SCIENCE

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Executive Editor

Antibiotic Growth Stimulants

RESEARCH in nutrition has been dominated by vitamins for thirty years. This domination is by no means ended, but the time must come when the last vitamin will be apprehended, catalogued, civilized, and put to work. But there are promising new fields in nutrition. Antibiotics constitute one of them.

An antibiotic is a compound that is synthesized by one living organism and inhibits the growth of another. To speak of antibiotics as growth stimulants may therefore seem paradoxical. Inhibition of one member of an ecological community, however, may favor other members. Much of our knowledge of nutrition is based on studies of animals in cages, but even these animals have complex internal ecological relationships. Alteration of these relationships is probably the basis of the antibiotics' ability to stimulate growth of chickens, turkeys, pigs, and rats.

The feeding of an antibiotic does not change very much the total number of microorganisms in the digestive tract, but the inhibition of some species permits others to increase and take their places. Reports that dietary antibiotics decrease requirements for several vitamins and for protein could be explained either on the basis of suppression of nutrient-utilizing forms or on the basis of encouragement of nutrient-synthesizing forms. To make the explanation fit the facts, we must assume the existence of an unknown essential nutrient. The known nutrients are present in ample quantities in the best commercial feeds for growing chickens and turkeys. Yet growth rate is increased by adding suitable antibiotics to such diets. There probably are essential dietary factors still unknown, but thus far no mode of action is supported by anything but suggestive evidence. Inhibition of toxin-producing organisms may also be involved.

Antibiotics do not improve reproductive performance of chickens, and in the diet of ruminants they are detrimental rather than beneficial, presumably because of different internal ecology. Thus their usefulness in the diet appears to be limited to growing nonruminants.

The fact that feeding streptomycin with an experimental purified diet stimulated the growth of chickens was discovered at the University of Wisconsin in 1946. This work received little attention, and the growth-stimulating effect of antibiotics was rediscovered in 1950. Rediscovery was incidental to the development of vitamin B_{12} concentrates from by-products of antibiotic manufacture. Some of these were more effective than others in stimulating growth, and this extra effect was traced to residual antibiotic.

Aureomycin, bacitracin, procaine, penicillin, and terramycin are being used commercially in feeds. Commercial broiler feeds are believed to contain antibiotics at levels ranging from two to seven grams per ton. If we assume an average of four grams per ton, the annual production of 3½ million tons of broiler feed requires 14,000 kilograms of antibiotic. Total production of aureomycin, penicillin, and terramycin in 1950 was about 300,000 kilograms. Of course, much of the aureomycin, bacitracin, and terramycin in animal feeds is residual and would not be recovered for other uses in any case. Each of them is also being used in pure or concentrated form to standardize the potencies of the residues for animal feeding. Penicillin differs from the others in the manner of its use. Practically all of it in feeds is crystalline procaine penicillin rather than residual material. There is little or no accumulation of antibiotic in the edible tissues of animals fed the above-mentioned levels.

Not all the consequences of this new development in nutrition can be foreseen, but some are already visible. These include the need to change or qualify the accepted figures for requirement of known nutrients, the need to re-evaluate the importance of microorganisms in the digestive tract of the nonruminant, and the opportunity to increase materially the efficiency of meat production.

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