Haematological and Nutritional Effects of Oral Antibiotics

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Antibiotics, in particular penicillin, terramycin and aureomycin, normally improve the growth of animals such as the chick, rat, pig and turkey when given at the rate of 2-20 parts per million in the diet. This effect is not demonstrable in animals reared under conditions of complete asepsis. If chicks are hatched and kept in strict isolation from other birds

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and maintained on an optimal ration, their growth is not improved by penicillin. These isolated chicks grow as well as normal birds given antibiotics, while normal birds do not grow as fast as these isolated chicks. If the isolated birds are now brought into contact with normal chicks, those receiving penicillin grow at the same rate as previously, whereas those without the antibiotic now grow no faster than normal. Experiments of this type have indicated that normal poultry may carry some transmissible condition that produces no detectable pathological effects but does prevent maximum growth of the birds.

It is not known how this transmissible agent depresses growth, whether by competing with the host for nutrients in the gut or by producing toxic metabolites. Similar conditions may occur in other species, but this has not yet been clearly demonstrated.

Dietary antibiotics have been shown to decrease the requirement of the rat and the chick for some vitamins, and it is also possible that their need for certain unidentified essential growth factors is also decreased. The utilisation of a number of haemopoetic agents is modified by dietary antibiotics. In both the rat and the chick dietary penicillin decreases the requirements for vitamin B12, while aureo-mycin diminishes the need for folic acid.

Dietary aureomycin overcomes the toxicity of "A-methopterin" in the rat in much the same way as does folic acid. This antibiotic has also been shown to relieve the macrocytic anaemia induced in rats by surgical formation of a blind loop of gut, a condition also eliminated by folic acid.

Little is known of the effects on man of dietary antibiotics given in doses comparable with those used in animal feeding practice, but it would appear reasonable to expect such treatment to lead to increased utilisation of certain essential growth factors and haemopoetic agents. It has in fact been found that oral aureomycin may lead to remission in pernicious anaemia, though at the moment it is not possible to say whether this is caused by improved utilisation of vitamin B12 or folic acid or through some other agency. In certain tropical macrocytic anaemias oral penicillin leads to a dramatic improvement.

No clear explanation can be given of the ways in which antibiotics produce these effects. The most likely would appear to be that they decrease bacterial utilisation of some haemopoetic and growth essential factors in the gut; perhaps the metabolic activities of gut bacteria are modified by the antibiotics so that more of these factors are formed by bacterial synthesis and made available to the host.