

Health and Lean Growth Performance of Barrows Reared in All-In, All-Out or Continuous Flow Facilities With or Without Antibiotic

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Health and well-being of pigs may be markedly affected by management and environment in modern pork production units. All-in, all-out animal flow during the growing-finishing phase of swine production is well established as a means for reducing certain diseases and improving growth performance (Clark et al., 1991; and Cline et al., 1992). Environment is a complex composite of many factors and stressors interacting with one another. Exposure to stress increases the animal's chance of being challenged by respiratory diseases. Respiratory disease in pigs has its most serious effects in the finishing stages (Done, 1991). *Mycoplasma hyopneumoniae* and *Pasteurella multocida type A* are causative agents of chronic respiratory disease that result in decreased overall performance. *Actinobacillus pleuropneumoniae* and *A. suis* can be causes of chronic pneumonia, but usually are present as acute pneumonia. The importance of these diseases during the finishing stages is associated with intensive systems of housing which change the relationship between the microorganisms and the pig and its environment (Done, 1991). The purpose of this study was to compare the effect of all-in, all-out management to continuous flow management, during the growing-finishing phase, on growth rate and severity of disease. In addition, the effect of chlortetracycline on overall health and lean growth in both environments was tested.

Materials and Methods

Barrows which were (Yorkshire x Landrace) x (Hampshire x Duroc) were allocated randomly to either an all-in, all-out (AIAO) or continuous flow (CF) room. Each room was environmentally regulated with separate ventilation and flush pit manure disposal systems. Five pigs were housed in each pen (4 ft x 6.5 ft) with a total of 10 pens in each room. The CF room was cleaned and disinfected before being seeded with three, four, and five month old pigs from a CF grower-finisher unit with a history of mycoplasmal pneumonia. Once the seeder pigs attained slaughter weight they were removed and 2-month-old barrows from an AIAO nursery were placed in the pen. As barrows left the study, the pen was restocked with 2-month-old barrows for the next replication. The AIAO room was cleaned, disinfected and then filled with fifty 2-month-old barrows from an AIAO nursery. The group of AIAO barrows were slaughtered at the same time, and the room was cleaned and disinfected between each of the four replications.

One half of the pens in each room (5) received chlortetracycline at a rate of 100 g/ton of feed (110 mg/kg). Pigs were allotted to one of four treatment groups: (1) AIAO, antibiotic; (2) AIAO, no antibiotic; (3) CF, antibiotic; and (4) CF, no antibiotic. Each treatment contained 25 pigs, and after 4 replications each treatment contained 100 pigs. Barrows were weighed every two weeks. Total gain, total feed consumed, and feed conversion were calculated at two week intervals.

A blood sample was collected from each barrow as it entered and exited the study. Sera were analyzed for *M. hyopneumoniae* and *A. pleuropneumoniae* titers by an enzyme linked immunosorbent assay. From each pen, one barrow was slaughtered at approximately 3, 4, and 5 months of age, and 2

barrows were slaughtered at approximately 6 months of age. At slaughter, standard carcass measurements were recorded, and carcass lean was estimated by total body electrical conductivity (TOBEC). Based on a visual analysis of color, appearance of lesions, and overall appearance, each liver was given a score of 1 (normal), 2 (mild), 3 (moderate), or 4 (severe). Adrenal glands were collected from each barrow and weighed. Lungs from each barrow were obtained and examined for macroscopic lesions. A computer digitizer (Osteoplan, Zeiss, New York) was used to determine the percentage of the surface area of the lung challenged by lesions.

Results and Discussion

Results are given in Table 1. Barrows in the AIAO facility had a higher ADG than CF barrows, 1.72 vs. 1.58 lb/day ($P < .02$). Chlortetracycline showed a trend in improving ADG regardless of environment (1.67 vs. 1.63 lb/day). Barrows housed in the AIAO room had a higher slaughter weight compared to barrows from the CF room. Carcass lean was also affected by environment. Antibiotic failed to alter slaughter weight or carcass lean. A reduction of 7.6 days to market was observed in the AIAO room as compared to the CF room.

Livers from the CF room exhibited more damage than livers from the AIAO room (1.0 vs 2.0). Twenty-six percent of the AIAO barrows had lung lesions indicating the presence of pneumonia with an average of 5.68% of the lung surface affected with pneumonic lesions (Figure 1). Seventy-six percent of the CF barrows had evidence of lesions with an average of 12.43% of the lung surface affected with pneumonic lesions. AIAO management increased weight gains and improved overall health and performance as compared to CF management. The use of chlortetracycline failed to enhance performance in either AIAO or CF facilities.

AIAO production was found to be superior to CF production in health and growth performance. Based on the results of this study, it can be concluded that AIAO management can reduce the prevalence and severity of pneumonia. It can also increase weight gains in pigs taken from herds affected by pneumonia.

References

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Table 1. Measurements from barrows reared in all-in, all-out (AIAO) or continuous flow (CF) facilities.

