

Exudative Epidermitis in Pigs. Clinical Studies and Preliminary Transmission Trials

by Conrad L'Ecuyer*

SUMMARY

Four outbreaks of an infectious, exudative skin disease of 6 to 10 week-old weaned pigs, are described. The disease was seen in fattening barns where weanlings from several sources were mixed. The disease was characterized in the peracute form by the formation, over the entire body, of a brown, greasy, odorous exudate, by loosening of the hoofs, by severe depression, dehydration and death in 3 to 5 days. In the acute form the lesions were identical, but their evolution slower, the mortality was high, and survivors severely stunted. Secondary infections seemed largely responsible for mortality in the acute form. Subacute infections were frequent and characterized by the formation of few to many circular exudative foci which became dry and cleared up completely in about 2 weeks.

Antibiotics and mineral supplements were of no value in controlling or preventing the development of lesions or mortality.

Minimal-disease pigs were exposed to diseased pigs from 3 of the 4 outbreaks studied and in all cases they developed typical lesions and could transmit the infection to other pigs. Bacteriological examination of field and experimentally produced cases gave inconclusive results pending further study.

SOMMAIRE

On décrit l'évolution, dans 4 foyers d'une épidermite exsudative infectieuse, affectant des porcelets sevrés, âgés de 6 à 10 semaines. La maladie s'est déclarée dans des porcheries d'engraissement, peuplées de porcelets sevrés provenant de plusieurs troupeaux. Dans sa forme suraiguë, la maladie se caractérise par la formation d'un exsudat, brun, gras et malodorant, couvrant toute la surface du corps, par le décollement des ongles, et par une dépression et une déshydratation aiguë menant à la mort entre 3 à 5 jours. Dans la forme aiguë, les lésions sont identiques mais l'évolution est plus lente, la mortalité moins élevée,

les survivants demeurent chétifs et montrent un retard marqué dans la croissance. Les infections secondaires jouent un rôle important dans la mortalité résultant de la forme aiguë. Les infections subaiguës fréquentes sont caractérisées par la formation d'un nombre variable de petits foyers d'exsudation cutanée, lesquels s'assèchent et disparaissent complètement en moins de 2 semaines. L'évolution des lésions commence par la formation d'un léger exsudat brunâtre à la base des poils, sur l'ouverture des glandes sudoripares. De là se développe une papule blanche, entourée d'une étroite zone d'hyperhémie. Les papules se couvrent de l'exsudat brunâtre caractéristique et la généralisation semble se produire par extension et par la formation de foyers secondaires sur tout le corps. Dans les cas aigus la généralisation se produit en moins de 2 jours après l'apparition des premières lésions.

Les antibiotiques administrés par voie parentérale ou dans les aliments, et les suppléments minéraux n'ont eu aucun effet sur l'évolution des lésions ou sur le taux de mortalité. Des porcs "exempts de maladies" furent mis en contact avec des porcs infectés, provenant de 3 des foyers étudiés. Dans les 3 cas, les porcs contractèrent la maladie, montrèrent des lésions caractéristiques et ont pu transmettre l'infection à d'autres porcs. La période d'incubation dans les infections expérimentales fut de 5 à 7 jours et les lésions ainsi produites étaient généralement moins étendues que dans les infections naturelles. L'examen bactériologique de cas cliniques et de porcs infectés par contact n'a pas fourni de résultats conclusifs.

Introduction and Literature Review

Exudative epidermitis has been described as characteristically affecting suckling pigs under 4 to 5 weeks of age, with a variable morbidity and high mortality. The purpose of this paper is to describe an infectious, transmissible skin condition resembling exudative epidermitis which occurs sporadically in Eastern Canada and affects weaned pigs between 6 and 10 weeks of age.

*Animal Pathology Division, Health of Animals Branch, Canada Department of Agriculture, Animal Diseases Research Institute, Hull, Quebec.

