Scientific Meetings

Antibiotics in Agriculture

The First International Conference on the Use of Antibiotics in Agriculture was held in the U.S. Department of Agriculture Auditorium in Washington, D.C., 19–21 Oct. 1955. It was sponsored by the NAS–NRC Agricultural Research Institute and was supported by funds contributed by the American Cyanamid Company, Merck & Company, Chas. Pfizer & Company, Inc., and E. R. Squibb & Sons. More than 400 persons attended the conference, from the United States and at least 15 other countries.

The conference was called for the critical evaluation of present knowledge with respect to growth and other responses of livestock to low-level antibiotic feeding, antibiotic use in crop plant production and food preservation, the influence of antibiotics on antibiotic-sensitive microflora, antibiotic effects on reproduction and carcass quality in livestock, antibiotic residues in human food, the mode of action of antibiotics, and the delineation of problems requiring research.

Young animals of our livestock species commonly respond to continuous oral administration in their feed of about 10 parts per million of one of several antibiotics by increased gain in weight about 10 percent greater than controls, under farm conditions. The growth response is generally less or absent in young of the same species under optimal conditions of nutrition and sanitation, although Luckey (University of Missouri) reported a few data, for chicks and turkeys, that he concluded indicated growth response in a germ-free environment. Rats respond only when their diet is inadequate; guinea pigs, when fed chlortetracycline, may develop Listeriasis and die. Data for children who were fed antibiotics continuously for 2 years, reported by Squibb (Servicio Cooperativo Interamericano de Agricultura, Guatemala) showed no unfavorable responses and no important net growth response, although some groups apparently did show an initial growth response.

Clausen (Denmark) demonstrated that low-level antibiotic feeding had no deleterious effect on carcass quality of swine when the antibiotic-fed swine were restricted to the same feed intake as the controls. He warned, however, that since antibiotic feeding generally increases feed intake, pigs that are fed *ad libitum* on low-protein diets might, therefore, become excessively fat. Some U.S. research workers have reported that protein level in the diet of antibiotic-fed pigs may be decreased. Clausen's report was, therefore, timely, and swine nutritionists must accept or refute his findings.

No effect of antibiotic feeding on reproduction of livestock has been demonstrated, but neonatal mortality is reduced in antibiotic-fed chicks, poults, pigs, calves, and lambs. The therapeutic use of antibiotics for treatment of livestock diseases is selectively effective. Both Pomeroy (University of Minnesota) and Finland (Thorndike Memorial Laboratory, Boston) noted that disease-producing strains have not been found to emerge among livestock that are raised for market on antibiotic-supplemented feeds. This is in contrast to experience with human beings and, as already noted, with guinea pigs.

The emergence of tolerant or resistant pathogens requires additional intensive research. Finland reported that *Micrococcus aureus* has been most troublesome in man; the incidence of strains of *M. aureus* that are resistant to any antibiotic appears to be related to the frequency and intensity with which that antibiotic has been used. J. J. Christensen (Minnesota) presented a beautifully illustrated report on variations, including many mutations, that occur in fungi grown in media that contain antibiotics. Apparently, no mutants have yet been reported in soil microflora as a result of antibiotics produced in the soil under natural conditions. The ecology of antibiotic-producing fungi was discussed by Mishustin and Krasilnikov (U.S.S.R.). Mishustin reported important effects of antibiotics in inhibiting nitrogen fixation by *Azotobacter*. Krasilnikov reported crop plant protection against disease by absorption of antibiotics produced by fungi naturally occurring in the soil. Application of antibiotics to crop plants for control of many diseases was reported by Zaumeyer (U.S. Department of Agriculture). A principal problem that remains to be solved is that of finding antibiotics that are effective in concentrations low enough to be economical for crop use.

Zaumeyer reported that antibiotics are absorbed by the plant. It has been a question to what extent they were absorbed by animals at the 10 parts per million level that is characteristic of feed use. Gordon and his colleague Taylor (England) presented assays and clearly demonstrated systemic presence of antibiotics when the antibiotics were fed at these low levels. A challenge method for evaluating the prophylactic hypothesis of mode of action of low levels of antibiotics, which was also proposed by Gordon, will be useful in the further research that is needed to establish mode of action.

Most of the speakers suggested or conceded that some effect of antibiotics on some of the intestinal microflora must be a principal factor in low-level antibiotic feeding. The general absence of nonspecific enteritis in young antibiotic-fed animals, the general lack of growth response of chicks in new quarters, and some direct research, reported by Combs (Maryland), on effects on intestinal flora support but by no means demonstrate the validity of the prophylactic hypothesis. Eagle (National Institutes of Health) succinctly pointed out that it remains to be demonstrated which microbial species are sensitive to 10 parts per million levels of which antibiotics.

Baumann (University of Wisconsin) reported evidence that, in the rat, antibiotic feeding stimulated vitamin synthesis in the intestine, and that in the chick, the thinner intestinal wall that is characteristic of antibiotic-fed chicks may be more permeable to nutrients. Freerksen (Germany) supported the antimicrobial prophylactic hypothesis, especially with respect to organisms abnormally present in the upper gut. However, he stated that the prophylactic hypothesis is insufficient and reasoned that antibiotic feeding must result in supplying directly essential substances, perhaps hormone precursors. François (France) reported evidence that antibiotics depress deaminase activity in the intestine of the pig. Johansson (Minnesota) pointed out that the effects of antibiotics on mammalian cells in tissue culture must be determined and suggested that the Metchnikoff hypothesis of autointoxication be reexamined. Other evidence was presented that suggests an effect of antibiotics on thyroid activity. It was generally agreed that determination of mode of action of antibiotics at low levels must be made in order to make further research on their use fully effective.

