Endemic ringworm and *Staphylococcus hyicus* infections: A case report

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Summary: *A 150-sow farrow-to-finish operation had a history of endemic skin problems in sows and pigs for 2 years. A complete investigation, including skin biopsies, cultural examination and sensitivity, blood samples, and nutritional and building evaluation, was conducted to identify possible causes. Results showed a dermatomycosis (ringworm infection),* Staphylococcus hyicus *infection, possible nutritional deficiencies, and housing inadequacies, causing these endemic conditions.*

A control program, which included washing sows, using antibiotics and autogenous vaccines, changing processing techniques, adding supplemental micronutrients, and modifying buildings, was initiated. These changes were followed by rapid improvement in the skin problems. The multiple control programs make it difficult to attribute the improvement to any one change or treatment.

A 150-sow farrow-to-finish operation in Washington state had been experiencing a dermatitis problem in their sows and pigs for 2 years. Numerous attempts were made by veterinarians and feed company representatives to diagnose and control the problem without results. This herd sells 50% of its pigs at 41–54 kg (90–120 lb) to a roaster market, and the packer had begun refusing the roaster pigs because of the skin problems.

Skin problems are common in intensified hog production.[2] Parasitic, bacterial, viral, and fungal infections as well as nutritional deficiencies were considered as possible causes.[1-3] Common parasitic problems are usually related to sarcoptic mange or lice.[1] Viral agents include porcine parvovirus and swine pox.[2] Bacterial agents include *Staphylococcus hyicus*, beta-hemolytic streptococci, *Actinomyces pyogenes*, and *Pseudomonas aeruginosa*.[2] Fungal agents include *Candida albicans*, *Microsporum* spp., and *Trichophyton* spp.[2] Also, *Pityriasis rosea* (porcine juvenile pustular psoriaform dermatitis) can cause skin problems and may be linked to a genetic problem.[2] Nutritional deficiencies of riboflavin, niacin, biotin, zinc, and iodine are also implicated in skin problems.[3] The many possible etiologies of skin disorders makes a complete workup necessary in problem herds.

Herd evaluation

The farm housed sows and finishing pigs from 23 kg (50 lb) to market on outside dirt lots. Each lot had a wood hut to provide shade for the pigs in the summer and warmth in cold weather. The farrowing, breeding, and nursery facilities were total-confinement buildings. The farrowing house consisted of two rooms of 12 crates on wire with a continuous-flow system. The nursery room had pens on wire, housing eight to 12 pigs per pen, again with a continuous-flow system. The pigs were weaned at 21 days of age and housed in the nursery until they were approximately 23 kg (50 lb).

Upon herd evaluation (performed in February 1993), approximately 60% of the sows had skin lesions resembling ringworm infection (Figures 1 and 2). These lesions, which ranged in size from 5 × 5 cm to affecting the whole side of a sow, were circular and red-to-brownish. The owner was washing all sows moving into the farrowing house with dish soap and spraying them with Prolate®. The lesions on the sows in the farrowing house were more pronounced than those in the gestation pens.

The baby pigs that were nursing sows had no skin lesions on the day of my visit. On day 1, teeth were clipped and an iron injection (100 mg) was given. Tails were being docked and male piglets castrated on day 5. All baby pigs over 7 days old had swollen tails that were sore to pressure and looked infected. One set of instruments was used for these procedures and cleanliness was a problem.

The nursery pigs were overcrowded, allowing 0.09 m^2 (1 sq ft) or less for 23-kg (50-lb) pigs and 70% of the pigs (280 of 400) had skin lesions resembling exudative epidermitis. The skin lesions ranged from individual 2 × 2-cm lesions to pigs with 40% of their body affected. The lesions were raised, darkened to black, and most were scabbed over. Neo Terra™ (Neomycin 50 g, Terramycin 50 g per ton) was being added to the nursery feed.

The skin problem continued into the grower pens that were on dirt. One pen of pigs had 80% morbidity (80 of 100) for skin lesions that were similar to lesions in the nursery pigs (Figure 3).

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Perspectives from the field are reviewed for their logic, relevance, and presentation.

The other grower pens showed 20% incidence of skin lesions. Antibiotics were not used in the grower feed.

Diagnostic investigation

The nutrition program was analyzed for possible deficiencies contributing to the skin problems. The sole source of grain was corn, which was tested at Iowa Testing Laboratories in Eagle Grove, Iowa and found to be within normal limits (Table 1). The complete feed was evaluated for added iodine, copper, selenium, zinc, vitamin E, and biotin. The feed company servicing this farm guaranteed that all levels met NRC-suggested levels (Table 2).

Table 1

Corn analysis

Protein	7.68%
Moisture	15.10%
Calcium	0.02%
Phosphorus	0.31%
Lysine	0.27%

Results from Iowa Testing Laboratories, Eagle Grove, Iowa.

Table 2

NRC concentrations per ton diet

	Sows	Nursery
Iodine	140 mg	140 mg
Copper	5 g	6 g
Selenium	270 mg	279 mg
Zinc	50 g	100 g
Vitamin E	22,000 IU	16,000 IU
Biotin	200 mg	50 mg

Sow serum was analyzed for antibodies to porcine parvovirus and PRRS virus at the University of Minnesota Diagnostic Laboratory. The PRRS titers were negative and the parvovirus titers averaged 2048, which was considered normal because the sows were being vaccinated twice a year against parvovirus.

Skin biopsies from the lesions on the sows were submitted to the University of Minnesota Diagnostic Laboratory. These biopsies showed epidermal parakeratosis and mild chronic dermatitis, and yielded numerous fungal hyphae. These findings are consistent with dermatomycosis (ringworm) and zinc deficiency.[3] The fluorescent antibody assay (FA) was negative for porcine parvovirus. No mange was identified.