Jones (7) gave a general review of the early and current reports on skin conditions resembling exudative epidermitis. He defined exudative epidermitis, as seen in the U.S. Middlewest as: "an acute, generalized dermatitis involving the entire body surface of young swine; characterized by sudden onset and a short course; marked by hyperhidrosis, excess sebaceous secretion, exfoliation, exudation, and without pruritis; resulting in loss of skin function, extreme dehydration, rapid exhaustion and usually terminating in death."

Jones described the pathogenesis of the skin lesions in detail and recognized 3 forms: peracute, acute, and subacute. The lesion he described began with drying of the skin and the appearance of brown spots or flakes at the base of the hairs. These spots increased in size and the lesions quickly generalized and the body became covered with a sticky, greasy exudate. The speed and degree of development of the lesions determined the form of the disease. Mortality was very high in both forms. He also gave a description of the gross and microscopic pathology seen in the various forms.

Sompolinsky (11, 12) described a similar condition in Denmark and named it "Impetigo contagiosa suis" due to its similarity to impetigo in man. This condition was less severe since most pigs recovered in 4 weeks and only a small number of the most severely affected died. Piglets were more susceptible.

Terpstra and Akkermans (13) described a similar skin condition which they called "Dermatitis crustosa". Ristic *et al* (9) described as "Seborrhea oleosa" a chronic, non-inflammatory condition of suckling pigs, characterized by large dark, waxy crusts on the skin of the ventral portions or in some cases over the entire body. The general condition of affected piglets deteriorated slowly until death in 14-21 days.

Blood and Jubb (2), Bennett (1) and Underdahl *et al* (14), have published further descriptions of the disease.

Etiological studies on similar skin conditions have been reported by Jones (7, 8), Ristic, *et al.* (9), Sompolinsky (11, 12) Sandbu (10), Imai *et al* (5, 6), Hörter (4), Hanson (3), and Underdahl *et al* (14). No conclusion can be drawn from their results.

Clinical and Experimental Results

Herd A

This herd comprised approximately 500

pigs of various ages, from 6 weeks to 6 months, subdivided into 5 groups according to size. Weaned piglets were purchased from a group of selected piglet producing herds in the immediate area. One of these herds had experienced an outbreak of a disease, similar to exudative epidermitis in one litter of piglets some months prior to the appearance of the disease in the herd under study. The condition was cleared from this litter of pigs when the antibiotic concentration of the feed was increased.

The type of management applied in this herd was continuous fattening in one large piggery, with about 120 weaned piglets, between 6 and 8 weeks of age, being introduced once a month. No isolation period was provided for the purchased weanling pigs prior to their introduction and they were mixed with those pigs from the previous groups, which had done poorly. The fattening house was drafty, poorly lighted, and no provisions had been made for proper cleaning and washing of the pens. Straw bedding was sparsely used. The rations used were proprietary mixtures containing antibiotics and were fed according to a commercial feeding program.

At the time the herd was examined, exudative skin lesions had been seen in every consignment of piglets introduced during the preceding 10 or 11 months. These appeared approximately 1 to 2 weeks after introduction of the piglets to the fattening house. As first seen by the owner, these exudative skin lesions were mild and affected only a small number of the pigs in each new group. The severity increased, however with each monthly introduction of weaned pigs. Approximately 80% of the pigs, in the group described here, showed lesions. Over half of these were severely affected with lesions covering the entire body surface, while the remainder showed from a few to several dozen focal lesions on the sides, hams, shoulders, neck and head. The youngest pigs in the consignment which were 7 to 8 weeks of age were the most severely affected, whereas those aged approximately 10 weeks generally showed only mild focal lesions. At the time of examination 30 weaners had died presumably from the effects of the disease and approximately 12 more appeared likely to die. A further 12 to 15 pigs were severely affected but appeared likely to recover. However, these animals were stunted and it appeared that their growth would be retarded.

The exudative skin lesions were seen to begin as foci of reddening and thickening of the skin on the ears, flanks, or sides, after which the lesions either resolved or spread to the entire body. The evolution of the disease in this fattening herd seemed to follow 3 patterns which were designated as peracute, acute and subacute.

