Project title: Evaluation of the prevalence of coccidia in Ontario suckling piglets and identification of a preventive treatment

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Executive Summary:
In Europe, coccidia (*Isospora suis*) are recognized as a frequent and important cause of enteritis, diarrhea and uneven weight gains in suckling piglets. Unfortunately, information on the prevalence and impact of the parasite in Canadian pigs is not available. In most countries the only drug that has been licensed for prevention of coccidiosis in piglets is Baycox (toltrazuril). Unfortunately, in 2005, the use of the drug in pigs in Canada was banned. As a result, Canadian swine producers are now without a drug with proven efficacy against the parasite. In order to maximize the chance of either the ban on Baycox being reversed, or an alternative drug being approved for use in Canada, it was decided to carry out a project with the following three objectives: (1) To determine the importance of coccidia infections in suckling piglets on Ontario swine farms, (2) To identify the preventive treatment regimens that are currently used by Canadian swine veterinarians for coccidia infections, and (3) To evaluate the efficacy of the most practical treatment regimens identified in “2”. In order to address Objective (1), 50 representative Ontario herds were selected; farms ranged in size from 30 to 1700 sows (median = 270). Depending on herd size, up to 10 litters were randomly selected on each farm in each of
two age groups: 7-15 days of age and 16-21 days of age. Piglets aged 16-21 days were
individually weighed. All weights were then standardized to 21 days of age. A composite fecal
sample was collected from 3-5 piglets in every litter, and thereafter examined to determine if it
was diarrheic. All fecal samples were also examined for the presence of coccidia. Coccidia were
detected on 70% of farms, and on positive farms the proportion of infected litters ranged from
5% to 100% (median = 21%). Litters that were shedding coccidia at 7-21 days of age were 4-
times more likely to have diarrhea than negative litters. On coccidia-positive farms, the average
standardized weight at 21 days of age was 400g less than on coccidia-negative farms. However,
this latter difference was not significantly different.

Discussions with a number of swine veterinarians in Ontario indicated that the following
two treatment protocols are often used for preventing coccidiosis in piglets: (a) *ad libitum*
provision of Deccox mixed with oral iron in the creep area (throughout the suckling period), and
(b) single treatment with Clinacox in the first week of life. In order to address Objective (3),
these two treatment regimens were evaluated on farms with a coccidia problem. Unfortunately,
neither treatment reduced the risk of coccidia infections, or the risk of diarrhea, in piglets aged 7-
21 days. Similarly, neither treatment had any beneficial effect on growth rates during this period.

In summary, coccidia infections are a common occurrence in piglets at 7-21 days of age
in Ontario. Furthermore, infections are associated with an increased risk of diarrhea. Two
treatment protocols that are currently used on Ontario farms to prevent coccidia infections in
piglets were evaluated in a controlled manner. Unfortunately, neither protocol appeared to have a
significant beneficial impact.
Problem

*Isospora suis* (coccidia) is a protozoan parasite that reproduces in cells lining the villi of the small intestine of pigs. In Europe, this parasite is recognized as a frequent and important cause of enteritis in suckling piglets, and is associated with diarrhea and uneven weight gains (Mundt et al. 2005). Unfortunately, current information on the prevalence and impact of coccidiosis in North American pigs is not available.

In most countries the only drug that has been licensed for prevention of coccidiosis in piglets is Baycox (toltrazuril) – administration of a single treatment in the first week of life has a significant economic benefit (Mundt and Daugschies 2004; Maes et al. 2007). Unfortunately, in 2005 the use of this drug in pigs in Canada was banned by Health Canada. If coccidia have an impact on pig production in Canada, it is therefore important that an alternative, practical, preventive treatment is identified.

Objectives

1. To determine (a) the prevalence of coccidia infections in suckling piglets on Ontario swine farms and (b) the association of coccidia with diarrhea and reduced growth rates.
2. To determine the preventive treatment regimens that are currently used by Canadian swine veterinarians for coccidia infections.
3. To evaluate the efficacy of the most practical treatment regimen identified in “2” as a preventive for coccidiosis.