Item	Age, months								P ^f				SEM ^g
	3		4		5		6		REP	ENV	ANTI	AGE	
	AIAO	CF	AIAO	CF	AIAO	CF	AIAO	CF					
Slaughter age, days	94.3	91.0	123.7	120.1	151.7	150.8	181.3	180.8	0.2	0.3	0.5	-----	0.9
Slaughter weight, lb	91.1	80.1	114.7	122.5	203.9	179.7	251.5	237.6	0.2	0.004	0.5	0.0001	3.3
Carcass lean, lb	30.1	28.4	48.4	43.1	69.7	62.7	84.5	77.9	0.3	0.03	0.9	0.0001	1.5
Total gain ^a	1.72	1.23	1.63	1.39	1.80	1.58	1.76	1.67	0.7	0.02	0.2	0.08	0.09
Lean gain ^a	0.90	1.01	0.79	0.77	0.77	0.70	0.70	0.66	0.4	0.5	0.5	0.0001	0.029
Liver score ^b	1.0	1.97	1.03	2.20	1.0	2.07	1.0	1.67	0.9	0.006	0.4	0.2	0.05
Adrenal weight ^c	0.062	0.07	0.051	0.054	0.042	0.048	0.039	0.04	0.7	0.09	0.8	0.0001	0.0009
Severity of lung lesions ^d	7.36	9.31	5.4	12.22	4.81	12.93	5.16	15.26	0.7	0.06	0.4	0.8	2.1
Incidence of lesions ^e	37.5	70.0	27.5	67.5	22.5	82.5	21.5	81.0	0.8	0.06	0.06	0.9	7.0

^a lb/day on trial.

^b Liver scores were based on a visual analysis of color, presence of lesions and overall appearance. 1 = normal, 2 = mild, 3 = moderate, 4 = severe.

^c g/kg body weight.

^d %

^e % of barrows with lung lesions.

^f REP = Replication, ENV = Environment, ANTI = Antibiotic, AGE = Age at slaughter.

^g SEM = Standard error of the mean.

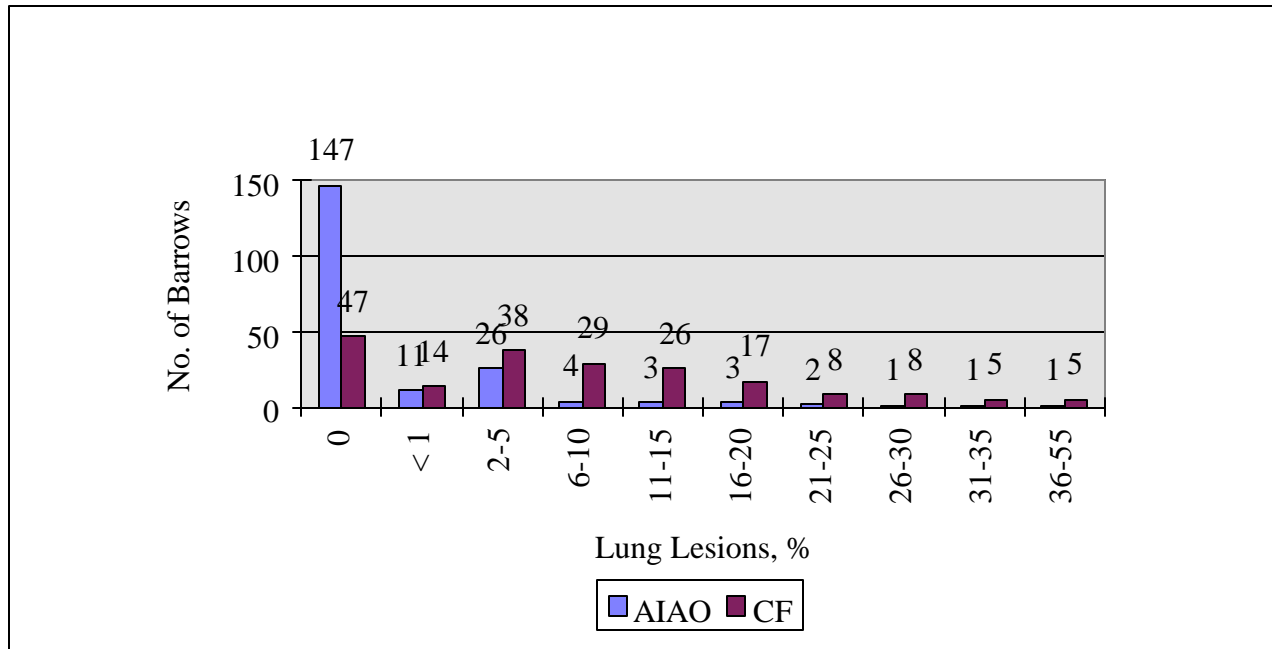


Figure 1. Severity of lung lesions of barrows reared in AIAO and CF facilities, regardless of whether they received antibiotic. Lungs from CF barrows had a higher percentage of lesions than AIAO barrows ($P < .06$). Chlortetracycline did not lessen lung lesion severity ($P > .40$).