

Antibiotics and Liver Extract for Suckling Pigs

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In experiments previously described (Braude, 1949) we observed a growth-stimulating effect in suckling pigs dosed with a liver extract, whereas we obtained no response to dosing with pure crystalline vitamin B₁₂ (Braude & Mitchell, unpublished results). Following reports from the United States of America about the growth-promoting effect of various antibiotics (Stokstad, Jukes, Pierce, Page & Franklin, 1949), we set out to investigate further the possibility of increasing the rate of growth of suckling pigs by supplementing their diet with antibiotics alone or combined with liver extract.

EXPERIMENTAL

General. The experiment was run on very much the same lines as the earlier ones. The test was carried out simultaneously on pigs reared either indoors or outdoors. Liver extract similar to that used in our previous trials was kindly put at our disposal by Glaxo Laboratories Ltd. The antibiotics used were penicillin and streptomycin, which were at the time the two most likely to be readily available in this country and were found in tests on chicks (Coates, Harrison, Kon, Mann & Rose, 1951) to be at least as effective growth stimulants as other antibiotics recently used in the United States.

Pigs and their treatment. Every suitable litter of pigs born in our piggery during the period May–November 1950 was included in this experiment; all were from home-bred Large White sows. Alternate litters were reared indoors, while the others were taken out when 3–4 days old to portable pig houses with runs, moved daily on pasture. The experimental unit within each litter consisted of six pigs chosen according to weight to form the most uniform group possible when the experimental treatment began at 14 days old. Usually one unit of six pigs per litter was available, but from a few large litters two units were used, the six heaviest pigs forming one unit and the six lightest the other. Except for the experimental dosing and weekly weighing, the litters were reared in the normal way. The litters reared indoors were dosed with iron pyrophosphate for 6 days beginning on the 4th day of life, and all litters were given unrestricted in a creep a suckling-pig meal mixture from the 3rd week onward. The meal mixtures fed to the sows and to the suckling pigs both contained 10% white fish meal. The following six treatments were allocated at random to the six pigs forming an experimental unit:

- (1) Control.
- (2) Daily dosing with 2 ml. liver extract, supplying 24 μ g vitamin B₁₂.
- (3) Daily dosing with a gelatin capsule containing 10 mg penicillin, given as 18 mg procaine penicillin.

(4) Daily dosing with a gelatin capsule containing 10 mg streptomycin, given as 15 mg of the calcium-chloride complex.

(5) Treatments 2 and 3 combined (liver extract and penicillin).

(6) Treatments 2 and 4 combined (liver extract and streptomycin).

Dosing. The experimental dosing was carried out once daily for 21 days, beginning on the 14th day of life. Altogether twenty-four units of six pigs were used, of which twelve were kept indoors and twelve out of doors. The pigs were weighed once weekly always at the same time of day, throughout their suckling period of 8 weeks.

RESULTS

Out of the 144 pigs used in this experiment six did not complete the test for reasons not connected with the experiment. Calculated values were inserted by the 'missing plot' technique (Yates, 1933).

Table 1. *Mean live-weight gains and responses to liver extract during 8 weeks suckling of pigs reared outdoors and indoors*
(Means adjusted for differences in weight at birth)

Antibiotic	Outdoor litters	Indoor litters	Mean
Live-weight gain (lb.)*			
None	32.6	27.8	30.2
Penicillin	31.6	27.7	29.6
Streptomycin	32.7	27.9	30.3
s.e.	± 0.93†	± 0.76‡	± 0.53
Mean	32.3	27.8	30.0
s.e.	± 0.70		
Response to liver extract (lb.)			
None	1.1	4.0	2.6
Penicillin	0.7	1.0	0.9
Streptomycin	-0.2	3.9	1.9
s.e.	± 1.52		± 1.07
Mean	0.5	2.9	1.7
s.e.	± 0.87		± 0.61

* Combined results for pigs with and without liver-extract dosing.

† Standard error for use in horizontal comparisons only.

‡ Standard error for use in all other comparisons.

Table 1 gives the mean live-weight gains and responses to liver extract, with their standard errors, of all pigs on experiment. The figures are adjusted for differences in weight at birth by means of a standard covariance analysis, the regression coefficient within litters of live-weight gain on initial weight being $+4.28 \pm 1.20$.

Table 2 gives the statistical analysis of the results; they show that the rate of growth of pigs, reared either indoors or outdoors, was not affected by dosing with antibiotics. Dosing with liver extract had no effect on pigs reared out of doors, but pigs reared indoors grew at a significantly higher rate than their litter-mates not given liver extract. Pigs reared out of doors grew significantly faster than pigs reared indoors, independently of any other treatment given.

Table 2. *Mean squares in the analysis of variance (in terms of individual piglets)*
(Live-weight gain adjusted by covariance on initial weight)

	Degrees of freedom	Mean squares
Between litters:		
Blocks	11	82.67
Environment (<i>E</i>)	1	723.71*
Error	10	34.77
Within litters:		
Antibiotics (<i>A</i>)	2	5.63
<i>A</i> × <i>E</i>	2	3.34
Liver extract (<i>L</i>) (indoors)	1	156.42*
Liver extract (<i>L</i>) (outdoors)	1	4.48
<i>A</i> × <i>L</i>	2	8.44
<i>A</i> × <i>L</i> × <i>E</i>	2	11.12
Error	103	13.60

* $P < 0.002$.

DISCUSSION

It is important to keep in mind that both the nursing sows and the suckling pigs used in this experiment received a balanced diet containing protein of animal origin. One should also remember that dosing with liver extract and antibiotics was limited to 21 days (the 2nd–5th weeks of the pig's life). Under these conditions it appears that no growth-promoting effect is obtained by supplementing the diet with either penicillin or streptomycin in the amounts used in this experiment. Our previous findings (Braude, 1949) that pigs reared indoors benefit from supplementing their diet with a small amount of liver extract, but that there is no similar effect on pigs reared out of doors, were confirmed. Similarly, the well-known and commercially important fact that pigs reared out of doors grow better than those reared indoors was again confirmed in this experiment.

We wish to thank Miss Z. D. Hosking for carrying out the statistical analysis of the data and Glaxo Laboratories Ltd for the liver extract and the antibiotics.

SUMMARY

1. Suckling pigs given daily during the 2nd–5th weeks of life 10 mg of either penicillin or streptomycin did not grow better during the 8-week suckling period than untreated litter-mates. The diets of mothers and young contained white fish meal.
2. Previous findings that pigs reared indoors benefit from the addition of a liver extract to their diet were confirmed.
3. Irrespective of treatment, pigs reared outdoors on pasture grew better than those reared indoors.

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