man and antisera raised against the enzymes. The antisera are specific inhibitors of the cathepsin antigens and their use has already made possible several important experiments. In particular, the antisera have been shown to prevent loss of matrix from bone rudiments grown in organ culture in the presence of excess vitamin A, thus confirming the supposed mechanism of action of vitamin A in this system, namely the stimulation of extracellular release of lysosomal proteinases.

PLANT GROWTH

First Gaseous Hormone?

from our Plant Physiology Correspondent

THERE has recently been a flurry of interest in the role of ethylene as a determinant of plant growth. Indeed, it now seems probable that ethylene gas must be added to the list of plant growth hormones—the auxins, the gibberellins, the kinins and abscissic acid. To be sure, there has for some time been no doubt of the profound influence of ethylene on the growth of plants—last year D. J. Osborne reviewed the way in which ethylene will inhibit cell extension growth, accelerate abscission of leaves, fruit and flowers and inhibit response to light and gravity. But specific criteria must be satisfied before plant physiologists will be persuaded that ethylene must be singled out as a plant hormone from the other chemicals that are known to influence plant growth. Is it, for example, synthesized by the plant? Is it effective in small quantities at sites remote from those at which it is manufactured? Is its presence essential to some step in growth? And of course there is the almost psychological difficulty of accepting that a simple gaseous molecule can be a hormone.

Soil microorganisms produce rather larger amounts of ethylene than do higher plants, so that ethylene in the soil atmosphere may reach concentrations which laboratory experiments have indicated may damage plant tissues. K. A. Smith and R. Scott Russell of the ARC Letcombe Laboratory have measured ethylene production in aerobic and anaerobic soils (*Nature*, **222**, 769; 1969). It seems that no significant accumulation of ethylene can be expected in a well aerated soil, but that in soils rendered anaerobic by waterlogging, ethylene may reach concentrations which could inhibit root growth and damage root tissues. In other words, it is agriculturally important that the significance of high concentrations of ethylene in waterlogged soils should be further explored.

Natural growth hormones and their chemical relatives, for example indolyl-3-acetic acid and 2,4-dichlorophenoxyacetic acid, can have considerable commercial importance. For years horticulturalists have used ethylene gas to hasten fruit ripening, but recent reports suggest that the use of ethrel (2-chloroethanephosphonic acid), a compound which releases ethylene within the plant, may have considerable commercial potential. This is illustrated by recent work on cucumbers and potatoes. Some species of cucumber bear both male and female flowers on the same plant. Growers must remove the male flowers to avoid fertilization and therefore unwanted seeds in the fruit, and as a preliminary to hybrid seed production. This has to be done by hand and is a costly business. A. L. McMurray and C. H. Miller found that application of ethrel to monoecious plants resulted in an overall

alteration of the sex expression of the plant towards female flowers. This means that the female flowers were produced very much earlier than the male flowers and in much greater numbers (*Science*, **162**, 1397; 1968). R. L. Lower and C. H. Miller have more recently shown that the technique can be used successfully in many cucurbit species (*Nature*, **222**, 1072; 1969).

A rather different response has been observed in potatoes. Much research has been directed towards understanding the induction of tuberization, but without success. A. H. Catchpole and J. Hillman treated potato sprouts with both ethylene gas and ethrel (*Nature*, **223**, 1387; 1969). Both treatments produced swellings bearing a remarkable resemblance to tubers just below the apex of the sprout. Unlike naturally induced tubers, these swellings contained no starch, but it is quite possible that starch is laid down later in tuber development and that ethylene is important in the early stages of tuber induction.

The mechanism of action of ethylene remains obscure. Addition of the auxin indolyl-3-acetic acid (IAA) to many plants results in a manifold increase in ethylene production, which has led to the suggestion that the hormonal effects of IAA may be mediated through the regulatory influence of ethylene. Experiments with pea stem tissue have shown that this is not the whole story. Stem swellings in pea tissue can be caused by ethylene or by the addition of IAA, and are correlated with an increase in the enzymes concerned with cell wall metabolism. I. Ridge and D. J. Osborne have demonstrated that the two types of swelling, although outwardly similar, arise from quite separate processes (*Nature*, **223**, 318; 1969). The effects of auxin on cell growth and cellular concentrations of enzymes cannot therefore be attributed solely to the influence of ethylene.

The answer to the problem of how ethylene works must remain, but at this time it is clearly important to realize that oxygen and carbon dioxide are not the only gases important to plant life.

LABORATORY ANIMALS

Origin of Nude Mouse

CURRENT research interest in thymus-deficient, hairless, "nude" mice (*nu nu*)¹⁻³ has prompted Professor N. R. Grist and Miss R. McLelland of the Regional Virus Laboratory, Glasgow, to record their origin. The mice were derived in Glasgow from a closed breeding colony of albino mice developed from stock purchased in 1953 from Messrs Schofield in Oldham.

During the early summer of 1959, the colony was struck by an unexplained short epidemic of sickness and death of males who were found to have enlarged, pale kidneys with granular calcified deposits. Because the breeding and mothering qualities of the mice were particularly suitable for work with Cocksackie viruses, the survivors were reinforced, in September 1960, with more mice of the same type. Line breeding was begun with eleven groups, each of two new females with one male from the original colony. Three lines were eliminated. Nude mice appeared in April 1961, in only one line, the best of the remaining eight. They comprised one, or rarely two, mice in litters averaging eight members; back-crossing nude males with their apparently normal mothers gave about 75 per cent