Materials and Methods

*Objective 1:* Fifty representative Ontario herds were selected for this study and visited between
May and August 2006. Depending on herd size, up to 10 litters were randomly selected on each farm in each of two age groups: 7-15 days of age and 16-21 days of age. Piglets aged 16-21 days were individually weighed and a composite fecal sample was collected from 3-5 piglets per litter. A composite fecal sample was similarly collected from litters of pigs that were 7-15 days of age. All weaning weights were standardized to 21 days of age and a survey was administered on each farm to obtain information on the environment in which the piglets were housed and any treatments performed. All fecal samples were scored for consistency on a scale of 0 to 2 (1 and 2 = diarrhea) and examined for coccidia oocysts using the Cornell-Wisconsin flotation method (Egwang et al. 1982). The number of oocysts was determined per gram of feces. Data were analyzed to obtain the farm-level prevalence of coccidia infections and to determine whether the occurrence of coccidia infections was associated with either diarrhea or reduced growth rates. Fisher’s exact test and a two-sample t-test were used for significance testing.

Objective 2: In the original proposal we indicated we would send a questionnaire to Canadian swine veterinarians to determine the preventive treatment regimens they currently use for coccidia infections in piglets. However, after discussion with a number of swine veterinarians in Ontario, the following two preventive treatment regimens were identified that appeared to be often used: *ad-libitum* provision of Deccox (decoquinate) in the creep area, and single treatment with Clinacox (diclazuril) in the first week of life.

Objective 3: In order to address this objective, the two coccidia treatment regimens identified in Objective 2 were evaluated on farms with a coccidia problem (identified in Objective 1). One farm was used to evaluate the efficacy of the Deccox regimen, a second was used to evaluate the
Clinacox regimen.

In order to evaluate the Deccox regimen, the drug was mixed with oral iron and provided *ad libitum* in the creep area from the day of birth until 21 days of age, to 15 litters. The control group of 15 litters received just oral iron, administered in the same manner.

In order to evaluate the Clinacox regimen, the drug was administered orally, on one occasion, in the first week of life to all piglets in 40 litters. The control group comprised 40 untreated litters.

For both studies, piglets were evaluated clinically from 7-21 days of age in exactly the same manner as for Objective 1 (i.e. monitoring of parasite shedding in feces, diarrhea status, growth rates). ANOVA analysis was used to determine if treatment had a significant impact on growth rates, the risk of coccidia infection and/or the risk of diarrhea in piglets up to 21 days of age.

**Results**

*Objective 1:* Farms ranged in size from 30 to 1700 sows (mean = 411, median = 270). Coccidia oocysts were detected on 70% of farms. The intensity of oocyst shedding in feces ranged from 1 oocyst to over 500 oocysts per gram of composite feces. On coccidia-positive farms, the proportion of infected litters ranged from 5% to 100% (mean = 29%, median = 21%). At least one litter aged 7-21 days was found to be experiencing diarrhea on 84% of farms, and an average of 47% of litters experiencing diarrhea were positive for coccidia. By comparison, 24% of non-diarrheic litters were positive for coccidia. Litters that had coccidia were 4-times more likely to have diarrhea than uninfected litters (95% confidence interval: 2.8-5.8; P<0.001). On coccidia-positive farms, the average standardized weaning weight was 6.3kg, while the average
standardized weaning weight on coccidia-negative farms was 6.7kg. This difference was not statistically significant (P=0.196). However, it suggested a potential impact on some farms. Finally, only 1 of the 50 farms administered a coccidiostat (diclazuril) to their piglets.

Objective 2: As indicated, ad-libitum provision of oral Deccox during the suckling period, and treatment with Clinacox on one occasion during the first week of life, were identified as two treatment regimens used by Ontario swine veterinarians to control coccidia problems.

Objective 3: (a) Evaluation of Deccox (decoquinate) provided ad libitum - Piglets in the 15 litters that were medicated with Deccox and oral iron had an average daily weight gain (DWG) of 237g compared to an average DWG of 226g for piglets in the 15 litters provided with just oral iron. The ANOVA analysis did not show a statistical difference in growth rates between the two groups. Likewise, shedding of coccidia oocysts and diarrhea scores were not significantly different between the two groups.

