FATS AND PROTEINS RESEARCH FOUNDATION, INC.

Director's Digest

FRED D. BISPLINGHOFF, D.V.M.
Director Technical Services

7150 ESTERO BLVD. • APT. 906
FT. MYERS BEACH, FL 33931
AREA CODE 813 — 463-4744

JUNE 1992 No. 236

USE OF INEDIBLE FATS IN SWINE DIETS FOR DUST CONTROL

E. R. Peo, Jr. and Austin J. Lewis
Department of Animal Science
University of Nebraska

INTRODUCTION

The rationale for conducting present experiment is derived from the results of previous studies reported earlier by us to FPRF that utilized modified-open-front buildings and 2.5 and 5% dietary tallow in the growing-finishing swine diets. Addition of 2.5% tallow to the diet reduced total aerial dust concentrations by only 21% (15.76 mg/m^3 with tallow vs 20.05 mg/m^3 without tallow) while the reduction was 49% with 5% tallow (10.28 mg/m^3 with tallow vs 20.21 mg/m^3 without tallow). Thus, it was of interest to assess the effect of including a higher percentage of tallow to the diet upon aerial dust levels in modified-open-front buildings.

It has been demonstrated over the years that the swine house dust is a carrier of potentially dangerous microorganisms and harmful gases. Although most of the microorganisms identified in swine buildings have not been pathogenic in nature, the implication is present that virulent organisms can gain entry and that the consequences might be very serious. Dust particles absorb gases which can lead to interactions between dust and gases in their effects on the respiratory structures. Field studies supporting this contention have shown an increase in buildings with high ammonia and dust.

Objectives of the present study was to determine the effect of adding 7.5% tallow to the diet of growing-finishing swine on: (1) pig performance,

(2) aerial dust concentrations with and without the feed distribution auger running, (3) dust accumulation, (4) aerial bacterial colony forming particle (BCFP) and ammonia concentrations, (5) the integrity of the respiratory structures, and (6) feed particle separation in an automated "Flex-auger" feed distribution system.

A series of experiments, involving nearly 2000 growing-finishing swine, were conducted to determine the effect of adding bleachable fancy tallow to a corn-soybean meal diet on dust accumulation in swine confinement facilities. The results were clear and positive that adding tallow at 2.5, 5.0 or 7.5% reduced markedly the measured concentration of dust in hog houses -- amounting to a 21%, 50% or 54% decrease in dust for the respective fat levels. From these experiments a regression equation was calculated to determine the expected reduction in hog-house dust depending upon level of tallow fed. It appears from the data that dust-reduction is optimized at the 5% level of added tallow -- a level that is reasonably close to being cost effective. It should be remembered that adding tallow to the diet of swine also improves gain (5%) and feed conversion (10%).

Results

As expected, pig performance was improved by the addition of tallow to the diet (table 2). Pigs fed a diet containing 7.5% tallow gained 5.3% faster, consumed 7.5% less feed, consequently showed a 12.5% improvement in feed efficiency.

The effect of tallow on aerial dust concentrations with and without the feed distribution auger running is summarized in table 3. Addition of 7.5% tallow to the swine diet reduced aerial dust concentrations without auger running in all size classes except .4 m. Total dust concentration was 10.25 mg/m^3 for Building 1 and 21.56 mg/m^3 for Building 2. This was 52.5% reduction of aerial dust in the air of the building in which the a containing tallow had been fed. Similarly, less dust was generated, during the feeding process, in the building where a diet containing tallow was used. The results of settled dust measurement are presented in table 4. Addition of tallow to the diet of growing-finishing swine resulted in 60.2, 54.3 and 57.3% reduction of settled dust in period 1, period 2 and average, respectively.

The effect of tallow on aerial ammonia and BCFP concentrations in modified-open-front buildings is summarized in table 5. Although the concentrations of ammonia were not high enough to cause any adverse effect on the respiratory structures, addition of tallow to the diet resulted in 58.4% reduction of aerial ammonia. The number of BCFP observed in this study were comparable to that reported by Elliot et al. (1976). Aerial BCFP concentrations were different throughout the study between the two buildings. Overall, the addition of 7.5% tallow to the diet resulted in a 75% reduction of aerial BCFP in the modified-open-front building.

Data from all of the trials were used to calculate regression equations to estimate the percentage reduction in aerial dust concentration in hog-houses by adding tallow to a corn-soybean meal type diet fed in meal-form. Zero, 2.5%, 5.0% and 7.5% levels of tallow additions were used to derive the equations shown below:

$$\text{Linear: } Y = 7.4712X + .4840 \; (r^2 = .84)$$

$$\text{Quadratic: } Y = 10.4728X - .6191 - .4254X2 \; (r^2 = .848)$$

Where Y = % reduction in aerial dust
and X = % of added tallow

Although the r^2 value is similar for the linear and quadratic regression components, it appears that from actual data, the quadratic regression line appears to be the best fit. However, the data were plotted for both regressions and are shown graphically in Figure 1. From the graph, one can quickly calculate the percentage reduction in hog-house dust expected depending upon level of tallow fed.

