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Safe Use of
Chemicals
in Agriculture

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OUR RESPONSIBILITIES

The Agricultural and Mechanical College of Texas has a responsibility to provide the people of Texas working in agriculture and the consuming public with information concerning the use of chemicals in the production and processing of food, feed and fiber. It is the responsibility of developing and disseminating new information in this important area within the limits of funds available.

In meeting this responsibility, the College maintains, in its various subject-matter departments, up-to-date files of information on the uses of agricultural chemicals, including recommended amounts and proper methods of use, recommended safeguards and legal restrictions. As this information is added, as it is developed, from our own research and that of other organizations. General information on this subject is transmitted immediately to agricultural personnel.

The College recognizes the dangers of the improper use of chemicals in the production and processing of food, feed and fiber, and the danger to the agricultural economy from possible public hysteria based on incomplete, misleading or false information.

The College also recognizes the benefits to Texas agriculture from the safe and proper use of agricultural chemicals in the economic production of an abundance of high quality food, feed and fiber. Such chemicals have been important factors in making Americans the best-fed, best-clothed and best-housed people the world has ever known.

Safe Use of *Chemicals* in Agriculture

MODERN AGRICULTURE and the present system of marketing attractive, palatable and nourishing foods depend heavily on the widespread use of chemicals. Much of the spectacular gain in agricultural efficiency in the past 20 years has been due to the development and use of new and better chemical compounds to perform specific functions in agriculture.

Chemicals are used to control insects, diseases, weeds and other pests; to control or speed up the growth of plants and livestock; and to prevent spoilage, maintain fresh quality and ensure the attractiveness and flavor of crop and livestock products.

Consumers have benefited by being able to purchase wholesome, high-quality farm products, free from pest damage and contamination, in all seasons and in practically all localities throughout the nation. Chemicals have made it possible to produce food, feed and fiber in sufficient quantity and at economical costs so that all our people may enjoy an improved level of living.

Some of the chemicals available for use, however, in varying degrees and under certain conditions, are harmful to humans. Present and future gains in the production, processing and distribution of agricultural products must give due regard to the health of the ultimate consumer. To this end, certain laws have been enacted and regulations developed by the federal government, some states and many local governments. All who are engaged in agriculture in any way should become familiar with these laws and observe the regulations issued under them.

Much confusion exists concerning the use of chemicals in agriculture. Many technical problems are involved which cannot be answered until more research is done.

THE LAWS

Federal laws regulating the uses of chemicals in agriculture are the Federal Food, Drug and Cosmetic Act (administered by the Food and Drug Administration of the U. S. Department of Health, Education and Welfare) and the Federal Insecticide, Fungicide and Rodenticide Act (administered by the U. S. Department of Agriculture). These laws affect all agricultural products which enter interstate commerce and are the basis for state and local laws in this area.

The first Federal Food and Drug Act, generally known as the Pure Food Act, was passed in 1906. It was replaced in 1938 by the Federal Food Drug and Cosmetic Act. Under this act, the Food and Drug Administration (FDA) cannot bar from use any chemical unless it can prove in court that the chemical was poisonous or harmful to man. Thus, the burden of proof is rested with the FDA.

The Miller Amendment (Public Law 558, passed in 1954) places the responsibility for clearing each compound with the USDA and the FDA on the manufacturer. It requires that all products, when sold, carry on its label full and specific instructions for its use so as to leave no residue above the legal limit set by FDA. The responsibility for using the chemicals exactly as directed lies with the user, and his crop is subject to confiscation if it contains more than the legal residues when it enters interstate commerce.

The Federal Insecticide, Fungicide and Rodenticide Act (passed in 1947) established regulations relating to the certification of usefulness of pesticides in agriculture for which a tolerance or exemption has been requested under the Federal Food, Drug and Cosmetic Act, and requires the registration of all such compounds with the Secretary of Agriculture. This act placed the responsibility for registration with the manufacturer. It also provides for the establishment of safety precautions in applying and handling agricultural chemicals.

