COMMENTARY

by Bernard Dixon

AN ALTERNATIVE TO HORMONES IN LIVESTOCK

A few months ago, the British Veterinary Association (BVA) found it necessary to issue a statement headed "Hormones and Antibiotics—There Is a Fundamental Difference," which explained the contrasting nature of these two groups of naturally-occurring compounds. A non-commercial body concerned solely with the welfare of animals and veterinarians, the BVA was driven to

take this bizarre step because of widespread misunderstanding about the "drugs" farmers put into our bacon, beef, and broiler fowls. Again and again, in public discussion, press coverage, and even parliamentary debate, the origin and effects of two categorically different types of substance have been woefully confused. At least in part, it was ignorance of such profundity which fueled calls for the total ban on hormones in animal husbandry proposed recently by the European Economic Community (EEC).

There have, of course, also been genuine alarms concerning both antibiotics and hormones. Indiscriminate use of antimicrobials in animal feedstuffs has contributed to the proliferation of enterobacteria (often pathogenic to humans as well) which are insensitive to those drugs. Five years ago, too, the illegal injection of diethylstilbestrol into veal calves resulted in the appearance of residues in canned baby foods in Italy. But such abuses have been dealt with by appropriate scientific and legal measures, rather than by blanket bans founded upon hysteria. For example, recent evidence of a fall in microbial drug resistance in Britain (*Bio/Technology* 3:415, May '85) shows that the attendant public health hazards can be curbed by removing medically important antibiotics from the agricultural domain and replacing them with non-therapeutic alternatives. Likewise, experience shows that once prudent safeguards are imposed, certain hormone preparations can be employed and with clear economic benefit in farm livestock. Currently, more than a quarter of the meat animals in Great Britain and about half of all U.S. cattle receive steroids, with no evidence whatever of harmful side-effects.

But rationality is not the sole touchstone of human behavior. If vociferous opinion-formers continue, willfully or otherwise, to make the most elementary errors in confusing antibiotics with hormones, then that is the real world in which the bio-industries have to operate. I rather doubt whether even the most admirable and well-intentioned leaflet sent out worldwide from the British Veterinary Association's headquarters in Mansfield Street, London, will turn the tide of opinion.

I'm delighted to see, therefore, that some biotechnologists are beginning to seek improvements in meat production which are altogether cleaner, neater, and less objectionable to objectors than any method dependent on the use of potentially suspect substances. Blazing the trail a few years ago were two researchers at the U.K. Agricultural Research Council's Meat Research Institute near

Bristol. Mindful of the potential EEC ban on hormones, details of which were then percolating out of Brussels, Stuart Spencer and Diane Williamson wondered whether they could make livestock fatten more quickly by interfering with normal physiological controls over growth. Would it be possible to immunize animals against their own somatostatin, and thereby lift this brake on the release of other hormones that promote growth? In experiments conducted in collaboration with Jan Garssen at the Dutch Research Institute for Animal Husbandry at Zeist in the Netherlands, they found that at least one breed of sheep could be successfully manipulated in this way. There is even an unexpected additional benefit in that the super-sheep produced by auto-immunization have larger frames, and thus more of the muscle protein we consumers recognize as meat.

Now researchers at another of the ARC's establishments—the Hannah Research Institute in Ayr, Scotland—have gone one discriminating step further. Adopting analogous reasoning to their Bristol colleagues', David Flint and his team brooded over the prospects for engineering leaner lamb and beef by attacking animals' fat depots immunologically. First, they took fat cells from rats and injected them into sheep, raising antibodies which they then injected back into the rats. Within one week of this treatment, the number of fat cells in three major fat depots in the rats' bodies had been depleted by 50 percent. By two months, a decrease in both the quantity and size of fat cells had reduced the weight of the major internal fat depot, the parametrial, by 75 percent. These dramatic changes seem to have resulted from antibody-dependent breakdown of the cells by both complement and lymphocytes attracted towards the fat depots.

Suprisingly, Dr. Flint and his colleagues observed that the treated animals reached the same final body weight as their controls. Exploiting the non-invasive technique of neutron-activation analysis five weeks after the injections, they found that an overall diminution of some 30 percent in total body fat had been compensated for by a concomitant increase in protein plus water. Traditional carcass analysis at eight weeks, based on the Kjeldahl nitrogen technique and ether extraction of lipids, gave similar figures.

These are exciting but early results, and the Hannah workers are, of course, hoping that the fat depots of cows and sheep can be impoverished in the same way. Several questions also remain to be answered: What happens, for example, to the breakdown products which are presumably liberated into an animal's bloodstream when fat cells are lysed? If satisfactory answers are forthcoming, there seems little doubt that the principle of diverting normal physiology along the pathways designed to give the consumer more acceptable meat will itself prove more acceptable than the injection, ingestion, or implantation of substances which can easily become the most hated of political targets. At least, I hope so.

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