

hand, similar transference of newly moulted second- or third-stage larvae results in normal growth, pigmentation and pupation. It seems probable, therefore, that folic acid functions by stimulating the production of a pupation hormone within the growing larva; but that it is incapable of doing so in a fully grown larva.

One final observation must be recorded here. In the insectary it is most unusual to find a weak adult mosquito, that is, one which on emerging cannot rise from the water. In our experiments, however, even on the most complete media, a large proportion of the adults were weak, irrespective of sex. Under the same conditions, when grown on contaminated media, all the adults were vigorous. There is thus some further factor, the nature of which we have not yet investigated, which is responsible for the development of vigorous adult mosquitoes.

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¹ Trager, W., *Amer. J. Hyg.*, **22**, 18 (1935).
² Trager, W., *New Jersey Mosquito Extermination Assoc., Proc. Ann. Meeting*, **29**, 46 (1942). (*Chem. Abstr.*, **37**, 1517).
³ O'Dell, B. L., and Hogan, A. G., *J. Biol. Chem.*, **149**, 323 (1943).
⁴ Hutchings, B. L., Bohonos, N., and Peterson, W. H., *J. Biol. Chem.*, **141**, 521 (1941).
⁵ Briggs, G. M., Jun., Luckey, T. D., Elvehjem, C. A., and Hart, E. B., *J. Biol. Chem.*, **158**, 423 (1944).
⁶ Mitchell, H. K., *J. Amer. Chem. Soc.*, **66**, 274 (1944).
⁷ Purmann, R., *Ann. Chem.*, **546**, 98 (1940). (*Chem. Abstr.*, **35**, 2147).

Effects of Secretions

SOME secretions of some organisms found to be inimical to some metabolic step necessary to the normal processes of some other organisms have come to be referred to as 'antibiotics'^{1,2}. As has been pointed out by Lucas³, it seems likely that it will be found profitable to regard such secretions as special cases of that great class of substances, distinguished by being physiologically active, the study of which constitutes a large branch of comparative physiology, and to consider their effects in terms of the evolution, by natural selection, of the organisms concerned. Their adverse effects on some organisms are presumably an example of these organisms not being adapted in a particular respect, comparable, in principle, with many other examples in ecology.

If this much be granted, then it would seem to become important that the nomenclature used in considering them shall be such as shall fit easily into the language of biological discussion. I suggest that 'antibiotic' is not such a word, and, further, that it contains implications contrary to what we believe to be the truth.

The word as it stands will, I think, suggest to nearly everyone 'opposed in general to the act of living'—in fact, a poison. But if my life is saved by penicillin, is the fact sufficiently reflected by calling penicillin an antibiotic in this sense? I think consideration of this difficulty, thus presented, may show that two mistakes have been made:

(1) It is not true, though it is implied, that penicillin (for example) is opposed to life in general. Few things are: one man's poison is notoriously another man's meat.

(2) It is true, though it is not stated, that because of the peculiar fact that penicillin (for example) is produced by certain organisms and adversely affects certain other organisms, it possesses the function, in Nature, not of forbidding life, but of precluding certain associations of living things, while permitting, or even encouraging, others. It acts upon a relationship.

Whether, on balance, life is increased or decreased as a result of the effects of one of these substances is likely to be almost impossible to determine. Whether more or fewer molecules are organized for life at any time than would have been without the action of the substance is a question which can scarcely be readily answered. Yet, this is just the question that the word 'antibiotic' appears to presume to answer.

Now, in medical practice, and in other branches of applied biology, the precluding of certain associations may seem to be the important thing. This one effect among many, therefore, is chosen as wanting a name. But this precluding of certain associations is not described in the word 'antibiotic'.

What we need is two words, one of which shall mean 'promoting certain associations of (perhaps named) living things', or, better 'promoting certain symbioses', and the opposite of that.

If, singling out for our own purposes one of its actions, we call a substance promoting certain such relationships a 'prosymbiotic', as I think we might, then perhaps we could call its opposite an 'antisymbiotic'. Thus penicillin could be called an antisymbiotic between *Penicillium notatum* and certain organisms which could be named as a group or individually as the context required. Penicillin could also be called a prosymbiotic between *Penicillium notatum* and certain other organisms as and when these came to be distinguished.

I make this suggestion tentatively, to direct attention to what I believe to be a serious conceptual confusion. I hope that others may improve upon it.

I think that these words can be applied in wider fields than that of bacteriology. They refer to the function of such substances, and to their origin in Nature. Of course, we may be able, for example, to take an antisymbiotic away from the organism producing it, or synthesize it, and use it in our attack on some organism adversely affected. But this artificiality does not affect the validity of the term.

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¹ Salisbury, E. J., *Nature*, **153**, 170 (1944).

² McIlwain, H., *Nature*, **153**, 300 (1944).

³ Lucas, C. E., *Nature*, **153**, 378 (1944).

Protective Action of Potassium Iodide on Thiourea Poisoning in Rats

KENNEDY¹, in reporting the goitrogenic action of the thioureas in rats, mentioned that doses of 200 mgm. of thiourea had no toxic action. This accords with the experience of Astwood². On the other hand, MacKenzie and MacKenzie³ found thiourea to be highly toxic to adult rats. During 1943 thiourea was administered to large numbers of rats in our laboratory with only infrequent deaths. Such deaths as did take place occurred on the first day of thiourea