References

*Chiba, L.I., E. R. Peo, Jr., A. J. Lewis, M. C. Brumm, R. D. Fritschen and J. D. Crenshaw. 1985. Effect of dietary fat on pig performance and dust levels in modified-open-front and environmentally regulated confinement buildings. J. Anim. Sci. (Submitted and accepted for publication in September, 1985 issue.)

Elliott, L. F., T. M. McCalla and J. A. DeShazer. 1976. Bacteria in the air of housed swine units. Appl. Environ. Microbiol. 32:270.

Jacobson, L. D. 1974. Bacterial and particulate concentration in a turkey house environment. M. S. Thesis. Univ. of Minnesota, St. Paul.

Miner, J. R. 1974. Odors from confined livestock production. EPA Report No. 660-2-74-023. pp 57-59.

Maum, S. G., W. Seltzer and T. M. Goldhaft. 1969. A simple method of determining concentrations of ammonia in animal quarters. Poul. Sci. 48;347.

*Key publication - will report, in detail, all of the research conducted under this project except for the last trial which is reported herein.

TABLE 1. COMPOSITION OF EXPERIMENTAL DIETS (Neb. Exp. 85402)

	Diet[a]	
	1 (W/T)	2 (WO/T)
Ingredients, %		
Corn	68.28	77.63
Soybean meal	20.74	18.91
Tallow	7.50	
Limestone	.87	.93
Dicalcium phosphate	1.27	1.18
Salt (iodized)	.25	.25
Trace mineral premix	.05	.05
Vitamin premix	1.00	1.00
Selenium premix	.05	.05
	100.00	100.00
Calculated analysis:		
Crude protein, %	15.00	15.00
Calcium, %	.70	.70
Phosphorus, %	.55	.55

[a]W/T = with 7.5% tallow; WO/T = without tallow.

TABLE 2. EFFECT OF TALLOW ON PERFORMANCE OF PIGS REARED IN MODIFIED-OPEN-FRONT BUILDINGS[a] (Neb. Exp. 85402)

	Diet[b]	
	1 (W/T)	2 (WO/T)
Init. wt., kg	19.6	19.8
Final wt. kg	73.5	70.8
ADG, kg	.79	.75
ADFI, kg	1.86	2.01
Feed/gain ratio	2.32	2.65

[a]Pig weights and feed consumption data were collected biweekly for 10 weeks.
[b]Building 1, W/T = diet fed with 7.5% tallow
Building 2, WO/T = diet fed without tallow

TABLE 3. EFFECT OF TALLOW ON AERIAL DUST CONCENTRATIONS WITH AND WITHOUT THE FEED DISTRIBUTION AUGER RUNNING IN MODIFIED-OPEN-FRONT BUILDINGS (Neb. Exp. 85402)

	Diet[a]	
	1 (W/T)	2 (WO/T)
Without auger running[b,c]		
Stage 1	7.36	14.23
2	2.38	6.15
3	.32	.99
4	.19	.19
Total	10.25	21.56
With auger running[b,c]		
Stage 1	7.50	46.27
2	2.69	12.07
3	.91	1.50
4	.83	.71
Total	11.94	60.51

[a]Building 1, W/T = diet fed with 7.5% tallow.
Building 2, WO/T = diet fed without tallow.
[b]Aerial dust levels are expressed in mg/m^3 of air.
[c]Dust particle sizes: stage 1, 14 m; stage 2, 4 m; stage 3, 1.5 m; stage 4, .4 m.

TABLE 4. EFFECT OF DIETARY TALLOW ON SETTLED DUST LEVELS IN MODIFIED-OPEN-FRONT BUILDINGS (GRAMS) (Neb. Exp. 85402)

	Diet[a]	
	1 (W/T)	2 (WO/T)
Period		
1 (30 d)	1.23	3.09
2 (31 d)	1.29	2.82
Average	1.26	2.96

[a]Building 1, W/T = diet fed with 7.5% tallow.
Building 2, WO/T = diet fed without tallow.

TABLE 5. EFFECT OF TALLOW ON AERIAL AMMONIA AND BACTERIAL COLONY FORMING PARTICLE (BCFP) CONCENTRATIONS IN MODIFIED-OPEN-FRONT BUILDINGS (Neb. Exp. 85402)

	Diet[a]	
	1 (W/T)	2 (WO/T)
Ammonia, ppm	4.2	10.1
BCFP, particles/m^3	103,971	421,938

[a]Building 1, W/T = diet fed with 7.5% tallow.
Building 2, WO/T = diet fed without tallow.

