disease may yield to treatment,but curative agents are not always satisfactory and afford only temporary relief.

NECROBACILLOSIS IN SWINE[1]

Necrotic Stomatitis, canker or infectious sore mouth
Necrotic Rhinitis, sniffles or bull nose
Necrotic Enteritis, thickening of the intestinal wall
Necrotic Dermatitis, ulceration or sloughing of the skin

Under the collective term *necrobacillosis* is grouped a variety of diseased conditions occurring in domestic animals caused by the *Bacillus necrophorus*, or bacillus of necrosis (see Fig. 1). As a specific infection it has attracted attention chiefly as a disease of sheep, and is best known in these animals under the names foot rot and lip-and-leg ulceration. Cattle are also affected, the different types of the disease in these animals being known as foul foot, calf diphtheria, or necrotic stomatitis. In swine, four distinct forms of necrobacillosis are recognized: viz., (a) necrotic stomatitis, canker sore mouth, or infectious sore mouth; (b) necrotic rhinitis, sniffles, or bull nose; (c) necrotic enteritis, or thickening and sloughing of the inner lining of the intestines; and (d) necrotic dermatitis, or necrosis and sloughing of the skin and underlying supporting tissue.

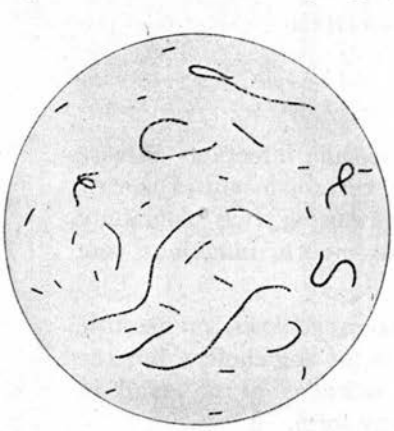

FIG. 1.—BACILLUS NECROPHORUS
(After Mohler, B. A. I. Bul. 67)

Bacillus necrophorus is a natural habitant of the alimentary tract of healthy swine and may be found in soil or in feedstuff contaminated with the manure of these animals. In the routine examination of a variety of apparently normal feedstuffs, including oats, alfalfa, clover, and orchard grass, this organism has been occasionally encountered. It thrives in filth about damp and unclean barns, dirty hog wallows, and insanitary premises. As a result, the ground surface of old feeding places or hog lots commonly harbors this infection and difficulty is eventually experienced in raising pigs on certain lots or

[1]By Robert Graham, Chief in Animal Pathology.

premises contaminated with this disease-producing germ. *Bacillus necrophorus* will not attack healthy, intact tissue but is a secondary invader once the tissue has been impaired by disease or mechanically injured by rough feeds or other agents. The development and recognition of the different forms of necrobacillosis in swine are therefore dependent upon the point of primary invasion and the character of the local lesions established. An animal may suffer from one or all types of the disease, yet one form or another generally predominates in a herd.

Occurrence.—In swine the lesions produced by *Bacillus necrophorus* have been observed in association with hog cholera for many years, but the economic importance of necrobacillosis to the swine industry was not fully appreciated until observations established its increasing prevalence and independent, fatal occurrence in these animals. In certain localities this infection has caused even greater losses than cholera. It may attack animals immunized against cholera as well as non-immune herds. According to federal and state authorities, necrobacillosis in swine is increasingly prevalent in Iowa, Minnesota, Missouri, and other middle-western states, and already in Illinois the inroads of the disease have made pork production unprofitable on some farms. Mr. W. J. Carmichael, in charge of the pork-production campaign in Illinois for the United States Bureau of Animal Industry, after observing conditions in different sections of the state, estimates the loss from this disease at 30 percent to 60 percent of the young pigs on some farms. One farmer (Mr. S.) writes: "Our losses from bull nose amounted to the offspring of 40 sows in the spring of 1917. Out of 136 pigs of March farrow, we raised 65 runts that sold in the market December 27 for 12 cents, average weight 134 pounds each. 107 May pigs were a total loss. We would have been better off if we hadn't raised a pig."

A complete survey of the state regarding the prevalence of necrobacillosis has not been made, yet in one county the loss from necrobacillosis in swine was estimated at $20,000 to $30,000, while its existence in other sections of the state is indicated by inquiry. The following extracts from letters relative to the character of a disease resembling necrobacillosis are significant of its economic importance.