Tarr (Canada), Deatherage (Ohio), and others reported convincing evidence that low levels of antibiotics added post-

mortally to fish, chicken, and meat have value in preserving these foods. Such meat, when processed under sanitary conditions, is preserved for several days without refrigeration; chilled, unfrozen fish and chickens are preserved for several days longer than is now possible. These and other speakers emphasized the necessity for establishing means of assuring the absence of antibiotic residues in foods as eaten. Randall (Food and Drug Administration) reviewed occurrence of antibiotics in food and reported very low levels of penicillin in a substantial percentage of milk samples, probably as a result of penicillin treatment of cows for mastitis. He pointed out the possible danger, for the occasional exquisitely sensitive human being, of small amounts of antibiotics in food, and reviewed the provisions of the Food, Drug and Cosmetic Act that are relevant to the use of antibiotics in food production. Rigorous tests for safety will properly delay use of antibiotics in food preservation until the public can be legally and biologically assured that there is no health hazard.

The conference was climaxed by the scholarly address of Rene J. Dubos (Rockefeller Institute of Medical Research), the discoverer of gramicidin, who reviewed basic research on microbial physiology. The proceedings of the conference will be published by NAS–NRC and will be available about April 1956.

T. C. Byerly

Agricultural Research Service, U.S. Department of Agriculture, Washington, D.C.

Meeting Notes

■ The following scientists from abroad have accepted the invitation of the Tissue Culture Association to participate in an International Decennial Review Conference to be held at Woodstock, Vt., 8–12 Oct. 1956: H. E. Street, University of Swansea, Wales; Roger J. Gautheret, Sorbonne, Paris; E. N. Willmer, Cambridge University, Cambridge, England; W. H. Schopfer, University of Bern, Bern, Switzerland; Jacques Monod and George Barski, Pasteur Institute, Paris; George Morel, National Agronomic Institute, Versailles, France; Peter J. Gaillard, University of Leyden, Leyden, Netherlands; Etienne Wolff, College de France, Paris; Honor B. Fell and Ilse Lasnitzki, Strangeways Laboratory, Cambridge, England; A. Moscona, Hebrew University, Jerusalem, Israel; O. A. Trowell, British Atomic Laboratories, Harwell, England; Maurice Chevremont, University of Liège, Liège, Belgium; Edith Paterson, Cristie Cancer Hospital, Manchester, England; George Klein, Karolinska Institute, Stockholm, Sweden; Charles Lumsden, Maida Vale Hospital, London, England; Wilhelmina de Bruyn, National Cancer Institute, Amsterdam, Netherlands.

Institutions in the United States or Canada that may wish to take advantage of the presence of these persons in this country as lecturers are urged to communicate with them, with the organizing secretary of the conference, Dr. Philip R. White, Jackson Memorial Laboratory, Bar Harbor, Maine, and with Dr. Paul Weiss, National Academy of Sciences, Washington, D.C., (chairman of the Biology Year Coordinating Committee). It is hoped that coordination of this sort may serve to make the stay of these scientists more interesting and useful and to spread the expense of their voyage.

■ The 1956 Western Joint Computer Conference and Exhibit is to be held at the Fairmont Hotel in San Francisco, 7–9 Feb. This conference is one of the two national conferences on electronic computers that are sponsored jointly each year by the American Institute of Electrical Engineers, the Association for Computing Machinery, and the Institute of Radio Engineers. For information write to the chairman of the publicity committee, Donald C. Holmes, Shell Development Company, Emeryville, Calif.

■ A Washington, D.C., chapter of the Association of Technical Writers and Editors, as authorized by the national meeting of this new society, has been formally organized, with a membership that will probably start with more than 50 persons in Government and private employment in the Washington area. Temporary officers of the chapter are: chairman, E. M. Cohn, U.S. Bureau of Mines; v. chairman, W. J. Miller, National Research Council; sec.-treas., R. T. Hall, U.S. Forest Service; programs, W. N. Ezekiel, U.S. Bureau of Mines; by-laws, R. H. Schaaf, Department of Defense, and H. B. Simpson, Westinghouse Air Brake Co.; and publicity, N. J. Pritchard, Operations Research Office.

The first regular program meeting of the chapter will take place on the evening of 18 Jan., at George Washington University (Building C). The program will consist of a forum on the general topic, "Technical writing—through the consumer's eye" and will include 15-minute talks from three different viewpoints.

Forthcoming Events

February

5–8. National Citizens' Planning Conf., Washington, D.C. (Miss H. James, 901 Union Trust Bldg., Washington 5.)

9–10. Soc. of American Military Engineers, annual, Chicago, Ill. (D. A. Sullivan, 72 W. Adams St., Chicago 90.)

13–17. American Soc. of Civil Engineers, Dallas, Tex. (ASCE, 33 W. 39 St., New York 18.)