

Response of Pigs to Feeding of Vitamin B₁₂, Streptomycin and Sulfathalidine.* (19010)

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There are numerous reports in the literature of the increased growth response obtained with pigs fed vit. B₁₂, and various antibiotics. In the case of the antibiotics the reason for the growth stimulus is not fully understood, but is attributed to specific or selective bacteriostatic action on the gastrointestinal microflora. This being the case it might be expected that a similar growth stimulation might result from the feeding of certain sulfonamides. However, agreement in the literature on this point is lacking, the sulfonamides having been used in nutrition studies mainly as probable inhibitors of microorganisms responsible for vitamin synthesis.

Wahlstrom, Terrill, and Johnson(1) have reported that although phthalylsulfathiazole (sulfathalidine) reduced the number of coliform bacteria present in the feces of baby pigs fed a complete synthetic milk, the addition of 2% sulfathalidine to this diet did not significantly increase 8-week gains in body weight. Previously Lindley and Cunha(2), working with pigs 16 weeks of age which were fed a synthetic diet, observed that sulfathalidine fed at a level of 5% of the ration, proved to be very effective in decreasing intestinal synthesis of vitamins over a 6-week period and caused a decrease in daily gains of approximately 40%. These authors described a syndrome in pigs fed sulfathalidine which was prevented by the addition of biotin to the ration, and which was alleviated to a large extent by inositol.

Schultze(3) has reported the beneficial effect of feeding sulfathalidine to rats, with the evidence indirectly suggesting an alteration of the intestinal flora which favored the microbiological synthesis of vit. B₁₂. Dietrick, Monson, and Elvehjem(4) have described experiments with chicks fed a synthetic diet, in which the addition of 1% of succinylsulfathiazole (sulfasuxidine) produced a growth response which was enhanced by the addition of vit. B₁₂, when a high level of B complex vitamins was included in the diet. These authors point out that sulfasuxidine does not inhibit the growth response attributed to vit. B₁₂, if the level of the other B vitamins is adequate.

Experimental. In a preliminary experiment conducted by the authors it appeared that some growth response was obtained with weanling pigs weighing 30-35 lb, when 0.5% sulfasuxidine was added to a basal diet consisting of ground yellow corn, soybean oil meal, methionine, minerals, vit. A and D and riboflavin. The inclusion of methionine in this diet was suggested by the work of Bell and associates(5). An outstanding growth stimulation was also obtained when aureomycin was fed with this diet.

Subsequently in a series of tests with weanling pigs, designed to evaluate the growth-promoting effects of certain antibiotics and of commercial sources of vit. B₁₂, one group of pigs was fed the basal ration supplemented with 0.5% sulfathalidine. The pigs were kept indoors in pens with concrete floors and were fed in groups. The results are given in Table I. Results are also included for groups

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1. Wahlstrom, R. C., Terrill, S. W., and Johnson, B. Connor, *Proc. Soc. Exp. Biol. and Med.*, 1950, v75, 710.

2. Lindley, Dean C., and Cunha, Tony J., *J. Nutr.*, 1946, v32, 47.

3. Schultze, M. O., *Proc. Soc. Exp. Biol. and Med.*, 1950, v75, 53.

4. Dietrick, L. S., Monson, W. J., and Elvehjem, C. A., *Proc. Soc. Exp. Biol. and Med.*, 1950, v75, 130.

5. Bell, J. M., Williams, H. H., Loosli, J. K., and Maynard, L. A., *J. Nutr.*, 1950, v40, 551

TABLE I. Effect of Vit. B₁₂, Streptomycin and Vit. B₁₂, and Sulfathalidine on Growth of Pigs.

Group No.	1	2	3	4
	Basal*	Basal + .5% sulfathalidine†	Basal + B ₁₂ ‡	Basal + B ₁₂ ‡ + streptomycin§
No. of pigs	4	6	5	5
Avg initial wt, lb	27.8	22.2	29	30.2
" final " "	173.8	196.8	194.2	211
Avg daily gain, first 7 wk, lb	.90	1.06	.93	1.09
Avg daily gain, 17 wk, lb	1.23	1.48¶	1.39¶	1.52¶

* Basal ration: ground yellow corn 63.60, soybean oil meal 34.25, methionine .15, salt .25, vit. A and D concentrate .15, B vit. mixture .60, || minerals 1.00.

† Contributed by Sharp and Dohme, Inc., Philadelphia, Pa.

‡ APF Feed Supplement (U. S. Industrial Chemicals, Inc.) added to supply 1.05 mg B₁₂ per 100 lb feed.

§ 2 g per 100 lb feed.

|| To supply 200 mg thiamine hydrochloride, 3 g niacin, 200 mg riboflavin, 1 g calcium pantothenate, 100 mg pyridoxine hydrochloride and 25 g choline per 100 lb feed.

¶ Groups 2 and 4 significantly higher than groups 1 and 3, and group 3 significantly higher than group 1 at $P = .05$.

of pigs fed only the basal ration, and the basal ration supplemented with a commercial source of vit. B₁₂, and with streptomycin and B₁₂. Average daily gains are given for periods of 7 and 17 weeks.

A definite growth response was obtained, with the pigs fed sulfathalidine, which was of the same order as that obtained with the group fed the combination of streptomycin and B₁₂, and exceeded that for the group receiving only the B₁₂ supplement. The basal diet used is one which the authors have used in a considerable number of experiments and which has proved very satisfactory for tests of this type with weanling pigs. Pigs fed this diet have consistently made good growth approximating 1.25 lb per day over an extended period. In our opinion the inclusion of B factors in ample amounts in this diet is very essential not only to support growth on the basal diet, but to permit the additional growth induced by supplements such as B₁₂, the antibiotics and in this instance sulfathalidine. While no direct evidence is presented in this report in support of this point of view, it has appeared that responses with the above named factors either are not obtained or are more limited, when the basal diet does not contain the B factors in ample amounts. Pigs fed this diet with the B factors included grow well, and have normal healthy skin and hair coats and show no evidence of any deficiency.

The results also point out that the growth

stimulation resulting from B₁₂, streptomycin and sulfathalidine apparently was sustained throughout the entire experimental period of 17 weeks. The differences in growth as seen at the end of 17 weeks do not appear to be the result of growth stimulation in the early weeks of the experiment alone, but actually are more apparent with the progression in length of the feeding period.

Summary Increased growth of pigs fed for 17 weeks after weaning was obtained as the result of the addition of vit. B₁₂, streptomycin and B₁₂, or 0.5% sulfathalidine to a basal diet consisting of ground yellow corn, soybean oil meal, methionine, minerals and vitamins. Approximately the same growth was obtained by the feeding of the sulfathalidine, and the combination of B₁₂ and streptomycin, the growth in both instances being greater than that obtained with the pigs with the addition of B₁₂ alone. The increased growth obtained by all of the additions to the diet was sustained over the entire experimental period of 17 weeks.

NOTE: Since this paper was submitted for publication, Heidebrecht *et al.* (Okla. Agr. Exp. Sta. Miscell. Pub. No. MP22, June 1951) have reported increased growth and improvement of the general appearance of pigs fed sulfathalidine as well as certain antibiotics.

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