"When the pigs are about six days old their tails start to canker at the root. In about four more days, the tails are all dried up crisp, and then fall off." (D.T.F.)

"..... It is first noticeable along the upper or lower jaw about where the tusk teeth appear, and in one or two days it will have formed an ulcer all along the jaw bone. ..... If the sow happens to step on the pigs' feet and make them sore in any way, an ulcer will form. I had one sow that had pigs a week ago and lost all of them. This sow had not been on the place but three days before farrowing." (W. F. S.)

"In the spring of 1916 we bought some feeding hogs which might have brought the disease with them, altho there were no symptoms noticeable other

than one or two affected in the nose. Our crop of spring pigs in 1916 started off well other than a little sore mouth. In August and the fore part of September our fall pigs came. Out of one bunch of about forty pigs we lost over half of them. We kept our 1917 pigs in three different bunches until weaning time, but as soon as they were allowed the run of the hog house the disease began to show up again. Some were affected with bull nose in 1916, yet they were few in comparison to what we had in 1917.'' (F. M.)

Susceptibility.—Suckling pigs are especially susceptible immediately following farrowing, during teething, or the first few weeks of life, as the infection gains entrance thru impaired tissue or injury inflicted by sharp teeth or tusks on the surface of the tongue, gums, or cheeks. The lining membranes of the mouth, nose, and intestines following injury become infected from contaminated pastures, feeds, dirty floors, or unclean udders, and any organ of the body may be secondarily involved. Thru abrasions of the tissue, the feet or the skin over any portion of the body may become directly infected. The disease is first manifested by a local affection which is characterized by inflammation and a progressive or latent penetrating death of tissue, followed by coagulation of the necrotic tissue involved. Unthrift and emaciation soon follow both from innutrition and from a general systemic intoxication resulting from the absorption of poisonous products generated by *Bacillus necrophorus.*

Course and Symptoms.—Necrobacillosis in swine may assume an acute form terminating fatally in a few days. In the slow or chronic type of the disease, affected animals may live for several weeks or even months and finally succumb, following temporary or permanent stunting. Animals mildly affected may recover spontaneously. Mature animals are highly resistant and only occasionally do they contract the disease, even in the case of sows nursing affected pigs; yet it must not be construed that mature animals from infected premises do not harbor the infection and aid in its spread. The history of some outbreaks indicates that the disease has been introduced on a premise by the purchase of mature breeding animals which showed no external evidence of the disease. Not infrequently pigs escape the infection until time of weaning, and as a result animals two to four months of age are frequently afflicted. The loss from necrobacillosis is dependent upon the resistance of the animal and the virulency of the infection, as well as upon the extent and location of the tissue involved. In some herds the losses are negligible, while in others they may be as high as 100 percent.

The symptoms vary with the type of the disease, but there is generally marked debility, unrest, emaciation, depraved appetite, malnutrition, tucked-up abdomen, rough coat, diarrhea, and cough. Canker or sore mouth in small pigs may affect only a part of the litter, while the disease may slowly develop in other forms before a specific infection is suspected, tho the constitutional disturbance is generally dependent upon the extent and location of the local lesions.

The premises become contaminated from the excrement of sick animals, including nasal excretions, saliva, and discharges from superficial skin lesions which enter healthy animals thru the channels previously mentioned. Rarely does the disease spread directly from animal to animal. One or two individuals suffering from any type of the disease may, however, indirectly infect an entire herd, and hence it is important that necrobacillosis in its various forms be recognized in its beginning stages. For several seasons necrobacillosis may occur in a mild form, when suddenly the farrow may all become affected before the nature of the disease is recognized and the importance of preventive measures appreciated.

NECROTIC STOMATITIS

Necrotic stomatitis, popularly known as infectious sore mouth or canker sore mouth, usually occurs in suckling pigs and is manifested by the development of local, circumscribed ulceration of the lips, tongue, gums, and cheeks. There is a progressive, deeply penetrating tissue destruction, accompanied by the formation of a dry, yellowish exudate, which, over the surface involved, is covered by a grayish brown scab. The affected areas may coalesce to form diffuse patches, and the skin about the corners of the mouth, nose, and face are occasionally involved (see Fig. 2). The necrotic tissue has a characteristic offensive odor which is noticeable in the quarters when the animals are closely confined. Affected pigs first show rough coats, accompanied by depraved appetite and emaciation, while death may follow in the course of five to twenty days from starvation and systemic