Peracute Form. The initial lesion in the 3 forms was the accumulation of a slight brown exudate at the base of the hairs over the openings of the sweat glands. These brown flakes were most obvious on the abdomen and on the inside of the legs. From some of the primary lesions, white, raised papules were formed and these were surrounded by a narrow zone of hyperemic epidermis. As these foci extended outward, the centers became covered with red brown, greasy exudate, the periphery became irregular, raised and white with a red hyperemic edge. The generalization of these lesions seemed to occur by extension and by the formation of new lesions over the entire skin. In 24 to 48 hours the body was covered with a thick, brownish, greasy and odorous exudate similar in appearance to dried serum. The ears were thick and heavy with exudate; the eyelids were thickened and could not be opened. In some cases the pigs were blinded by the encrusted eyelids although the conjunctiva itself remained grossly normal. The skin around the coronary bands was severely inflamed and congested resulting in the loosening of the wall of the hoof, particularly the interdigital surface and occasionally the abaxial surface. The cornified area of the bulb was regularly detached and in some cases had sloughed off.

Affected pigs were severely depressed, suffered a complete loss of appetite, and rapidly became dehydrated. They were very reluctant to move and became recumbent perhaps due to the severe foot lesions. Pruritis was not a feature, temperature rarely exceeded 105°F. and death followed in 3 to 5 days after onset of symptoms.

Acute Form. In the acute form, the evolution and lesions were much the same except for a somewhat slower development of lesions which tended to become dry in 4 or 5 days. The exudate became dried and cracked giving the appearance of a very rough brown fish scale. These scales could be removed leaving raw areas, but the hairs were not involved or removed with the scales. Dehydration was severe in most cases, mortality was over 50 per cent, ex-

tended over a period of several days and appeared in most cases to be due to secondary infections particularly purulent pleuritis, pneumonia and peritonitis. Survivors were slow in regaining their appetite, were severely stunted and showed a roughened lumpy skin due to scarring and subcutaneous abscesses.

Subacute form. The subacute form appeared as few to several dozen focal lesions on the ears, head, neck and sides. These lesions began as red, raised foci surrounded by a white edematous band. Within 24 hours the center of the lesion was covered with a brown, sticky exudate and this exudate proceeded to cover the entire lesion. The development of these focal lesions stopped at this point. The lesions varied from one to approximately 4 cm. in diameter and after 2 or 3 days became dry and turned from a light brown to a dark brown or black. The dry scab could be scraped off in a few days, leaving an apparently normal underlying skin. These focal lesions cleared up completely within 15 days. A second manifestation of the subacute form was noticed on a few pigs and was characterized by the formation of a small brown scale at the base of the hair shaft. The coat of affected pigs became slightly roughened but no generalization or focal lesion formation occurred. The skin of these animals cleared in a few days.

The animals suffering from the subacute form showed no loss of appetite or of condition. They continued to show rapid growth rates equal to unaffected pigs in the same group.

A variety of antibiotics had been used parenterally but did not affect the development of lesions or the rate of mortality. The group of weanling pigs seen had been fed, from the time of introduction to the fattening house, a special starting ration containing high levels of chlortetracycline, sulfamethazine, and penicillin. This had no effect on the evolution of the disease since this particular group of pigs suffered the most severely from the infection.

Several attempts to treat the condition, with various applications usually employed for the control of mange, were without success.

Since it seemed possible that the disease resulted from a mineral deficiency, the owner attempted to treat a group of pigs with a diet supplemented with zinc salts. Feeding the zinc supplement had no ap-

parent effect on the development or the severity of the disease.

