

of these patients do not reduce their symptoms, this would suggest that  $\alpha$ -oxidation must be of great importance in nervous tissue, and deserves further investigation.

## Staphylococcal Responses to Hormones

from our Microbiology Correspondent

AN aspect of animal pathology which appears to deserve more intensive investigation is the effect of endocrine secretions on microbial pathogens. It has been suggested that hormonal action may be important in the regulation of toxin and antigen production by staphylococci, and evidence exists that reactivation of latent infections can be affected by hormones. How do microbial infections interfere with the normal functioning of the endocrine system? What effects, both primary and secondary, do such hormones have on the course of a microbial infection? Answers to some of these questions have been provided recently by Dr William Yotis, who has examined the *in vivo* and *in vitro* response of certain bacteria to synthetic progestins and oestrogens (*J. Bact.*, **94**, 1353; 1967). The progestational contraceptive norethindrone was studied most fully in this context, but with the ever increasing use of this form of contraception the results are of wider relevance.

The growth of *Staphylococcus aureus* was inhibited significantly *in vitro* when cultured anaerobically in the presence of 10–50  $\mu$ g norethindrone per millilitre. The hormone caused a protraction of the lag phase and reduced the maximum population obtained; these effects were severely lessened in the presence of oxygen. In a developing furuncle, however, anaerobic conditions will arise rapidly and the maximal bacteriostatic effect of norethindrone, therefore, might be anticipated *in vivo*. The synthetic oestrogen mestranol exerted an insignificant effect on the staphylococci, but its combined action with norethindrone was synergistic. Although this potentiated activity was not realized with other androgens and oestrogens such as testosterone, 17 $\alpha$ -oestradiol and 17 $\beta$ -oestradiol, progesterone showed an additive bacteriostatic effect in the presence of norethindrone. In contrast to its effect on Gram positive cocci, norethindrone did not inhibit the growth of the Gram negative enterobacteria screened. This selective action may be due to differential permeability phenomena, or to transformation of the hormone. Bacteria are well known to transform steroids, and the inability of norethindrone to inhibit staphylococci after about 8 h of incubation may be related to such a detoxication mechanism.

The *in vivo* activity of norethindrone was tested by intradermal challenge of adult female rabbits with *S. aureus*. Prior treatment of the rabbits with the progestin produced a marked retardation of lesion development, but once a staphylococcal infection had become established norethindrone was without therapeutic action. The prophylactic action, on the other hand, was effective for as long as 6 weeks after infection. Precise definition of the bacteriostatic effect of norethindrone and other hormones *in vivo* cannot yet be made, but certainly a complex interaction of factors is involved. Considerable evidence now exists linking the suppression of sebaceous gland activity by hormone administration with an improvement in acne vulgaris, while

stimulation of connective tissue development is another likely factor in limiting or suppressing furunculosis. Further analyses of the norethindrone effect could be important to our understanding of the course of bacterial infections in animals while also providing a useful system for assessing the microbiological properties of oral contraceptives.

## Classifying Algae

from a Correspondent

AN International Symposium, "Algae, Man and the Environment", sponsored by Syracuse University and the New York State Science and Technology Foundation, was held at the Sagamore Conference Center and main campus of Syracuse University, New York, in June last year. An international group of biologists who study freshwater algae and engineers who study waste disposal and pollution were able to discuss each other's research and to consider the problems of controlling the growth of algae in a variety of situations.

One of the informal discussions was devoted to the classification of blue-green algae and the designation and preservation of algal cultures. A meeting under Dr R. A. Opperman decided that though, like bacteria, blue-green algae are prokaryotic, their classification should continue to conform to the International Rules of Botanical Nomenclature. This means that names should be accompanied by formal descriptions, with good illustrations of normal form and range, and that reference material should be preserved in herbaria. As additional information becomes available about biochemistry, physiology, fine structure, virus susceptibility or the composition of the DNA, this should be incorporated into the description, and used to improve the classification.

The problem of borderline organisms, more or less intermediate between blue-green algae and ordinary bacteria, is unresolved, and further detailed study is needed. For practical reasons it seems simplest and best (at least for the present) to consider those organisms which most closely resemble blue-green algae in form—if not in pigmentation—as apochlorotic algae, and to consider flexibacteria, along with myxobacteria and the like, as organisms whose classification should conform to the International Code of Nomenclature of Bacteria.

Cultures of algae provide valuable information about the potential range of form which clones may exhibit, and physiological, biochemical and cytological characteristics are best obtained from unialgal or axenic cultures. It was therefore decided that critical experiments should be carried out on designated clones. The date and source of isolation of strains or clones, accompanied by illustrations, should be included in the first full length publications which report their use.

Numerical designation of strains and clones has hitherto been unsystematic and confusing. The meeting suggested a unified system which would necessitate a single world register of algal cultures, and is to prepare formal proposals for publication and, it is hoped, adoption at a forthcoming congress.

Many clones of algae are maintained by serial transfer in public and private culture collections, where spontaneous mutations may arise and accumulate as sources of variation. Cells which have been frozen and main-