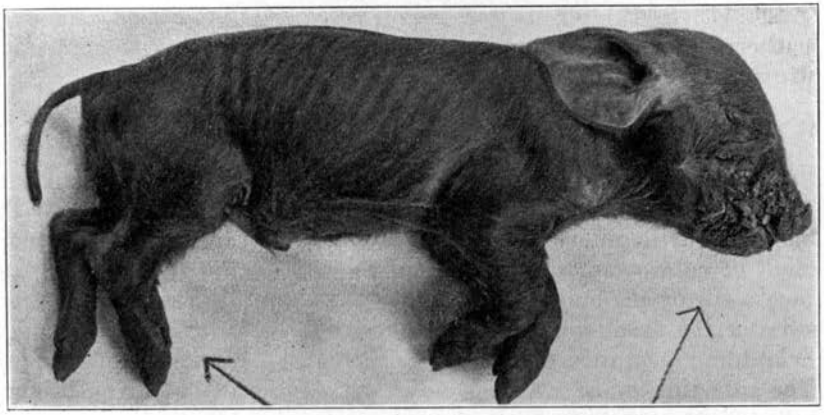

FIG. 2.—NECROTIC STOMATITIS IN YOUNG PIG
(Courtesy of Mo. Agr. Exp. Sta.)

intoxication or a secondary infection from the local necrotic areas. A mild type of the infection may result in lack of thrift and stunting, while visible local lesions may heal spontaneously and not be recognized by the keeper.

In the early stages of necrotic stomatitis, vigorous treatment may effect a cure. Affected animals should be isolated and the contaminated premises disinfected to prevent the development of more serious and insidious types of the disease. Local treatment of affected pigs consists of removing the scabs, together with the underlying exudate and necrotic tissue, to the edge of the markedly inflamed and sensitive tissue. The affected part should then be swabbed with tincture of iodine diluted one-half with water. Small pigs may be conveniently treated by holding the mouth in a bucket of a 2-percent watery solution of a reliable coal-tar disinfectant, care being taken that the animals do not swallow any appreciable amount of the solution. The character of the local lesion should be observed each day, and all newly formed necrotic tissue should be removed from the affected parts. Fistulous tracts, or "pipes," which may penetrate completely thru the lips or extend to the bones of the jaw or face, should be cleaned before the disinfectant is applied. It is important that the scabs and debris removed be burned or thoroly mixed with lime or other reliable disinfectant. To aid in preventing the infection spreading in suckling pigs, the udder and teats of sows nursing affected pigs should be washed daily with a 2-percent watery solution of a reliable coal-tar disinfectant, followed by drying with a clean towel to prevent soreness induced by cold and dampness. The feed buckets, barrels, and troughs, floor, and side walls of the isolation pen should be thoroly cleaned and sprayed with a 3-percent watery solution of compound cresol (U. S. P.), or its recognized equivalent, and lime should be scattered about the ground surface to prevent permanent reinfection of premises by sick animals.

NECROTIC RHINITIS

Necrotic rhinitis, popularly called bull nose, involves primarily the lining membranes of the nasal cavities. It may extend to the bony or cartilaginous tissue in the nose and result in the development of enlargements or lumps on the side of the snout, giving the face a distorted, bulging, or "dish face" appearance. One or both sides of the nasal canal may be involved, while occasionally a superficial lump may appear on the median line above the point of the nose. The infection gains entrance following exposure to cold or injuries inflicted in rooting in the soil, and not infrequently follows ringing. The inflamed tissue becomes necrotic, accompanied by the production of excessive amounts of mucus, which protrudes into and diminishes or occludes the lumen of the nasal passages, resulting in labored