Figure 1

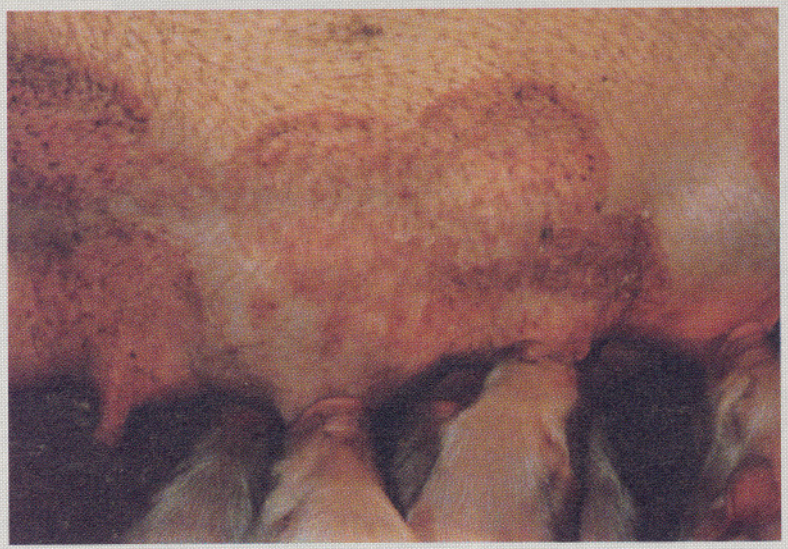

Figure 2

Figure 3

Skin biopsies from nursery pigs were sent to Grand Laboratories in Iowa for a bacterial workup. The laboratory identified a *Staphylococcus hyicus* organism from these biopsies. Sensitivity yielded a resistance to all antibiotics except Naxcel®.

Control programs

We concluded that the ringworm was harbored in the huts and dirt lots. All huts were turned over and washed with an iodine-based soap and remained turned over for 3 days before being moved to new locations. Upon entry to the farrowing barn, all sows were washed with an iodine-based soap. The Prolate® spray was discontinued and, although no mange was found in the biopsies, Ivomec® was used prophylactically for mange control. Any ringworm lesions found on sows in the farrowing house were sprayed with 50% mild iodine and 50% mineral oil.

Washington is known for having soil low in iodine, copper, and selenium concentrations. The skin biopsy showed signs of parakeratosis, suggesting that nutritional changes could be helpful.[4] In April 1993, the producer began to add the following micronutrients to the feed (per ton):

- zinc: 260 g,
- copper: 57 g,
- iodine: 8 g (40% organic, 60% inorganic),
- vitamin E: 80,000 IU, and
- biotin: 750 mg.

We believed the staphylococcal infection was starting in the farrowing area because of poor processing techniques. I suggested that the producer keep an extra set of instruments in a solution of Nolvasan® while the other set was being used on a litter of pigs. Tail docking and ear notching was moved to day 1. At the time of processing, 12.5 mg of Naxcel® was given. On day 5, when castration was performed, 12.5 mg Naxcel was repeated. The disinfectant for the farrowing room along with the nursery was changed to Tek-Trol®. A third farrowing room was added and all-in–all-out pig flow was initiated.

At weaning, an autogenous *Staphylococcus* killed vaccine (Grand Laboratories, Iowa) was given to all weaned pigs. A new four-room nursery was built and all-in–all-out pig flow was instituted. The antibiotic in the nursery feed was changed to Denagard® at a dose of 35 g per ton up to 14 kg (30 lb) and 250 g of Aureo™ from 14–27 kg (30–60 lb). In April 1993, the nursery feed was changed to include the following concentrations of nutrients added per ton:

- zinc: 280 g,
- copper: 100 g,
- iodine: 6 g (40% organic and 60% inorganic),
- Vitamin E: 80,000 IU and
- biotin: 760 mg.

The grower was changed to a Cargill-type facility on cement. The pigs are kept in this facility from 27–54 kg (60–120 lb). At this time the pigs are sold to the roaster market or moved to dirt lots until they are 104 kg (230 lb). No antibiotics were used in this ration.

Results

In July 1993, the sow ringworm lesions had decreased by 30%. It is expected that the lesions will continue to decrease on this program. The exudative epidermatitis signs have disappeared in the nursery and grower pigs. The docked tails in the nursing pigs are no longer showing signs of swelling or infection.

In September 1993, the exudative epidermatitis still had not returned. Because sow ringworm had decreased by 50% from February 1993, we reduced some of the extra nutrients instituted in April 1993. The following concentrations of micronutrients are now added per ton of feed:

- sow ration: copper 22 g, iodine 3.5 g (organic); and
- nursery ration: copper 70 g, iodine 2.6 g (organic).

In September 1994, the sow lesions had decreased by 70% and a total confinement gestation stall barn had been completed. By March 1995 the sow lesions were completely gone.

Discussion

The skin problems observed in this herd were related to facility design, pig flow system, baby pig processing techniques, possible nutritional deficiencies, and contaminated facilities. The chronic ringworm lesions could be partially attributed to the deficient concentrations of zinc, copper, iodine, and biotin in the ration.[4]

The *Staphylococcus hyicus* problems were probably related to poor sanitation, inadequate processing techniques, continuous-flow barns, possible nutritional deficiencies, and a resistant strain of bacteria.[2] These problems were addressed together, and the condition quickly disappeared.

Implications

- Skin problems have a number of different etiologies, so a complete diagnostic workup is necessary.
- The multifaceted control program makes it difficult to attribute the improvement to any one or any combination of changes or treatments. Some of these programs may not have been necessary.

References

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