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Artificial Rearing of Baby Pigs with Twice-a-day Feeding and Cow Colostrum

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Summary

Four experiments involving 140 pigs were conducted to evaluate cow colostrum and twice-a-day feeding in artificial rearing of baby pigs. Piglets were allowed to nurse the sow for 15 hours after birth and allotted by litter and weight to milk replacer or milk replacer plus cow colostrum. Piglets were housed in individual wire cages and fed four times on day one, three times on day two, and twice daily days 3 through 21. Dry feed was offered to pigs after day 14. Pigs were removed from the individual cages and moved to a conventional nursery at 21 days of age. Piglets receiving cow colostrum had improved weight gains and decreased incidence of scours during the first week of life. Piglets fed cow colostrum had increased livability (98 vs. 91%) compared to piglets receiving only milk replacer. There was little advantage to feeding cow colostrum after the first week. Piglets raised artificially were similar in weight to sow-reared pigs at 6 weeks of age. These results suggest a practical, inexpensive method of artificially rearing of orphaned or extra baby pigs.

Introduction

Two obstacles face swine producers who wish to artificially raise orphaned or extra pigs. First, the immune protection normally provided by the sow must be replaced, and second, the feeding and management system must not require more time and money than the pigs are worth. We evaluated cow colostrum as a source of immune protection and twice-a-day feeding to minimize labor and costs.

Procedures

Animals

All pigs in these trials were from the KSU herd, purebred Yorkshires in experiments 2 and 3, and Yorkshire x Hampshire x Duroc crossbred pigs in experiments 1 and 4. In experiments 2 and 3, the pigs were removed immediately at birth and returned together after the last pig was born. Newborn pigs were weighed and given the desired day 1 care. All pigs nursed the sow for at least 15 but not more than 24 hours. Pigs were allotted to treatment by litter and weight.

Housing

When removed from the sow, pigs were taken to a separate room on the swine farm. Individual 1' x 2' x 1' cages made of 1" x 2" welded wire with

¼" wire netting on the floor were used. Cages were equipped with plastic feeding cups with a capacity of 200 milliliters. Room temperature was maintained at 90 F. At weaning, pigs were taken to a conventional nursery with group pens.

Feeding

A commercially available milk replacer (Soweena) was used. In experiments 1 and 2, the milk replacer was fed at the recommended 15% dry matter, but was increased to 25 and 30% for experiments 3 and 4, respectively. Pigs received no water or milk for the first six hours after removal from the sow. Pigs were fed every six hours the first day. Each pig was introduced to the milk by having its nose placed in it. Usually two or three pigs would not eat the first feeding, but in all experiments they consumed the second feeding. Pigs were fed every 8 hours on the second day and twice daily (every 12 hours) on days 3 through 21. Daily volume was divided equally among the feedings. Pigs were fed 400 ml of milk replacer and/or cow colostrum on day 1 and volume was then increased to appetite with a maximum of 1200 ml being fed during days 14 through 21. At 2 weeks of age, a dry pig starter was mixed with the milk replacer at the rate of 120 grams per head per day until pigs were moved to the conventional nursery at 3 weeks of age. Water in addition to that in the milk replacer was only given in trial 4. The cow colostrum used was from first and second milkings from the university dairy herd. Colostrum was frozen in ice cube trays (25 ml) and gallon milk cartons, and then thawed in quantities needed each day.

General Procedures

Diarrhea scores were taken daily and scored from 0 to 3 with 0 being for normal feces, 1 for loose feces, 2 for moderate diarrhea, and 3 for extremely watery diarrhea. Pigs were weighed weekly, midway between feedings to avoid the influence of fluctuating stomach volumes.

Experiment 1 - Twelve pigs from two litters were allotted to three treatments: 1) milk replacer only; 2) 400 ml of cow colostrum day 1; and 3) 400 ml cow colostrum day 1 followed by 125 ml cow colostrum days 2 through 10.

Experiment 2 - Twenty-four pigs from two litters were allotted to six treatments: 1) milk replacer only; 2) milk replacer only plus antibiotics given for diarrhea; 3) 400 ml cow colostrum day 1 followed by 125 ml cow colostrum days 2-10; 4) 400 ml cow colostrum day 1 followed by 125 ml cow colostrum days 2-21; 5) 125 ml cow colostrum days 1-10; and 6) 125 ml cow colostrum days 1-21. Only treatment 2 received any further antibiotics during the trail.