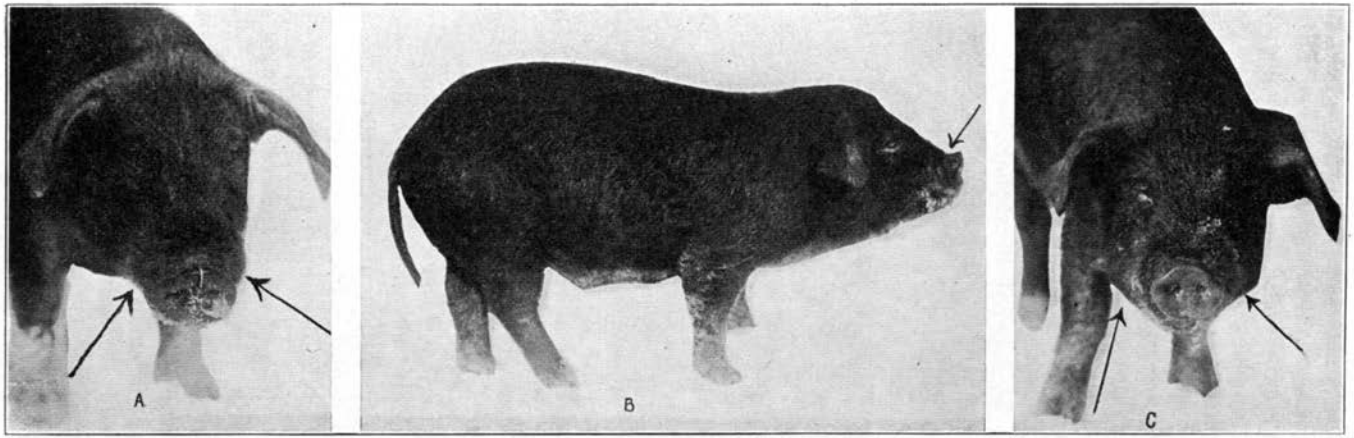

FIG. 3.—NECROTIC RHINITIS (BULL NOSE). A, SHOWING NASAL DISCHARGE FROM LEFT NOSTRIL
(Arrows point to enlarged and affected parts on nose and face)

breathing (see Figs. 3 and 4). Following quick, short, expiratory efforts, the nasal mucus containing particles of necrotic membranes smeared with blood adheres to the external opening of the nostril or is discharged upon the ground. Because of the frequent sniffling sound, the disease is commonly referred to as "sniffles." Progressive inflammation of the nasal passages may involve the sinuses in the face and head, or extend backward to the pharynx. The affection of the pharynx is generally accompanied by a chronic cough. Inhalation of particles of necrotic tissue may result in necrotic pneumonia, followed by such complications as chronic pericarditis or pleurisy, with permanent adhesions to the chest wall. Pulmonary complications are generally manifest by labored breathing, coughing, thumping, unthriftiness, or a permanent stunting of the animal, and death. A variety of secondary microorganisms are associated with the active cause.

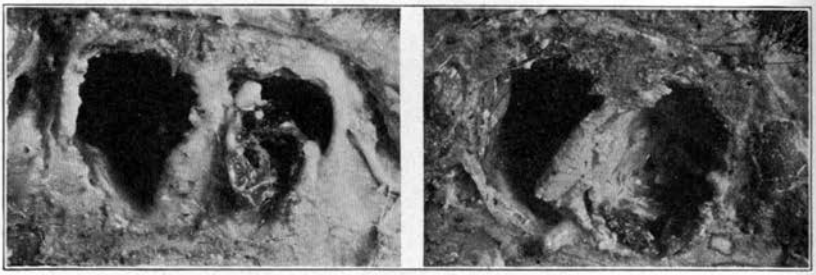

FIG. 4.—NECROTIC RHINITIS, SHOWING CROSS-SECTION OF AFFECTED NASAL PASSAGES, WITH NECROTIC MEMBRANE PARTIALLY OCCLUDING THE LUMEN OF THE LEFT NOSTRIL

The deep-seated nature of necrotic rhinitis renders the affected parts inaccessible, so that local treatment is usually of little avail. Valuable animals mildly affected may be treated with nasal douches of 2-percent watery solution of copper sulfate. Affected animals should be segregated and contaminated premises disinfected. The pulmonary forms of this disease are not successfully treated.

NECROTIC ENTERITIS

Necrotic enteritis is the most fatal form of necrobacillosis and can be recognized only on post-mortem examination. The lining of the wall of the large or small intestine may be diffusely involved and covered with a yellowish white, cheese-like material, which is detached from the underlying tissue by gently scraping (see Fig. 5). The wall of the intestines becomes thickened, and the inflammatory exudate adhering to the inner lining interferes with digestive and

absorptive functions and results in malnutrition, diarrhea, and emaciation (see Fig. 6). A restive attitude associated with various nervous symptoms, such as spasms, holding the head to one side, and walking or running in a circle, is commonly observed in this type of necrobacillosis. Growth and development are retarded indefinitely, the abdomen is drawn up, abnormal excretions collect and dry on the surface of the skin, giving it a wrinkled appearance, and death results from starvation and absorption of waste products of metabolism or of products of decomposition within the intestine. Mild cases may naturally recover and the animals gain in weight, yet an attack of necrotic enteritis generally renders an animal unprofitable.

