Spray-Dried Animal Plasma Mitigates the Negative Impact of Deoxynivalenol (DON) in Nursery Pigs

L. Eastwood, J. N. Shea., D. A. Gillis, L. Johnston, and A.D. Beaulieu

Janice Shea

Laura Eastwood

SUMMARY

Deoxynivalenol (DON) is a mycotoxin of concern to grain and livestock producers in Canada. It is prevalent in cool, temperate regions and often occurs on wheat and barley. The use of DON contaminated grain in livestock feed leads to depressed feed intake and growth performance. Pigs are especially susceptible to its negative effects relative to other livestock species, and thus a study was carried out to determine if the negative effects observed with feeding DON contaminated diets could be mitigated by feeding a clay binder and/or spray-dried animal plasma (SDAP). Pigs fed a DON contaminated diet plus SDAP performed as well as those consuming a non-contaminated diet in terms of ADFI and ADG.

INTRODUCTION

The presence of DON contamination in grain is directly related to the presence of head or ear blight produced by Fusarium fungi, which in turn is directly related to the moisture content at flowering and/or harvest. Possibly due to recent high stress growing seasons, we have seen an increase in the presence of DON contaminated grains in the Prairie Provinces, and it is expected that DON contamination will continue to spread. Grains contaminated with DON are often downgraded, and either fed to livestock or destroyed. The best strategy for dealing with contaminated grains is to reduce the final concentration of the mycotoxin by dilution; however, this may not be possible if large quantities of contaminated grain are available.

Feeding DON contaminated diets to pigs has negative effects on performance, and can also affect intestinal integrity. Contrary to this, including SDAP into swine rations leads to improved performance and has positive benefits on gut health and integrity. This led to the hypothesis that feeding SDAP to pigs consuming DON contaminated diets would mitigate the negative effects on performance. The use of activated clay binders is another strategy designed to help reduce the negative effects of certain mycotoxins in livestock, and thus we also hypothesized that adding an activated clay to the diet would improve animal performance in DON fed pigs.

MATERIALS AND METHODS

Two blocks of 100 nursery pigs each were used for this trial. Pigs were housed in groups of 5/pen with a total of 8 pens per dietary treatment. Pigs began consumption of experimental diets 3 days post weaning and remained on trial for 20 days. Body weights and feed intakes of the pigs were measured on days 0, 3, 11 and 20. Intestinal samples were collected from the jejunum and ileum for 8 pigs per diet at the end of the trial for histological analysis.

Diets consisted of a negative control (NC; 0 ppm DON), a positive control (PC; 3.9 ppm DON) and 3 treatment diets which consisted of the PC diet plus clay (PC+clay), SDAP (PC+plasma) or both (PC+both). Diet formulations are shown in Table 1.

"Pigs fed a DON contaminated diet plus SDAP performed as well as those consuming a non-contaminated diet in terms of ADFI and ADG."

RESULTS AND DISCUSSION

Throughout the course of the experiment we observed no evidence of animals being ill (no vomiting or diarrhea). Overall, relative to the negative control (NC; no DON), ADG and ADFI of pigs fed the positive control (with DON) were reduced by 60 and 100 g/d respectively ($P < 0.01$). There was no obvious benefit of supplementing the diets with the clay binder, as ADG of pigs consuming the PC+clay diet was similar to those consuming the PC diet ($P > 0.05$); feed intake, however, of pigs fed the PC+clay was numerically improved relative to the PC but was less than the NC (PC+clay 450 g/d, PC 400 g/d, NC 500 g/d).

When SDAP was added to the DON contaminated diet (PC+plasma), ADG of pigs was similar to the NC pigs (420 g/d vs. 390 g/d; $P > 0.05$). The ADFI however, was greater for pigs consuming PC+plasma than the NC pigs (550 g/d vs. 500 g/d; $P < 0.01$). Performance of pigs fed the PC+both diet was also similar to the NC and PC+plasma fed pigs. Overall, gain:feed averaged 0.79 and was unaffected by DON, SDAP or the activated clay ($P > 0.05$). The effects of dietary treatment on ADG and ADFI are shown in Figures 1 and 2.

In the intestine, mucosal thickness and villus height were unaffected by dietary treatment. Pigs fed a DON contaminated diet plus SDAP (PC+plasma) had reduced crypt depth ($P = 0.04$) and thus the villus height to crypt depth ratio tended to be higher.

CONCLUSION

Inclusion of SDAP improved ADFI and ADG relative to the positive DON control, and pigs consuming SDAP with DON performed as well as the negative controls. SDAP alleviated the negative effects of DON. In this experiment, SDAP was more effective than the activated clay. SDAP should be included into nursery diets if DON contaminated feed is suspected or known.

ACKNOWLEDGEMENTS

Strategic program funding was provided by Sask Pork, Alberta Pork, Manitoba Pork Council, Ontario Pork and Saskatchewan Agriculture and Food Development Fund. Specific funding for this project was provided by Saskatchewan Agriculture and Food Development Fund.