Gross Pathology. Three affected pigs were obtained for necropsy. The first pig showed generalized skin lesions with involvement of the entire body surface and loosening of the hoofs. The carcass was in very poor condition with signs of severe dehydration. Internally the superficial and deep lymph nodes were double or more in size and the cut surface exuded clear fluid. The only internal lesions found, were a purulent leiritis with accumulation of a large amount of fluid pus in the pleural cavity and a severe pneumonia involving the antero-ventral portions of the lung. The second pig necropsied showed a severe exudative dermatitis involving the entire skin surface with loosening of the hoofs and almost complete obstruction of the eyes. Internally, the superficial lymph nodes were considerably enlarged and moist. A diffuse purulent lesion involved the subcutaneous tissues and muscles on the posterior half of the right rib cage. This lesion extended through to cause a purulent pleuritis in the right pleural cavity. In addition, a purulent pneumonia with abscess formation involved over half of the total lung area. The third pig necropsied was in fairly good condition and suffered from exudative dermatitis of moderately severe extension. The hoofs of this animal were not involved. Internally the superficial lymph nodes were much enlarged and an uncomplicated pneumonia involved the anteroventral portions of the lung. This animal had retained its appetite since the stomach and bowels contained food at the time of necropsy.

Macerated skin scrapings from all three of these pigs were found to contain small numbers of mites typical of the species *Sarcoptes scabiei*.

Bacteriological examination of lymph nodes and internal organs from the 3 necropsied pigs yielded cultures of *Corynebacterium pyogenes* from the superficial lymph nodes and pleural exudates. In addition, a micrococcus was isolated from the lymph nodes of one pig, and *Pasteurella multocida* was isolated from the lung of one pig and the pleural exudate of one other pig.

Transmission Trials. Two minimal disease pigs¹, 4 weeks of age, were exposed overnight to 2 of the severely affected pigs from herd A. One of these pigs was dead 7 days post-exposure (PE) and showed a few whitish to yellow, raised papules on

the head and shoulders. The first indications of the development of these skin lesions were seen on the day prior to death. Some of the lesions were covered with a red-brown, greasy, soft exudate. Necropsy of the animal revealed signs of congestion in the viscera and lymph nodes indicating the occurrence of septicemia. The pig had a moderate pneumonia and one hock joint was enlarged with an excess of synovial fluid and periarticular purulent deposits. *C. pyogenes* was recovered from the lungs, liver, spleen and the arthritic joint. Mange mites were not demonstrated.

The second pig, No. 2, showed skin lesions 7 days PE. These began either as small slightly raised, yellowish foci over the pores of the skin which exuded fluid and formed very small flakes at the base of the hairs; or as round, white, raised foci of edematous epithelium, over which the serum-like exudate formed a brown scab from the center towards the periphery of the lesion. The initial lesions were removed without difficulty and left a smooth surface free of hemorrhage, they extended outward while new lesions were formed all over the body and were most pronounced on the lower abdomen, ears and around the eyes. The lesions developed into large red-brown scabs varying in thickness according to the area involved, i.e., thin on the abdomen, thick on the shoulders, ears and head. The scabs could easily be removed, were greasy and sticky to touch and left a smooth but raw surface. Terminally there were purulent foci formed under the more thickly scabbed areas, particularly on the ears, neck and shoulders with the formation of fistulous tracks through which liquid pus could be evacuated. The skin lesions had spread over most of the body at the time of death, 11 days PE. At necropsy, examination of the carcass revealed signs of dehydration and generalized bacterial infection. The lungs showed a moderately extensive non-purulent pneumonia. The abdominal cavity contained a small amount of serofibrinous exudate. The superficial and deep lymph nodes were mildly hemorrhagic and were considerably enlarged and moist.

Pig No. 3 was exposed to pig No. 2 for

¹All pigs employed in transmission trials were from 4 to 6 weeks of age and were from a minimal disease herd, maintained under strict quarantine. This herd was established with pigs obtained by cesarian section and raised in isolation, without colostrum. The pigs used in this work were naturally farrowed and raised, and weaned at 3 weeks of age. During the course of the experiments, the pigs were fed a proprietary early-weaning ration, free of antibiotics.

a 48 hour period and showed one small lesion on the flank, 7 days PE. The evolution of the disease in this pig was more gradual and did not attain the degree of severity seen in the field or in the first contact transmission trial. At 14 days PE, the pig was showing respiratory distress and lesions at various stages of development were present on the inside of the things, on the lower abdomen, between the front legs, on the sides, and on the snout and lips. The pig was killed and at necropsy the carcass appeared in good condition and examination of the internal organs revealed a moderately extensive pneumonia with purulent pleuritis and peritonitis. Bacteriological examination of the purulent materials yielded pure cultures of *C. pyogenes*. Mange mites were not demonstrated.