The Food Additive Amendment to the Federal Food Drug and Cosmetic Act (passed in 1958) prohibits the use of substances in foods until they have been tested adequately to establish their safety. The Delaney Clause provides that

additive shall be deemed to be safe if it is found to induce cancer when ingested by man or animals. As in the other laws, the burden of proof rests with the chemical companies and food processors.

Fungicides and herbicides were specifically brought under the Federal Food, Drug and Cosmetic Act by the regulations of the Federal Insecticide, Fungicide and Rodenticide Act and further defined in the Miller Amendment. Plant regulators, defoliants, desiccants and nematocides were specifically added by Public Law 85-139 in August 1959, in an attempt to have uniform regulations for all agricultural pesticides.

There also are many state and local laws governing the use of chemicals in agriculture. In Texas, these laws, in general, are patterned after the federal statutes.

Each pesticide chemical has the equivalent of a zero tolerance until specific action is taken by regulatory authorities to establish a tolerance or an exemption for its residue.

"Tolerance" is simply the amount of a chemical which scientists have determined may remain safely as a residue on or in food or feed crops without injury to the consumer.

"Exemption" simply means that certain chemicals are exempt from the requirement of a tolerance.

Chemical tolerances or exemptions usually are cleared by one of four methods:

1. By the establishment of a tolerance under the Federal Food, Drug and Cosmetic Act for residues for such use.
2. By the establishment of an exemption from the requirements of a tolerance by FDA.
3. By submission of a statement from FDA that the pesticide chemical is not a poisonous or deleterious substance and is safe to use.
4. By the submission of adequate information by the manufacturer, in the petition for registration and labeling to the USDA, to show there will be no residue when the product is used as directed.

RECOMMENDATIONS

The safest procedure in the use of chemicals in agriculture is included in a statement by the

Commissioner of the Food and Drug Administration in December 1960:

"To be sure that your crop will be safe for shipment, follow these three simple rules:

"First, use a pesticide only on a crop which it is recommended on the label;

"Second, use only the quantity of pesticide called for by the label;

"Third, apply the pesticide at the rate recommended on the label.

"Do these three things and pesticides will work safely for you—both as a grower and as a consumer. So—always read and follow the label—whether it be for foods, drugs or pesticides. It pays!"

Note the emphasis on what the label contains.

The A&M College of Texas accepts the following recommendations as its guiding principles:

Subject-matter departments of the College have the responsibility for making recommendations on the use of chemicals within the framework of current laws and their interpretation. In the case of insecticides, the responsibility is with the Department of Entomology; for fungicides, nematocides and regulators, the Department of Plant Physiology and Pathology; for herbicides, the Department of Range and Forestry; for feed additives, the Department of Animal Husbandry and the Feed Control Service; for implants, the Department of Animal Husbandry and School of Veterinary Medicine; for food additives, the Department of Horticulture and Department of Dairy Science; and for chemicals for the control of internal parasites of animals, the School of Veterinary Medicine. These departments will from time to time issue the releases necessary to keep up-to-date information available on the safe use of chemicals in agriculture.

EFFECTS ON AGRICULTURE

Agriculture has just begun to feel the impact of the Food Additives Amendment of 1958 and its Delaney Clause, and the broadening of the scope of the Insecticide, Fungicide and Rodenticide Act.

It is necessary that all growers of crops and livestock understand they run the risk of having their products seized in interstate commerce

they are found to contain chemical residues above the legal limits. Every grower should familiarize himself with regulations governing the use of chemicals on the crops he grows. He should take care that every chemical compound he purchases has been registered or approved, and that his purchase carries the seller's guarantee to this effect. He must read label instructions carefully and follow them to the letter.

The new regulations, for the time being at least, rule out a number of chemical compounds heretofore used commonly in agriculture. They limit strictly the time, manner and amount of use of many others. This requires care on the part of the grower in the use of all chemicals, but should create no serious handicaps to efficient agricultural production.