TABLE 6. EFFECT OF DIETARY TALLOW ON LUNG LESIONS OF PIGS REARED IN MODIFIED-OPEN-FRONT BUILDINGS (Neb. Exp. 85402)

	Diet[a]	
	1 (W/T)	2 (WO/T)
Lung score[b]		
0	17	13
1	3	3
2	5	6
3	4	3
4	1	1
5	0	0
6	0	0
Total	30	26

[a]Building 1, W/T = deit fed with 7.5% tallow.
Building 2, WO/T = diet fed without tallow.
[b]Higher the value greater the degree of lung lesions.

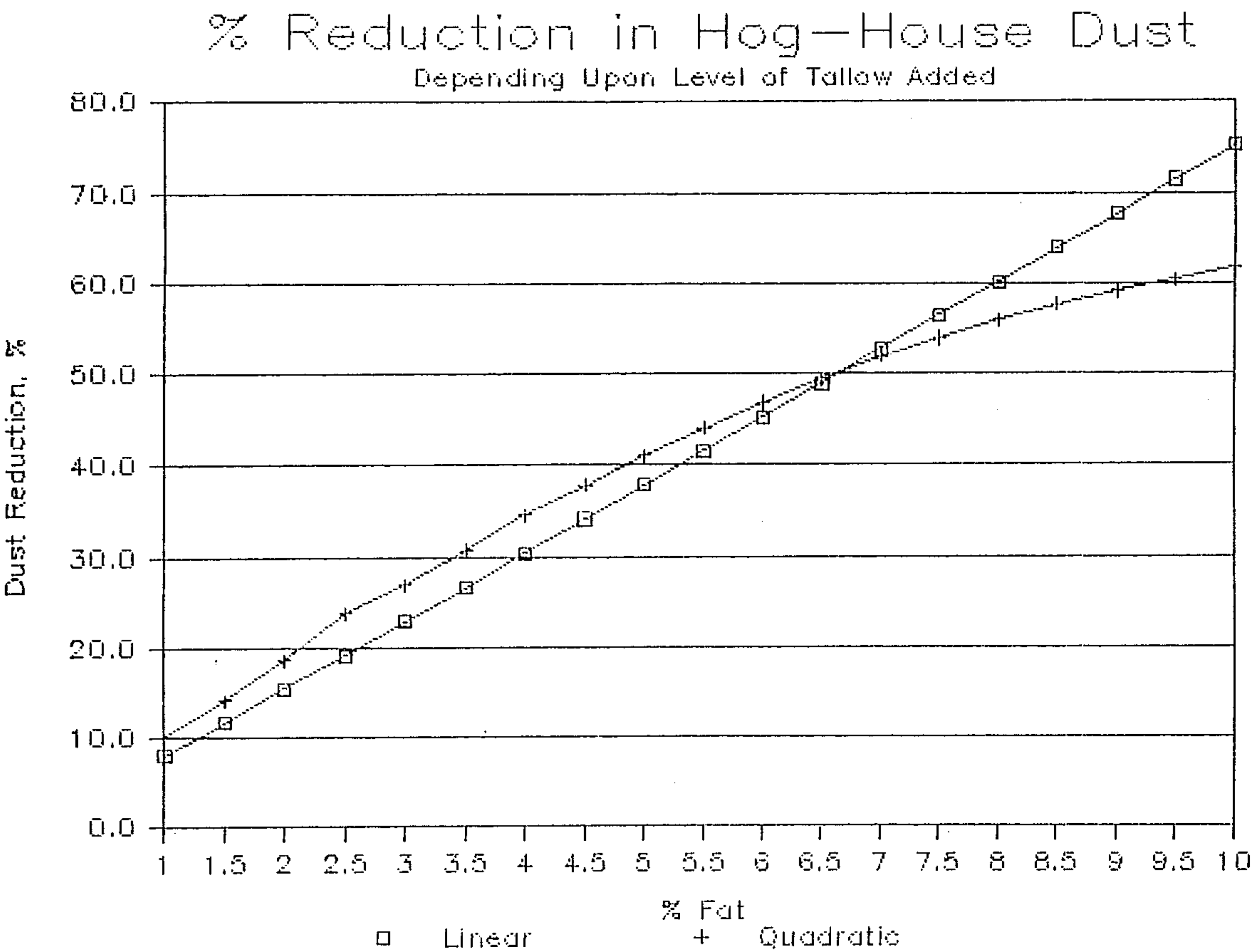

Fig. 1: Linear regression = Y = 7.4712X + .4840 (r^2 = .84)
Quadratic regression = Y - 10.4728X - .6191 - .4254X^2 (r^2 = .848)