The disease produced by experimental contact exposure of minimal disease pigs to field cases was not nearly so severe as that seen in the field. None of the experimentally exposed pigs developed lesions on the feet, and death appeared to result from secondary infection with *C. pyogenes*.

Herd B

This herd was made up of approximately 200 pigs at various stages of fattening. The affected group of pigs comprised approximately 70 pigs aged 8 to 10 weeks, at the time of examination. The management applied in this herd was continuous fattening with groups of pigs being added to the herd at intervals. The level of management was good, the piggery was clean, straw bedding was liberally used and ventilation was adequate. The pigs were fed proprietary rations according to a commercial feeding program.

The disease first appeared in this herd approximately one week after the addition of the group of 70 weanling pigs under consideration. These pigs were from 6 to 8 weeks old at the time of introduction to the herd, they were purchased from a number of selected piglet-producing premises in the area and trucked directly to the fattening barn. Morbidity was approximately 50 per cent but most of the affected animals showed only the subacute form of the disease. Only 12 pigs developed either the peracute or acute form of the condition and at the time of examination 6 pigs had been lost and 4 more were moribund. The clinical appearance of the pigs suffering from the various forms was identical to that described above. However, the great

majority of the pigs showed only a very few focal lesions scattered over the ears, head, neck and sides.

Two, 9 to 10 week-old pigs were available for necropsy. Both were severely affected with reddish brown crusts covering the entire body surface. The crusts on the lower legs, ears, snout, around the eyes and in places on the back and shoulders were very thick but could be removed without removing the superficial layers of the skin or the hair. The crusts on the sides and lower abdomen were very thin and easily scraped off leaving an apparently normal underlying skin and hair coat. In the more mobile areas of the skin the crusts were cracked and in some places these cracks also involved the skin. The inflammation at the coronary band area was severe with loosening of the cornified layers of the hoof particularly of the bulb. Both of these pigs were very severely emaciated and showed signs of dehydration, however, they appeared to have passed the crisis and the skin lesions were quite dry. At necropsy the superficial lymph nodes of one pig were markedly enlarged and a moderate uncomplicated pneumonia was found. The other internal organs appeared normal on gross examination. The second pig showed a severe pneumonia involving the antero-ventral portions of the lungs, and a fibrinous pericarditis. The superficial lymph nodes were generally enlarged and the submaxillary lymph nodes on both sides of the head were abscessed. Bacteriological examination of the superficial lymph nodes and of some of the internal organs yielded no organisms perhaps due to prior treatment of the animals with antibiotics. No sarcoptic mange mites were demonstrated.

Transmission Trials. One 4 week-old pig, No. 4, was held overnight in a small pen with the 2 pigs from Herd B. On the sixth day PE this pig had a rough hair coat and small brown scales were beginning to form at the base of the hairs. These scales were from 1 to 2 mm in diameter, became dry very rapidly and could be scraped off leaving a normal underlying skin.

One small papule about 1 cm in diameter appeared on the chin at this time but no further extension or development of lesions occurred.

A further 2 pigs, Nos. 5 and 6, were exposed to pig No. 4 on the seventh day PE. Five days later pig No. 6 had hyperemic areas on the ears on the right shoulder and on

the neck. By the sixth day PE, this pig showed early papular lesions on the ears, head, neck and shoulders. The lesions were most prominent over and around the scratch marks which resulted from the animals fighting when they were put together 6 days previously. The skin lesions on pig No. 6 continued to spread slowly over the face, shoulders and back and became encrusted with the typical reddish brown, greasy exudate. By the fourteenth day PE the lesions had attained their maximum development. Pig No. 5 developed only a few mild, transient lesions and no generalization occurred.

