# Effect of Streptomycin on the Metabolism of Certain Mycobacteria

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A nonpathogenic strain of tubercle bacillus, No. 607 of the American Type Culture Collection, rapidly oxidizes benzoic acid. The hydroxybenzoic acids, however, are not oxidized. This confirms Lehmann's observation (*2*) that the oxygen uptake of nonpathogenic strains is not affected by hydroxybenzoic acids, whereas that of pathogenic strains, as previously shown (*1*), is definitely increased by o-hydroxybenzoic acid as well as benzoic acid. The evidence indicates, however, that although the pathogenic strains of tubercle bacillus have an increased oxygen uptake in the presence of benzoic and o-hydroxybenzoic acids, these compounds are not oxidized in the process. Because of the apparent importance of benzoic acids in the metabolism of these bacteria, it was of interest to study the effect of streptomycin on it.

Resistance to streptomycin was induced in *Myco. tuberculosis* No. 607 by successive passage in Long's medium containing increasingly higher concentrations of the drug. Suspensions of the resistant strain and the normal parent strain were prepared from 3-day cultures on Long's medium by the method previously described (*1*). The bacteria were resuspended in M/20 phosphate buffer pH 6.7 so that 1.0 cc. of buffer contained 0.1 cc. of the packed centrifuged organisms,

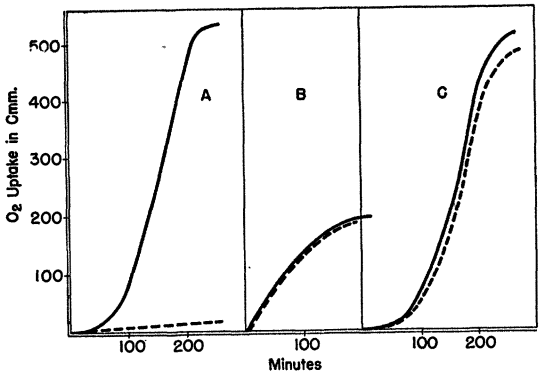


FIG. 1. A—Effect of 10 $\gamma$ streptomycin on the oxidation of 1.0 mg. sodium benzoate by the normal 607 strain; B—Effect of 100 $\gamma$ streptomycin on the oxidation of 2.0 mg. sodium pyruvate by the normal 607 strain; C—Effect of 100 $\gamma$ streptomycin on the oxidation of 1.0 mg. sodium benzoate by the streptomycin-resistant 607 strain. The control uptakes have been subtracted. The dotted lines represent the addition of streptomycin.

and 0.5 cc. of this suspension was used in each Warburg vessel, which contained a final volume of 2.0 cc.

Ten $\gamma$ of streptomycin (Merck) completely inhibits the oxidation of 1.0 mg. of benzoic acid by the normal strain, whereas 100 $\gamma$ is without effect on the oxidation by the resistant strain. The oxidation of pyruvic acid by the normal strain as well as its oxygen uptake without added substrate is not affected by 100 $\gamma$ of streptomycin. This indicates that the inhibition of the benzoic acid oxidation by streptomycin may be fairly specific. The results are shown in Fig. 1. However, the increased oxygen uptake of the virulent H37 strain in the presence of benzoic acid is not affected by 300 $\gamma$ of streptomycin. Other mechanisms must, therefore, be inhibited in this pathogenic strain.

## References

1. BERNHEIM, F. *J. Bact.*, 1941, **41**, 387.
2. LEHMANN, J. *Lancet*, 1946, **250**, 16.

# Suppression of Axillary Growth in Decapitated Tobacco Plants by Chemicals

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In the commercial production of tobacco the plant is topped or decapitated at the flowering stage and later "suckered," *i.e.* at intervals all subsequent axillary growth is removed. An inexpensive substitute for the operation of suckering without detriment to quality or yield would be of practical importance to growers.

It was with this final objective in mind that greenhouse trials were begun on suppression of axillary growth of topped plants. The chemical compounds employed included certain synthetic growth-regulating substances, some of which have been reported to possess the ability of retarding axillary growth. Powdered compounds were applied to the stem wound with a spatula after topping, and liquid compounds with a dropper. Decapitated plants retained 7 leaves at the time of treatment. The plants were harvested 35 days after treatment

TABLE 1

| Treatment | Green moist weight | | | | |
|---|---|---|---|---|---|
| | Leaf | | Stem | Suckers | Total (grams) |
| | (grams) | (%) | (grams) | | |
| Control 1, suckered..... | 145.6 | 100.0 | 55.8 | 46.2 | 247.6 |
| Control 1, unsuckered..... | 114.7 | 78.6 | 52.7 | 132.3 | 299.7 |
| Control 2, suckered..... | 146.3 | 100.0 | 45.3 | 63.9 | 255.5 |
| Control 2, unsuckered..... | 140.1 | 96.0 | 53.7 | 145.9 | 339.7 |
| $\gamma$-(Indole-3)-n-butyric acid.. | 162.4 | 111.2 | 56.9 | 111.8 | 326.1 |
| 4-Chlorophenoxyacetic acid*. | 168.0 | 115.1 | 55.3 | 180.3 | 403.6 |
| $\alpha$-2-Chlorophenoxypropionic acid*..... | 174.7 | 119.7 | 59.5 | 156.6 | 390.8 |
| $\alpha$-Naphthylacetic acid methyl ester*..... | 165.8 | 113.6 | 68.2 | 0 | 234.0 |
| 2,4-Dichlorophenoxyacetic acid methyl ester*..... | 175.2 | 120.0 | 78.0 | 72.0 | 325.2 |

*Courtesy of the Dow Chemical Company.

A few of the responses are given in Table 1. The figures, which are average values for three plants in grams of fresh weight, clearly indicate the possibility of controlling the relative development of the various parts of the tobacco plant.

The responses fall into several categories. In one, chemical suppression of axillary growth is accomplished in a degree equal to manual suckering, with as great or greater increase in yield of leaf. In another category, the yields of leaf, stem, and suckers are all increased considerably above those of the