Experiment 3 - Thirty-six pigs from four litters were allotted to six treatments: 1) milk replacer only; 2) milk replacer plus antibiotic on day 3; 3) 125 ml cow colostrum days 1 through 3 plus antibiotic day 21; 4) 125 ml cow colostrum days 1 through 3 and days 18-21; 5) 125 ml cow colostrum days 1-21; and 6) 125 ml cow colostrum days 1-21 plus antibiotic day 5.

Pigs received no additional antibiotics.

Experiment 4 - Sixty-four pigs from eight litters were allotted to 8 treatments: 1) milk replacer only; 2) 120 ml cow colostrum days 1-21; 3) 60 ml cow colostrum days 1-21; 4) 30 ml cow colostrum days 1-21; 5) 120 ml cow colostrum days 1-10; 6) 60 ml cow colostrum days 1-10; 7) 30 ml cow colostrum days 1-10; and 8) 120 ml cow colostrum as needed for treatment of diarrhea. Pigs received no additional antibiotics.

Results

Experiment 1 - Results of experiment 1 are shown in table 21. Piglets fed cow colostrum gained significantly ($P<.05$) faster during the first week than those receiving only milk replacer. Weight gains were similar for piglets fed cow colostrum on day 1 and for those receiving cow colostrum days 1 through 10. The same trend prevailed the second week, with smaller differences. The cumulative diarrhea score was improved by the 10-day colostrum treatment with no differences between milk replacer only and cow colostrum on day 1 only. Average daily gains during week 3 and average weights at 3 and 6 weeks were similar for all treatments.

Experiment 2 - Supplementation with cow colostrum improved average daily gain during weeks 1 and 2 and gave the lowest diarrhea score (table 22). Antibiotics in addition to the milk replacer had no significant effect over milk replacer alone on pig performance or incidence or severity of diarrhea. Pig performances were similar by pigs fed cow colostrum 10 or 21 days. Pigs fed milk replacer alone were slightly lighter at 3 weeks and 6 weeks than pigs on other treatments.

Experiment 3 - Supplementation with cow colostrum increased average daily gain week 1 (table 23). Pigs fed cow colostrum tended to be heavier at 3 weeks than pigs given only milk replacer. Giving antibiotics did not affect weight gain of the pigs.

Experiment 4 - Supplementing the milk replacer with cow colostrum resulted in no significant differences in average daily gain, diarrhea scores, or average final weight (table 24). Quantity of cow colostrum fed (30, 60, or 120 ml per head per day) did not affect pig performance. Similarly, feeding cow colostrum 10 or 21 days did not affect performance. Diarrhea scores were similar for all treatments. Mortality and diarrhea observed appeared to result from pigs being in negative water balance. When supplemental water was given between the daily feedings, diarrhea stopped and no more pigs died.

Discussion

Results reported here show the ability of cow colostrum to reduce the incidence of diarrhea and thereby increase gains and reduce mortality the first week of life. The main effects from supplemental cow colostrum were during the first week. In experiments 1 through 3, supplemental cow colostrum decreased the incidence of diarrhea and increased average daily gains during the first week. Gains of pigs fed milk replacer only improved the second week, and usually were similar to colostrum-fed pigs the third

week. At 3 weeks colostrum-fed pigs weighed slightly more than pigs fed only milk replacer. Pig weights at 6 weeks were similar for all treatments. The occurrence of diarrhea in experiment 4 was due to a negative water balance from feeding the milk replacer at 30% solids with no additional water. No pathogenic organisms were found to be responsible. The negative water balance may explain why there was no first week advantage from supplemental colostrum.

The twice-a-day feeding schedule we used gave gains similar to those with more frequent feeding schedules by other researchers. The twice-a-day feeding program saves the expense of an automatic feeding device without investing a great deal of time with the pigs. Between feedings the pigs would act hungry and squeal when anyone entered their room. But at three weeks, when removed from the individual wire cages to the nursery, weights of the artificially reared pigs and sow-reared pigs were similar.

Table 21. Effect of Cow Colostrum on Pig Performance (Experiment 1)[a]

	Weeks	Milk replacer	Cow colostrum Day 1	Cow colostrum Days 1-10
Avg. daily gain (gm)	1	58.4[d]	81.1[c]	82.7[c]
	2	98.1[e]	107.8[de]	128.9[d]
	3	201.1	203.5	163.0
Avg. weights (lbs)	3	8.67	9.20	8.95
	6	17.93	16.30	16.43
Diarrhea score[b]		8[d]	8[d]	1[c]
Mortality		0	0	0

[a]Four pigs per treatment.