FIG. 5.—SHOWING DIFFUSE ULCERATION OF THE INNER LINING OF THE LARGE INTESTINE OF A PIG AFFLICTED WITH NECROTIC ENTERITIS (Courtesy of Ky. Agr. Exp. Sta.)

The overfeeding of sows frequently causes digestive derangements in suckling pigs, accompanied by inflammation of the intestinal wall, which is manifested by diarrhea or scours. Prompt efforts should be made to correct this condition, as it opens the way for the invasion of *Bacillus necrophorus* and the development of necrotic enteritis. Intestinal parasites, inferior feedstuffs, improper feeding of sows or pigs, or the practice of overfeeding hungry animals caustic minerals or lye, may act in a similar manner as a predisposing cause by inducing an inflammation of the alimentary tract.

Intestinal necrobacillosis may be mistaken for hog-cholera infection, as the necrotic intestinal areas observed on post-mortem examination may resemble the button-like ulcers found on the lining of the intestines in hog-cholera. Necrotic enteritis may be observed in hogs suffering from hog cholera, but it is a distinct, secondary infection.

If necrotic enteritis occurs independently of cholera, the serum treatment for hog cholera is not indicated, and if administered may be followed by unfavorable results. Similar irregular results may follow the injection of serum in outbreaks of hog cholera if necrotic enteritis prevails. Differentiation between these two diseases is generally based upon the fact that in necrotic enteritis the areas involved are non-elevated and diffuse, while the ulcers of hog cholera are circumscribed, well-defined, and project above the surface of the intestinal lining. The acute and contagious character of cholera, together with other post-mortem lesions characteristic of this disease, further serves to differentiate it from necrotic enteritis.

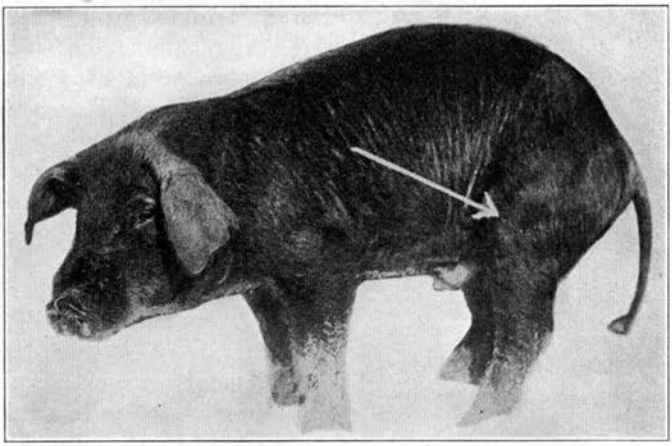

FIG. 6.—SHOWING ROUGH COAT, INNUTRITION. PYOSEPTICEMIA
(Arrow points to deep-seated abscess in the region of the thigh)

As yet no cure has been found for the intestinal form of necrobacillosis. Laxative feed and intestinal antiseptics constitute a palliative treatment in the early stages of the disease. Buttermilk as an exclusive diet is recommended by some. The Bureau of Animal Industry recommends the feeding of one heaping teaspoonful of the following mixture to every 100 pounds live weight: copper sulfate, 1 part; hyposulfite of soda, 4 parts; charcoal, 2 parts, and common salt, 6 parts. This should be given in slop or milk, night and morning, for about a week. As an intestinal antiseptic, a dilute watery solution of copper sulfate may prove helpful. Eight ounces of finely powdered bluestone should be dissolved in one gallon of water. One pint of this solution is added to each eight gallons of thin slop in the daily feed. This should be employed as a preventive in animals before the symptoms of the disease have progressed.