A further 6 minimal disease piglets were exposed to pig No. 6 and were held in contact with the infected pig for the remainder of the trial. A few small foci of hyperemia and inflammation of the skin were noticed on the third day PE on 3 piglets. The other pigs in the group developed focal lesions during the 14 days that followed exposure. However, none of the third-passage pigs developed extensive skin lesions. Necropsy examination of the pigs used in these transmission trials did not reveal any lesions of the viscera. The superficial lymph nodes were slightly enlarged and edematous in those pigs showing the more extensive skin lesions but appeared normal in the pigs suffering from only focal skin lesions.

Bacteriological studies were made of scrapings collected during the early stages of development of lesions in experimental cases. Inoculation of ground scrapings onto horse-blood agar plates yielded, from a number of the specimens, a beta-hemolytic streptococcus and a variety of micrococci. Culture of the viscera and superficial lymph nodes of these pigs gave negative results.

Herd C

This herd was made up of approximately 150 pigs divided into 3 groups according to size and housed in 3 semi-detached buildings on the same premises. The group of pigs affected with exudative epidermitis, comprised approximately 50 weanling pigs purchased at a local auction sale and introduced 21 days prior to examination. The pigs were kept as a group from the time of purchase. The level of management in this herd was poor, buildings were inadequately lighted and ventilated. The bedding used was straw. Proprietary rations were fed.

The first skin lesions were seen in the group of pigs approximately 10 days after

introduction to the fattening barn. The description of the evolution of the disease, provided by the herdsmen, was similar to that seen in herds A and B. A group of 15 pigs which had been housed in the building for some time, prior to introduction of the last lot of 50 pigs, were free of skin lesions at the time of examination. Morbidity exceeded 50 per cent of the pigs in the group. The pigs housed in the other buildings were older and remained free of lesions. Mortality reached 25 per cent of the affected group and seemed to have reached its peak at the time of examination. Twelve of the surviving pigs had lesions over the entire body and the remaining affected pigs had only focal lesions scattered across the ears, head, neck and sides. The remaining affected animals were in good physical condition and the lesions were dry and in some cases were in the stage of resolution.

Two severely affected pigs were necropsied. The first pig had died prior to necropsy and the second was moribund when killed. The entire skin surface of both pigs was covered with the typical thick, greasy, red-brown exudate. The exudate was thick over the head and ears, almost completely closing the eyes and was also thick over the shoulders, back and the lower parts of the legs. The exudate on the flanks and lower abdomen was rather scaly. The feet of both pigs were severely affected and the hoofs were loosened over the bulb and in the interdigital spaces. Internally both pigs had a moderately extensive consolidation of the lungs and one pig showed a mild adhesive pericarditis. The superficial lymph nodes of both pigs were doubled or more in size and were very moist.

Bacteriological examination of the superficial lymph nodes of the first pig yielded cultures of *C. pyogenes* and various micrococci. The lymph nodes of the second pig yielded cultures of *Pasteurella multocida* and a micrococcus. Examination of the consolidated areas of the lungs yielded in the first case cultures of *P. multocida* and in the second case of *Hemophilus suis* and a micrococcus. Mange mites were not demonstrated.

No contact transmission trials were attempted with the pigs from this herd.

Herd D

This was a small fattening herd made up of approximately 100 pigs divided into two age groups. The level of management was good and straw bedding was provided. Pro-

prietary rations were fed. The affected pigs were in a group of 60, purchased 5 weeks previously at a local auction sale. A further group of some 40 pigs had been introduced to the herd 10 days prior to examination and were housed in an adjoining pen.

The first lesions were seen 6 days prior to examination and at the time of our visit approximately 50 per cent of the pigs were affected. Twenty per cent or 12 pigs were severely affected with a generalized exudation over the entire body and loosening of the hoofs on a few. Five pigs had died and the remaining severely affected pigs were dehydrated and depressed. The initial lesions were described by the herdsman as pimples appearing on a few pigs. At the time of examination, the lesions on most animals varied from a few to many, foci on the sides, back, lower abdomen and legs. The disease in this herd was in its early stages and the lesions were in the stage of development.

