it is essential to ensure that EEC as well as national authorities do not legislate until research is complete and the results have emerged. Independent assessors advising licensing authorities now require information on the mode of action of the active ingredients in medicinal products as well as evidence of their effects on metabolism, and the latest data pertaining to these requirements were reported at the meeting.

Following recent interest in the structure of growth hormone in different species, attention is now being focused on characterizing growth-hormone receptors (M. J. Waters, University of Queensland). The receptor in the rabbit liver and bone is up-regulated by the level of growth hormone in circulation and has 80 per cent sequence homology with the human liver growth-hormone receptor as well as some similarity with the prolactin receptor. The next step is to determine the upstream and downstream control sequences.

There is on the other hand evidence of some heterogeneity of receptor types in individual animals with potential specificity for somatogenic, lactogenic and somatomammogenic effects (P. Gluckman, University of Auckland). The ontogeny varies with the tissue and no growth-hormone receptors have been isolated so far in the fetal liver, but in lambs a somatogenic receptor appears about 6 days after birth. Furthermore, there are both high- and low-affinity receptors and the level of high-affinity receptors, important in the control of growth, are probably insulin-mediated (Gluckman). Nutritional influences are important, with a high plane (generous nutrient intake) stimulating increased concentrations of high-affinity receptor sites. Of considerable interest in the agricultural context is that oestrogens increase both growth-hormone receptors and insulin-like growth factor-1 (IGF-1) level under a high nutritional plane but have little effect under a low plane.

Concerning the hypothalamic control of growth-hormone secretion, which involves both growth hormone releasing factor and somatostatin, it was suggested that acute feedback mechanisms operate via somatostatin whereas control of basal growth-hormone level is via IGF-1 (M. Scanlon, University of Wales, Cardiff). The pattern of growth-hormone administration may be an important factor governing the growth response (I.C.A.F. Robinson, National Institute for Medical Research, London) because at equivalent doses, pulsatile administration has a superior effect in hypophysectomized rats compared with constant infusion. There are sex differences in the normal pattern of growth-hormone secretion in rats; the low, flat mode characteristic of the female can be converted into the male episodic mode by intermittent somatostatin infusion, which results in extra weight, bone

growth and a higher growth-hormone level (Robinson).

High-plane nutrition during treatment and its influence on milk yield in dairy cows and carcass composition in lambs is beneficial (I. Hart, Cyanamid, New Jersey; J. Pell, IGAP, Hurley), and changes in both IGF-1 and IGF-2 in relation to milk yield are important. In response to fears that IGF-1 levels in milk from rBST-treated cows might be unduly elevated and thus affect new-born babies, it was reported that normal cow's milk contains large quantities of IGF-1 during the peri-parturient period. Human breast milk contains high levels of IGF-1 and there is an unexplained, substantial increase in IGF-1 in this milk at about 6–8 weeks post-partum (C. Prosser, IAPGR; R. Collier, Monsanto, St Louis). Fears of consumers at this point should thus be assuaged. Clinical interest in therapeutic properties of growth-hormone administration in relation to control of bone growth is supported by evidence from receptor-antibody studies that both proliferation and differentiation of cells controlling bone growth are IGF-1-dependent (Z. Hochberg, Rappaport Family Institute for Medical Research, Haifa).

The latest results of transgenic studies with both pigs and sheep were reviewed at the meeting. The efficiency of gene integration in pigs using the metallothionein promoter (0.9–1.42 per cent) and the percentage of expression has been disappointingly low in US Department of Agriculture trials (V. Pursel, Bettsville Agricultural Research Center, Maryland), with no relationship between copy number and growth-hormone level or indeed between growth-hormone level and growth rate. Eight of fourteen transgenic animals studied died before 90 days of age and there were significant problems of lethargy, muscle weakness, uncoordination, lack of libido and susceptibility to stress in these transgenic pigs. Similar results were reported from more limited studies in sheep (C. D. Nancarrow, CSIRO). Embryo manipulation as a route for transgenesis, perhaps using embryonic stem cells, is being investigated (E. J. C. Polge, Animal Biotechnology Cambridge Ltd). In addition, researchers at IAPGR and Ohio University have exploited a new construct consisting of a prolactin promoter and the bovine growth-hormone gene that can be inserted into pigs. Bovine growth-hormone levels in the circulation are low but induced expression can be achieved in a pulsed fashion with appropriate agonists or antagonists. All these data highlight the need for more precise control of the time, mode and level of gene expression. □

G. E. Lamming is professor of Animal Physiology at the University of Nottingham Faculty of Agricultural and Food Sciences, Loughborough, Leicestershire LE12 5RD, UK.

Daedalus

Bending the bugs

THE central problem of food preservation is killing the resident bacterial population of the food. Traditional methods like boiling and salting are very brutal; even pasteurization and gamma-radiation can alter the taste and character of the food. Now Daedalus has a new idea. He plans to give bacteria the 'bends'.

A diver gets the bends if he comes up to the surface too quickly. In the high pressure of the ocean depths, nitrogen from his air supply dissolves in his body fluids, and emerges as bubbles if the pressure is reduced too rapidly. In the bloodstream a bubble is a nuisance; in synovial or spinal fluid it can be very painful and dangerous. In a bacterium, says Daedalus, it would be fatal. The sudden expansion would blow the bacterium up like a tiny balloon and burst its cell wall.

So DREADCO biologists are subjecting selected bacterial cultures to sustained high gas pressures. When the organisms are saturated with gas, the pressure is suddenly released. Spherical cocci have little choice but to swell and burst; rod-like bacilli could perhaps accommodate their sudden flatulence by deforming into spheres, but should still be fatally disorganized by the experience. Spirilli would be disastrously unwound, like a Bourdon pressure gauge. The ideal gas for the process needs to be harmless and fairly soluble in water; nitrous oxide should be a better bet than nitrogen itself. Ten or twenty atmospheres should be sufficient to guarantee that every organism will absorb enough gas to form a bubble inside it when the pressure is released.

Any food product could be 'bent' in this way. Fluids like milk will simply froth up violently as the pressure comes off, and then collapse back to their original state; finished products like pies and sausages should first be sealed in a microporous packaging film permeable to gas but not bacteria. 'Bending' will cause no chemical damage at all, and may even enhance the texture of the denser foodstuffs. They could well expand permanently, acquiring a welcome lightness and fluffiness. Indeed, entirely new 'foamed foods' may emerge from the research, a range of nutritive generalizations of popcorn. The lightest imaginable puff-pastry, ethereally bouyant sponge-cakes, huge insubstantial foamed steaks melting in the mouth but disconcertingly pneumatic on the plate, expanded vegetables of thistledown rarefaction — all may be possible. Their guaranteed freedom from bacterial contamination, their subtlety and lightness of texture, and their unprecedentedly low calorie content per unit volume, should ensure them a wide welcome in the market-place. David Jones