study was designed to determine performance response to low-level vitamin A supplementation of an otherwise adequate diet.

Experimental Procedure

Twenty-five crossbred (Duroc x Poland China) feeder pigs were randomly divided into two groups. They had previously been vaccinated for cholera and erysipelas and treated for worms with piperazine.

The pigs were confined on concrete with water and feed before them at all times.

Ration formulations are listed in Table 23. One ration contained 100 I.U. of added vitamin A per pound and the other 400 I.U. Analysis of the rations indicated that essentially no vitamin A or provitamin A was coming from other sources.

Individual pigs were removed from the pens as they reached slaughter weight. Carcasses were evaluated on the rail after slaughter.

Observations

Increasing the vitamin A content of the diet from 100 to 400 I.U. per pound did not change the average daily gain or the feed efficiency of the pigs. Both groups did as well as similar pigs consuming diets with much higher vitamin A content. Carcasses from pigs receiving the lower level (100 I.U.) of vitamin A tended to carry more backfat than those from pigs on the higher level.

Stomachs were recovered at slaughter and examined by Dr. W. J. Griffing as part of a School of Veterinary Medicine study of stomach ulcers in swine. No difference in incidence or severity of ulcer symptoms was noted between the two groups.

Table 29
Vitamin A levels for growing-finishing pigs.
(Started on feed, December 16, 1961)

Ration no.	29-B	29-C
Av. % crude protein	15.8	15.8
I.U. vitamin A added/lb.	100	400
No. of pigs	12	13
Av. on-test wt., lbs.	52	49
Av. off-test wt., lbs.	223	211
Av. daily gain, lbs.	1.62	1.56
Standard error	±0.10	±0.08
Av. feed efficiency, lbs.	342	333
Av. feed cost per cwt. gain	$10.70	$10.42
Feed cost per ton	$62.60	$62.60

Arsanilic Acid in Growing-finishing Swine Rations (Project 110).

B. A. Koch and Tran Nam

Arsanilic acid is one of the many feed additives approved by the Food and Drug Administration for use in swine rations. Results from an uncontrolled feeding demonstration suggested that arsanilic acid effectively increased daily gain and improved feed efficiency. This study was designed to check further the value of dietary arsanilic acid.

Experimental Procedure

Thirty head of Poland China and Duroc weanling pigs were randomly divided by breed and sex into three groups and started on test, December 16, 1961. Before the trial started all pigs had been vaccinated for erysipelas and cholera and had been wormed with piperazine.

Two groups were closely confined on concrete; the third had access to winter rye pasture. Individual pigs were removed from test pens as they reached market weight.

Observations

Table 30 summarizes the performance of the three groups. There were no statistically significant differences in average daily gain. However, pigs fed in confinement and supplemented with arsanilic acid had the highest average daily gain. Pigs on rye pasture required the most feed per pound of gain. They spent considerable time on pasture, but still had the poorest feed efficiency of any group.

The rye pasture, an old hog pasture, apparently increased incidence of roundworms in that group of pigs. They threw more roundworms when all groups were treated with piperazine 60 days after going on test. They also walked more than the pigs in confinement pens.

Feed costs per 100 pounds of gain were highest on the rye pasture because of poorer feed efficiency. Although pigs receiving no arsanilic acid in confinement gained slightly less per day than confined pigs receiving arsanilic acid, highest efficiency and lowest cost per 100 pounds of gain were from nonarsanilic acid, confined pigs.

Table 30
Arsanilic acid in growing-finishing swine rations.
(Feeding period began December 16, 1961.)

No. of pigs	10	10	10
Ration no.[1]	33	44	44
Av. % crude protein	15	15	15
Arsanilic acid	No	Yes	Yes
Rye pasture	No	No	Yes
Av. on-test wt., lbs.	43	52	48
Av. off-test wt., lbs.	204	230	218
Av. daily gain, lbs.	1.56	1.73	1.51
Standard error	±0.07	±0.09	±0.10
Av. feed efficiency, lbs.	325	338	369
Av. feed cost per cwt. gain	$ 9.98	$10.44	$11.40
Feed cost per ton	$61.40	$61.81	$61.81

1. See Table 23 for ration composition.

Some Effects of Dietary Nitrate and Nitrite on Growing-finishing Pigs (Project 311).

Siripong Sukhonthasarnpa, D. B. Parrish and B. A. Koch

The presence of nitrates and nitrites in feed and drinking water of farm animals apparently has caused some serious nutritional problems. This study was to establish more clearly some ways the nitrites interfere with normal processes in the animal body.

Experimental Procedure and Observations

A pilot study using two pigs per treatment was initiated in June, 1962. Table 31 shows the general design of the study plus average results of data collected. Either sodium nitrate ($NaNO_3$) or sodium nitrite ($NaNo_2$) was mixed into the ration at the indicated level.

The pigs were fed on concrete from a self-feeder and were watered by hand. A fog nozzle was over each pen on the outside of the shed or shade areas. Blood samples were taken from the anterior vena cava area.

Results shown in Table 31 indicate that the two levels of dietary $NaNO_3$ caused an increase in the methemoglobin level of the blood, a decrease in serum vitamin A level and some decrease in growth rate.

Table 31
Dietary nitrate and nitrite for growing-finishing pigs.
June 20, 1962, to August 29, 1962.

Treatment group (2 pigs per group)	A.D.G. lbs.	Feed eff. lbs.	Hemoglobin (gms./100 ml.) Initial	Hemoglobin (gms./100 ml.) Final	Methemoglobin (% total Hb_1) Initial	Methemoglobin (% total Hb_1) Final	Serum Vitamin A Final
Positive control[1]	1.74	2.88	14.3	16.1	1.30	3.25	20.05
+0.6% $NaNO_2$[2]	1.66	3.02	15.5	14.3	1.07	2.52	10.01
+1.2% $NaNO_2$[3]	1.74	3.16	16.2	15.7	1.62	2.37	11.10
+0.15% $NaNO_2$[4]	1.46	2.76	14.4	12.5	2.22	4.78	2.06
+0.30% $NaNO_2$[5]	1.39	3.07	12.1	13.3	1.87	25.53	2.06
Negative control[6]	1.57	2.93	15.1	16.1	2.37	2.59	6.04
+0.6% $NaNO_2$[7]	1.50	3.11	14.0	16.2	2.81	2.53	7.21

1. Basic sorghum grain ration—contained 1% alfalfa meal.
2. Increased to 1.0% $NaNO_2$ after 28 days.
3. Increased to 2.0% $NaNO_2$ after 28 days.
4. Increased to 0.2% $NaNO_2$ after 28 days.
5. Increased to 0.4% $NaNO_2$ after 28 days.
6. Basic sorghum grain ration—contained no alfalfa meal.
7. Increased to 1.0% $NaNO_2$ after 28 days.

A second trial is now in progress. Performance data, blood data and tissue data are being collected. The general design of the study follows:

1. Control—basic sorghum grain ration plus 5% alfalfa meal
2. Control + 3% $NaNO_2$
3. Control + 5% $NaNO_2$
4. Control + 0.3% $NaNO_2$
5. Control + 0.5% $NaNO_2$
6. Control + added carotene + 3% $NaNO_2$

Results of this study will be presented as they become available.