Two pigs were obtained and killed 6 days later for necropsy examination. Both pigs were in a fair condition and the skin lesions were moderately extensive and undergoing resolution. The lesions were dark brown or black, were dry and could be scraped off, leaving an apparently normal underlying skin. Both pigs had a moderately extensive non-suppurative pneumonia and the superficial lymph nodes were enlarged. Bacteriological examination of the superficial lymph nodes from these 2 pigs gave negative results. Mange mites were not demonstrated.

Two, 4 week-old, minimal disease piglets were exposed for 48 hours to the 2 diseased pigs from herd D. Focal lesions were seen on these pigs on the seventh day PE and appeared as small papules scattered over the head, ears and shoulders. At this time, collections were made of the early focal lesions by removing the superficial layer of affected skin with a scalpel blade. The harvested material was examined bacteriologically and yielded a beta hemolytic streptococcus and 2 micrococci. The lesions on these pigs did not develop beyond the primary foci and the animals were necropsied. No internal lesions were seen.

Discussion

The case histories and preliminary transmission trials presented, describe an infectious disease which, though sporadic in its occurrence, may cause serious econo-

mic losses when introduced into a pig fattening operation. This disease, in weaned pigs 6 to 10 weeks of age, is similar in its clinical manifestations and pathology to the classical form of exudative epidermitis seen in young suckling pigs. The condition described here differs from the classical form in the occurrence in a large proportion of cases of subacute or mild forms, with focal lesions only and no secondary complications. Subacute forms of the disease were mentioned by Bennett (1), Hanson (3) and Jones (7) but these made up a small proportion of affected piglets and recovery was reported to be slow. The disease "Impetigo Contagiosa suis" described by Sompolinsky (11, 12) more closely resembles the condition seen here than the other skin conditions described in the literature.

The differences seen in the evolution of the disease in the 4 herds studied, were mainly of degree of severity of lesions, and of mortality. The disease in Herd A was extremely severe and had disastrous economic effects. Over a period of one year the disease had shown a progressive increase in severity and eventually forced depopulation of the premises. The disease in Herd C was severe with high morbidity and mortality. Poor management practices and secondary infections appeared to influence the severity of the disease and to contribute to the high mortality rates in Herds A and C. The clinical appearance of the disease in Herds B and D was much less severe than in Herds A and C. Morbidity and mortality were lower and the rate of recovery of subacute cases appeared to be more rapid.

Experimental transmission trials were successful in every instance, however, the experimentally produced disease was much less severe than that seen in the field.

The sources of infection, in the outbreaks studied, cannot be identified with certainty. In Herd A, the infection had been introduced about one year prior to our examination and had become progressively more severe in subsequent monthly introductions of weanling pigs. Contamination of the additions was assured by mixing them with the stunted pigs from the previous month's purchases. To further enhance the severity of the disease in this herd, the primary disease was complicated by visceral infection with *C. pyogenes*.

The pigs in Herd B were purchased directly from local herds, none of which had

experienced skin disease problems. Upon close examination, a group of weanling pigs of which a few showed mild, focal, skin lesions was found in one of the source herds. This condition resolved quickly and without complications and posed no clinical problem to the herdsman. It was considered possible that pigs from this herd, though infected, had a degree of immune resistance to the disease and could transmit it when mixed, on the fattening premises, with susceptible pigs from other herds.

Herds C and D were stocked with piglets purchased from largely unknown sources, at auction sales. The infection in Herd C was apparently introduced with the group of affected weanling pigs since the owner had not encountered the disease before. It is of interest, however, that in Herd D the lesions appeared in the affected pigs 4 to 5 weeks after their introduction to the fattening barn. In the other herds, lesions appeared within 7 to 10 days of introduction and this led to the conclusion that the source of infection in Herd D may have been the group of pigs introduced to the fattening house a few days prior to the appearance of lesions.

Exudative epidermitis, as seen in the cases described, was an infectious and contagious condition. Repeated contact transmissions of the disease to minimal disease pigs maintained at a high level of management would tend to decrease the significance of nutritional deficiencies, or of toxic or allergic factors in the primary etiology of the disease. In every case, the affected pigs were fed proprietary rations and except for the experimental transmission trials these rations contained various antibiotics at different concentrations. It is possible that nutritional imbalances or deficiencies would enhance the severity of the disease in rapidly growing pigs.