(b) Evaluation of Clinacox (diclazuril) single treatment - Piglets in the 40 litters that were treated with Clinacox had an average DWG of 249g compared to an average DWG of 237g for piglets in the 40 control litters. This was not statistically different. Likewise, shedding of coccidia oocysts and diarrhea scores were not significantly different between the two groups.

Discussion

The proportion of coccidia-positive farms found in this study (70%) is comparable to the value obtained recently in a study on 324 farms in Germany, Austria and Switzerland (76%) (Mundt et al. 2005). The average proportion of infected litters on coccidia-positive farms (29%) is also
comparable to the European study.

Litters that were infected with coccidia were significantly more likely to experience diarrhea between 7 and 21 days of age than litters that were not infected with coccidia. It should also be noted that coccidia were detected in 24% of the fecal samples from litters with no diarrhea (sometimes at high levels) – this is of concern as recent data have indicated that subclinical infections (i.e. infections without diarrhea) may have a significant detrimental effect on growth rates (Maes et al. 2007).

Surprisingly, on only one farm were there treatment measures in place for coccidiosis. However, as indicated, coccidiosis was widespread and was associated with clinical disease.

Finally, in work that was carried out to evaluate the efficacy of coccidia treatments that are currently used by swine veterinarians, the activity of Deccox was evaluated when administered \textit{ad libitum} with oral iron in the creep area. No significant beneficial activity was demonstrated against coccidia. However, it is possible that piglets did not consume adequate amounts of drug when administered in this manner. Similarly, single treatment of piglets in the first week of life with Clinacox did not show significant beneficial activity. Thus, although the drug is closely related to Baycox (toltrazuril), it does not appear to be as potent a coccidiostat, consistent with work elsewhere (Mundt et al. 2003).

\textbf{Conclusions:}

1. Coccidia (\textit{Isospora suis}) is a common infection in neonatal piglets on Ontario farms.
2. Piglets infected with coccidia are 4-times more likely to have diarrhea than uninfected piglets.
3. Subclinical coccidia infections are a common occurrence in piglets up to 21 days of age.
4. Deccox (decoquinate) did not appear to have significant activity against coccidia infections when administered *ad libitum* with oral iron in the creep area.

5. Clinacox (diclazuril) did not appear to have significant activity against coccidia infections when administered on one occasion to piglets in the first week of life.

**Future work**

The data obtained in this study have been used to secure CORD/Ontario Pork funding to determine the impact of coccidia infections on growth rates of pigs up to 8 weeks of age. Field work for this study is being carried out in the summer of 2007.

**Training of students**

- Emma Webster, a DVM student at OVC, was employed full time from May to August 2006, inclusive, to manage the project. In addition to presenting data from this study as a poster at the OVC’s Summer Leadership and Research Program (August 2006), she was selected to present the data as an oral presentation at the American Association of Swine Veterinarians Annual Conference (March 2007) and subsequently received a second prize for the presentation.

- In September 2006, Andrea Aliaga-Leyton, DVM, began a MSc program in the Department of Population Medicine, University of Guelph. All the data contained in this report will comprise the body of her MSc thesis. It is anticipated that two peer-reviewed publications will result from this work.
Dissemination of information

- “Parasitic infection more common than expected”. Assisted Kim Waalderbos, University of Guelph SPARK Coordinator, with the writing of this article (December 2006).
- “Piglet infection more common than expected”. Assisted Arthur Churchyard/Kim Waalderbos, with the writing of this article for Country Guide Brief (January 2007).
- “Piglet parasite problems: Prevalent or passé?” Assisted Kathy Zurbrigg, OMAFRA, with the writing of this article for Pig Pens (May 2007).
- “Study finds coccidia parasite on 70 per cent of farms tested.” Assisted Mike Mulhern, Ontario Pork, with the writing of this article for Pigs, Pork and Progress (2007).
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(e) The OVC Dean’s Office for providing financial support for a summer student to work on the project.

(f) Alpharma Animal Health for providing the Deccox used in Objective 3.

References


