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## The Influence of Acetyl-Salicylic Acid on Growth and Some Respiratory Enzymes in Broiler Chicks.* (32173)

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The enzyme, succinic dehydrogenase, was observed to be significantly inhibited by salicylate in *in vitro* studies(1). A serum salicylate level of 137 mg/100 ml had no effect on hexokinase, cytochrome oxidase or DPNH-cytochrome c reductase(2). *In vitro* studies with rat liver mitochondria indicated that malate and isocitric dehydrogenase activities were inhibited by salicylate(3,4). An additional study has demonstrated that acetyl salicylic acid fed at levels of 0.005-0.08% of the diet failed to produce a significant difference in growth rate or feed conversion in 3 chick studies(5).

New Hampshire X Delaware chicks were fed 0.3, 0.6 and 0.9% acetyl-salicylic acid (ASA) in addition to the basal diet (Table I). Each dietary treatment was replicated 5 times, and each replicate employed in the experiment consisted of 4 males and 4 females. All chicks were reared for 4 weeks in electrically-heated chick batteries with raised wire floors, and feed and tap water were supplied *ad libitum*. Feed and body weights were determined for each replicate group at the beginning and end of the experiment. At 4 weeks of age, whole blood samples, obtained by cardiac puncture, from 5 males and 5 females per treatment, were heparinized, centrifuged and frozen for analyses. The same birds were sacrificed; livers and kidneys were removed and wrapped in foil and quick-frozen. Isocitric dehydrogenase activities of the plasma were determined by the method of Wolfson and Williams-Ashman(6). Succinic dehydrogenase and cytochrome oxidase activities of the livers and kidneys were determined by the methods of Cooperstein *et al*(7) and Cooperstein and Lazarow(8). Enzyme activities were measured with a Beckman Model B spectrophotometer and the data recorded on a coupled Bausch and Lomb V.O. M-5 strip chart recorder. Data obtained from these tests were subjected to an analysis of variance as outlined by Snedecor(9), and differences between treatment means were tested by the multiple range test of Duncan(10).

TABLE I. Composition of Basal Diet.

| Ingredients | % |
|---|---|
| Ground yellow corn | 50.75 |
| Dehydrated alfalfa meal (17% protein) | 5.00 |
| Soybean meal (45% protein) | 15.00 |
| Meat and bone scraps (50% protein) | 5.00 |
| Fish meal (65% protein) | 7.50 |
| Dried whey | 5.00 |
| Distiller's dried soluble | 3.00 |
| Hydrolyzed animal and vegetable fat | 5.00 |
| Calcium carbonate | .50 |
| Dicalcium phosphate | .50 |
| Salt (trace mineralized) | .25 |
| Manganese sulfate pentahydrate (70%) | .20 |
| Vitamin premix* | 2.50 |
| Total | 100.20 |

* Vitamin mix supplied the following per kg of diet: 9,900 I.U. vit. A, 1,540 I.C.U. vit. $D_3$, 4.4 mg riboflavin, 27.5 mg niacin, 11.0 mg D-calcium pantothenate, 930.0 mg choline chloride, 13.2 $\mu$g vit. $B_{12}$, 5.5 I.U. alpha tocopheryl acetate, 2.2 mg menadione sodium bisulfite, 124.85 mg ethoxyquin (as a preservative) and 18.48 g soybean meal as carrier.

Average growth rates of both sexes were depressed stepwise with increasing level of ASA (Table II). The growth rate was significantly ($P<0.01$) depressed with either 0.6

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TABLE II. Effect of Acetyl-Salicylic Acid on Body Weights, Feed Conversion and Isocitric Dehydrogenase of 4-Week Broiler Chicks.

| Supplement to basal diet | Body wt (g)† | Feed conv.* | Mean I.C.D. activity‡§ |
|---|---|---|---|
| None | 410.0[a] | 1.84 | 692.3[a] |
| .3% ASA | 399.1[ab] | 2.08 | 761.6[a] |
| .6% " | 358.0[b] | 2.09 | 768.9[a] |
| .9% " | 254.9[c] | 2.38 | 824.7[a] |

* 2 lb of feed per lb of gain.

† Values with different superscripts were highly significantly different ($P < 0.01$).

‡ Values with different superscripts were significantly different ($P < 0.05$).

§ mμMoles of NADPH formed per ml of plasma per hr.

or 0.9% dietary ASA. A further significant growth depression ($P < 0.01$) was observed with the 0.9% ASA compared with the 0.6% level. From these data, the toxic level of ASA was estimated to be between 0.3 and 0.6% of the diet.

To determine the effect of ASA on the respiratory enzymes in chicks, activities of succinic dehydrogenase and cytochrome oxidase were measured in the livers and kidneys, and isocitric dehydrogenase activities were measured in plasma. The 3 dietary ASA levels significantly increased ($P < 0.05$) succinic dehydrogenase and cytochrome oxidase activities in liver homogenates when compared with the values for control birds. No significant differences were noted in kidney succinic dehydrogenase and kidney cytochrome oxidase activities (Table III). Also, no significant differences were found for plasma isocitric dehydrogenase among the chicks fed the various treatments (Table II).

Feeding 0.6 or 0.9% ASA significantly depressed body weights of broiler chicks at 4 weeks of age. The toxic level was estimated to be between 0.3 and 0.6% of the diet. Liver cytochrome oxidase and succinic dehydrogenase activities were significantly accelerated by feeding ASA. Kidney cytochrome oxidase and succinic dehydrogenase and plasma isocitric dehydrogenase activities were not affected by dietary ASA at the levels fed.

TABLE III. Effect of Acetyl-Salicylic Acid on Liver and Kidney Succinic Dehydrogenase and Cytochrome Oxidase Activities on 4-Week Broiler Chicks.

| Supplement to basal diet | Succinic dehydrogenase† | | Cytochrome oxidase† | |
|---|---|---|---|---|
| | Liver | Kidney | Liver | Kidney |
| None | 1.218[a]* | .660[a] | 5.112[a] | 4.578[a] |
| .3% ASA | 1.608[b] | .618[a] | 5.598[b] | 3.936[a] |
| .6% " | 1.740[b] | .708[a] | 5.928[b] | 4.200[a] |
| .9% " | 1.380[b] | .708[a] | 7.332[b] | 4.758[a] |

* Values with different superscripts were significantly different ($P < 0.05$).

† Change in optical density per mg of tissue per hr.

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