[b]Cumulative diarrhea scores based on 0 = normal and 3 = severe diarrhea.

[c,d]Means in the same line with different superscripts differ significantly ($P<.05$).

Table 22. Effect of Cow Colostrum on Pig Performance, Diarrhea Scores and Mortality (Experiment 2)[a]

	Weeks	Milk replacer	Antibiotic	400 ml day 1 125ml days 2-10	400 ml day 1 125ml days 2-21	125 ml days 1-10	125 ml days 1-21
Avg. daily gain (gm)	1	64.9[d]	71.3[d]	116.7[c]	97.3[c]	100.5[c]	102.2[c]
	2	133.0[e]	134.6[e]	157.3[cb]	158.9[cb]	147.6[de]	165.4[c]
	3	223.8	243.2	243.2	240.0	202.8	222.2
Avg. weights(lbs)	3	9.31	9.68	10.74	10.43	9.75	10.34
	6	15.84	18.13	18.33	18.68	16.30	18.55
Diarrhea score[b]		16[d]	18[d]	3[c]	2[c]	1[c]	1[c]
Mortality		0	0	0	0	0	0

[a]Four pigs per treatment.

[b]Cumulative diarrhea scores based on 0 = normal and 3 = severe diarrhea.

[c,d,e]Means in the same line with different superscripts differ significantly ($P<.05$).

Table 23. Effect of Cow Colostrum on Pig Performance, Diarrhea Score and Mortality (Experiment 3)[a]

	Weeks	Milk replacer	Antibiotic day 3	125 ml Days 1-3 plus antibiotic day 21	125 ml Days 1-3 and days 18-21	125 ml days 1-21	125 ml Days 1-21 plus antibiotic day 3
Avg. daily gain (gm)	1	63.6^{f}	82.4^{ef}	100.5^{de}	125.2^{cd}	144.0^{c}	139.4^{c}
	2	177.1^{c}	154.4^{cd}	136.3^{d}	182.9^{c}	175.1^{c}	177.1^{c}
	3	248.4^{d}	220.5^{e}	225.7^{e}	275.6^{c}	282.1^{c}	269.2^{cd}
Avg. weight (lbs)	3	10.78^{d}	10.27^{d}	10.10^{d}	11.95^{c}	12.17^{c}	11.97^{c}
	6	21.10	19.32	18.68	21.32	20.48	22.22
Diarrhea score[b]		39^{e}	18^{d}	17^{d}	6^{c}	1^{c}	5^{c}
Mortality		2	1	0	0	0	0

[a]Six pigs per treatment.

[b]Cumulative diarrhea scores based on a score of 0 = normal and 3 = severe diarrhea.

[c,d,e,f]Means in the same line with different superscripts differ significantly ($P<.05$).

Table 24. Effect of Cow Colostrum on Pig Performance, Diarrhea Scores, and Mortality (Experiment 4)[a]

	Weeks	Milk replacer	Cow colostrum						
			Per day to day 21			Per day to day 10			120 ml as treatment
			120 ml	60 ml	30 ml	120 ml	60 ml	30 ml	
Avg. daily gain (gm)	1	139.4^{cd}	142.0$_{c}$	140.1$_{c}$	129.7$_{c}$	140.1$_{c}$	145.3$_{d}$	153.1$_{c}$	136.8$_{c}$
	2	158.3^{cd}	186.1^{c}	177.1^{c}	185.5^{c}	175.1^{c}	140.1^{d}	190.7^{c}	173.8^{c}
	3	182.4	208.5	188.9	192.0	200.2	189.0	193.8	187.3
Avg. weight (lbs)	3	10.21	11.11	10.78	10.89	10.89	10.43	11.24	10.60
	6	19.01	19.16	18.19	20.22	19.23	19.01	19.36	20.26
Diarrhea score[b]		20	39	38	49	49	52	31	51
Mortality		0	1	0	0	0	1	0	0

[a]Eight pigs per treatment.

[b]Cumulative diarrhea scores based on a score of 0 to 3 with 0 = normal and 3 = severe diarrhea.

[c,d]Means in the same line with different superscripts differ significantly (P<.05)