NECROTIC DERMATITIS

Necrotic dermatitis, or ulceration of the skin and underlying tissue, may occur at any point on the body. In young pigs this type of the disease may cause sloughing of the tail or ears. It is most commonly observed about the feet, legs, and face, and may extend deep into the underlying tissue of these parts (see Fig. 7). Lameness is generally observed when the feet are involved. Metastatic abscesses

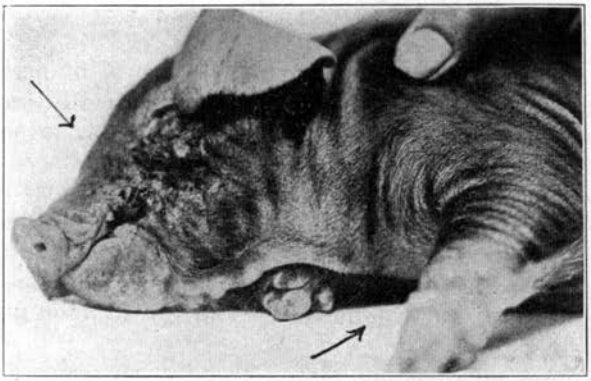

FIG. 7.—NECROTIC DERMATITIS AFFECTING THE CORNERS OF THE MOUTH AND FACE AND THE LEFT KNEE

in the subcutaneous tissue in the regions of the shoulder, inner side of forelegs, thigh, and neck are occasionally associated with necrotic dermatitis while the liver and other internal organs may be the seat of abscess formation. The abscesses in the subcutaneous tissue may be soft, containing a semi-liquid, yellow, creamy pus or a lumpy, semi-solid, dry cheese-like substance, with a characteristic disagreeable odor. Such abscesses should be opened and all necrotic tissue removed, followed by daily irrigation with a reliable antiseptic until healing occurs, while superficial lesions should be cleansed with soap and water and painted with tincture of iodine undiluted. A variety of pus-producing bacteria may be associated with this type of the disease, which is frequently referred to as pyosepticemia.

SYSTEMIC LESIONS

Aside from the local destruction of tissue, in the parts attacked, the poison generated by *Bacillus necrophorus* may invade the general circulation; and judging from autopsy on affected pigs, hemorrhagic spots on the kidney and on the surface of the lungs may be found which closely resemble the hemorrhages in these organs characteristic of hog cholera. The surface of the liver may show distinct, yellowish white spots, or even visible abscess formation. Encased abscesses in

the lungs have been mentioned, together with adhesions of the lungs to the chest wall. Necrobacillosis in an uncomplicated form with visible external lesions rarely offers difficulty in diagnosis. The characteristic odor of necrotic tissue in the parts involved, resulting from the invasion of *Bacillus necrophorus*, is quite reliable evidence upon which to base a diagnosis. Doubtful cases, wherein abscesses occur in the subcutaneous tissue or internal organs, may necessitate a bacteriological examination to definitely establish a diagnosis.

PREVENTION

As a single animal suffering from any form of necrobacillosis may contaminate the quarters and endanger future litters farrowed on the premises, all animals purchased should be quarantined, dipped, and carefully inspected before being placed with the herd. The disease is rapidly contagious in sucklings, yet it is efficiently checked by quarantine and disinfection supplemented by local treatment. It is economical to destroy incurable cases, as the feeding of such animals is without profit. The excrement of all affected animals in quarantine should be mixed with quicklime and spread upon pastures not used for swine.

Hog houses and feeding places, troughs, runways, fences, and sheds, should be thoroly cleaned and sprayed with a 3-percent watery solution of compound cresol (U. S. P.) or its recognized equivalent. Quicklime should be scattered freely about the lots, after they have been raked clean of cobs and manure. Wallows should be drained or fenced off, all small holes filled, and large fields where the infection prevails should be cultivated. Animals should not be pastured on infected ground for at least one year. The infection in pastures and hog lots is appreciably reduced during the winter months, but freezing is not to be relied upon to completely destroy the germ. Sunlight destroys the causative agent of the disease, but protected by manure, dirt, straw, boards, or under cover of houses or sheds, the infection may remain indefinitely.

The soil of pastures that have been used for grazing and feeding swine for a number of consecutive years may become thoroly impregnated, and in such cases it is imperative that these areas be thoroly cleaned, covered with quicklime, and cultivated. Portable houses should be cleaned, disinfected, and moved to fresh pastures.

Success in eradicating this infection from a premise is dependent upon thoroness of disinfection, isolation of affected animals, rotation of pastures, and the application of curative remedies in the very early stages of the disease. Proper rotation of pastures, and disinfection of the houses and feeding places each year are practical procedures in avoiding the development of this infection, and should be employed before necessity demands more radical measures, for necrobacillosis in swine is more cheaply prevented than eradicated once it becomes implanted on a premise.