Table 1. Diet Formulations

	Treatment				
Ingredients [1,2], % as fed	NC	PC	PC + Clay	PC + Plasma	PC + Both
Wheat	50.8	28.8	28.6	27.8	27.6
DON Wheat (9.3 ppm)	0.0	22.0	22.0	22.0	22.0
Soybean Meal	19.0	19.0	19.0	18.1	18.1
Whey Powder	11.7	11.7	11.7	11.4	11.4
Fish Meal	9.0	9.0	9.0	0.0	0.0
Barley	4.9	4.9	4.9	5.8	5.8
Canola Oil	2.3	2.3	2.3	2.4	2.4
LS 20	0.1	0.1	0.1	0.1	0.1
Activated Clay	0.0	0.0	0.2	0.0	0.2
SDAP	0.0	0.0	0.0	8.0	8.0
Analyzed DON, ppm	0.0	3.2	3.6	4.2	4.4

[1]All diets contained equal amounts of vitamin and mineral premixes, choline chloride, salt and CuSO4-5H2O
[2]Amino acids, limestone, and mono/di-calcium phosphate were added to balance diets

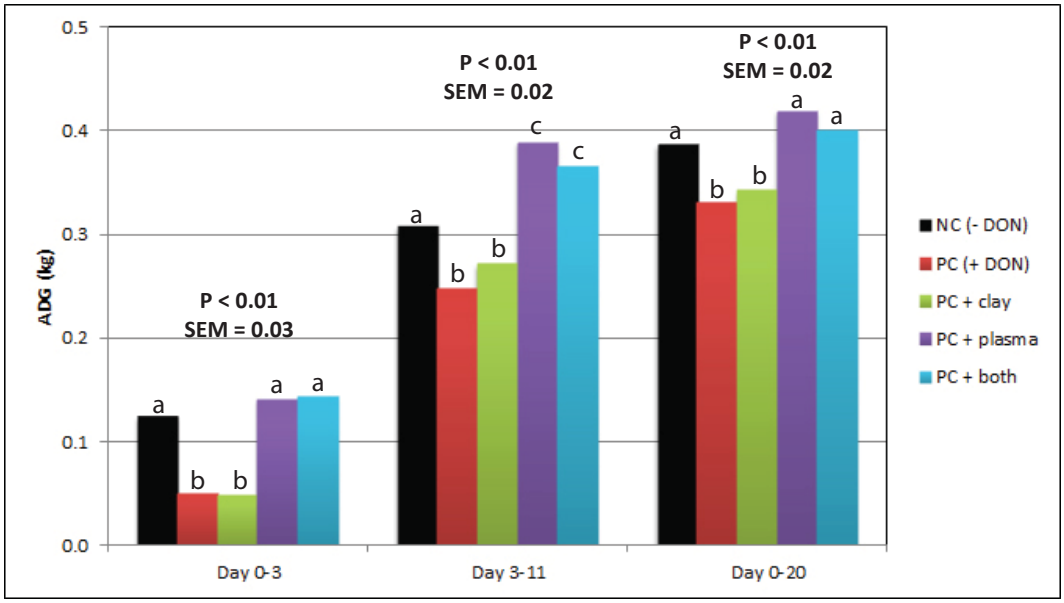

Figure 1. Average daily gains of piglets fed diets containing DON contaminated wheat +/- additives relative to a negative control.

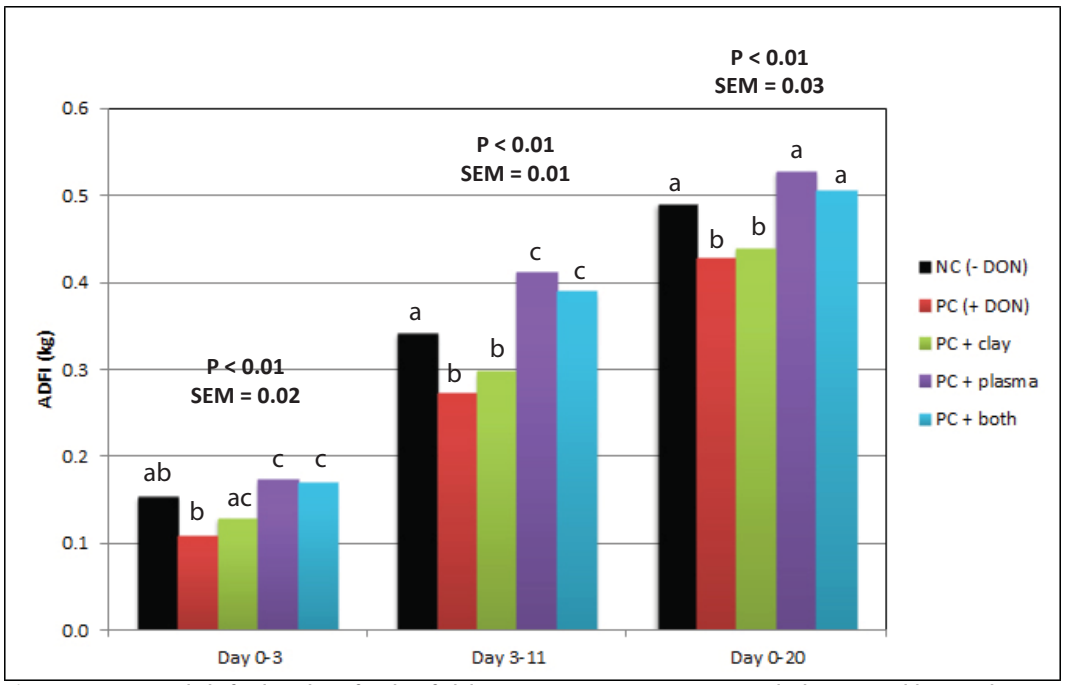

Figure 2. Average daily feed intakes of piglets fed diets containing DON contaminated wheat +/- additives relative to a negative control