The etiology of the disease is not clear at this time. A number of bacterial organisms were recovered from the tissues of affected pigs but no organism seemed to be consistently involved. Micrococci were regularly isolated and the evaluation of their significance must await pathogenicity tests in pigs. These micrococci gave a variety of biochemical reactions and did not seem to belong to one species. *C. pyogenes* and beta-hemolytic streptococci were recovered in some cases and seemed involved mainly as secondary invaders. Mange mites were present on all pigs necropsied from Herd A,

and although they did not appear to be involved in the etiology of the disease, one readily visualizes their potential importance in the transmission of the infection and the development of lesions, due to their burrowing habits. The skin abrasions, produced by coarse straw bedding, have been incriminated as predisposing factors to skin infections due to streptococci. Straw bedding was employed in the herds studied but did not seem necessary since experimental contract transmissions were successful after relatively short exposure periods in open pens where soft-wood shavings were used as bedding.

ACKNOWLEDGEMENTS

The author wishes to express his appreciation for their assistance in reporting outbreaks and forwarding specimens to Drs. E. B. Meads and P. A. Taylor, Regional Veterinary Laboratory, Ontario Department of Agriculture, Kemptville; to Dr. D. Mitchell of this Institute for taking part in some field investigations; and Drs. C. E. Rice and J. Frank for their editorial comments.

REFERENCES

1. BENNETT, P. C. Exudative epidermitis. Diseases of Swine. Ed. 1, Dunne, H. W., ed. 552-554. 1958.
2. BLOOD, D. C. & JUBB, K. V. Exudative epidermitis in pigs. Aust. Vet. J. 33: 126-127. 1957.
3. HANSON, L. J. Studies on parakeratosis and exudative epidermitis in swine. Dissertation, University of Minnesota, 1962. 104 pages. University Microfilms, Ann Arbor, Mich.
4. HORTER, R. Zur Pilzflora hautkranker und-gesunder Schweine. Dtsch. tierärztl. Wschr. 69: 717-719. 1962.
5. IMAI, N., KAMIMURA, T., TABUCHI, K., KABA-YASHI, Y. and SUZUKI, T. Papular dermatitis of pigs. I. Etiological studies with reference to fungi, particularly *Aspergillus*. Bull. Azabu, Vet. Coll. 7: 135-151, 1960. Abstr. in Vet. Bull. 31: 381. 1961.
6. IMAI, N., KAMIMURA, T., and TABUCHI, K. Papular dermatitis in pigs. II. Pathogenicity of aspergillus strains for pigs and precipitin and intradermal tests. Bull. Azabu Vet. Coll. 8: 91-104, 1961. Abstr. in Vet. Bull. 32: 741. 1962.
7. JONES, L. D. Exudative epidermitis of pigs. Am. J. Vet. Res. 17: 179-193. 1956.
8. JONES, L. D. Observations on exudative epidermitis. Vet. Med. 56: 95-103. 1961.
9. RISTIC, M., SANDERS, D. A. and WALLACE, H. D. Seborrhea oleosa in pigs. Vet. Med. 51: 421-422. 1956.
10. SANDBU, E. H. Impetigo contagiosa. En del undersökelse over sjukdommens arsaksforhold. Nord. Veterinärmötet VIII: 85-92. 1959.
11. SOMPOLINSKY, D. Impetigo contagiosa suis. Dansk. Maanedsskrift Dyrlaeger 61: 401-453. 1950.
12. SOMPOLINSKY, D. De l'impetigo contagiosa suis et du *Micrococcus hyicus* (nsp.) Schweiz. Arch. Tierheilk. 95: 302-309. 1953.
13. TERPSTRA, J. I. and AKKERMANS, J.P.W.M. De dermatitis crustosa van het varken. Tydschr. Diergeneesk. 81: 755-762. 1956.
14. UNDERDAHL, N. R., GRACE, P. D., and YOUNG, G. A. Experimental transmission of exudative epidermitis of pigs. J. Amer. Vet. Med. Ass. 142: 754-762. 1963.