INSECTICIDES

Recommendations for the safe use of insecticides on all crops, livestock and poultry are published and distributed by the Extension Service in: L-255, *Texas Guide for Controlling Insects on Vegetable Crops*; MP-339, *Texas Guide for Controlling Insects on Corn, Sorghum, Small Grains and Grasses*; L-256, *Texas Guide for Controlling External Parasites of Livestock and Poultry*, and L-218, *Texas Guide for Controlling Cotton Insects*. The guides are revised annually. If changes become necessary, they are made through press releases and in *Entomology Notes*, which are distributed to all Extension Service personnel.

If the recommendation suggests the use of an insecticide at one-fourth pound per acre, 14 days before harvest, it should be applied at this exact dosage at not less than 14 days before harvest. The use of the pesticides as recommended will result in the control of the pests without hazard to the consumer. Growers who follow the recommendations should, under normal conditions, have no problem with pesticide residues.

FUNGICIDES, HERBICIDES, PLANT REGULATORS, DEFOLIANTS, DESICCANTS AND NEMATOCIDES

Fungicides, herbicides, plant regulators, defoliants, desiccants and nematocides are regis-

tered under the Federal Insecticide, Fungicide, and Rodenticide Act for use on raw agricultural commodities as defined in Public Law 55-483, Public Law 86-139.

Recommendations cannot be made for the use of a chemical that has not been cleared by the USDA and FDA for use on a crop in a manner not approved by these agencies. The condemnation of the crop may result if residues are found in or on the raw agricultural commodity. The absence of a published tolerance or exemption does not necessarily imply that a pesticide chemical may be used. This is particularly critical for new chemicals, or recently brought under federal legislation (herbicides, regulators, defoliants, desiccants and nematocides) on which no tolerance rulings or exemptions have been made for use on a given crop. The critical problem regarding these compounds is the lack of information on which to make recommendations. For example, FDA tolerances or exemptions have not been made for the use of defoliants and desiccants on cotton or other crops.

We cannot assume safely that chemicals applied just prior to harvest will not leave residues (unless the regulation based on residue data states this) since, according to law, the tolerance applies.

Tolerances for herbicides on several crops have been published, although information is lacking for their use on many crops. In use situations of weed control chemicals and soil sterilants ordinarily do not result in residues on or in the harvested crop. Uses which do not leave residues do not require tolerances.

Although crops grown for planting seed are exempt from a tolerance, it is important to remember that fields treated with a zero-tolerance chemical should not be grazed by animals producing milk or to be slaughtered, and straw, residue or stubble should not be used for feed. Recommendations cannot be made for the use of any herbicide that might be found in milk or in the meat of animals as the residue on grazing treated forage unless specific regulations have been established for its use. Many types of herbicides leave no residues, if such use

accordance with the registered directions. If a chemical has been ruled to be a carcinogen, residue in or on the crop means it is subject to seizure by the FDA. In most cases, a tolerance is not required for the use of a pesticide on fallow or non-crop land not being grazed.

ANIMAL DISEASES AND PARASITES

Chemicals are used in one form or another for the control of diseases and parasites of poultry and livestock. If these animals or their products are to be used for food, it is essential to know whether a chemical is desirable and, in most instances, illegal if residues of the chemical or chemicals in question are present in the tissues, milk or eggs. In milk and eggs, the tolerance is zero. Therefore, chemicals to be used on lactating cattle or laying hens must be selected carefully.

Tissue tolerances vary from zero to several parts per million (p.p.m.), depending on the particular chemical. The rate of excretion must be known. For example, the tolerance for toxaphene in meat has been set at 7 p.p.m. An animal treated with toxaphene should not be slaughtered for a minimum of 28 days after treatment to assure the amount of the chemical in the tissues does not exceed 7 p.p.m.

If antibiotics or other chemicals are given to dairy cattle, no milk may be sold for human consumption if traces of the product are present. The product may be used for intramammary, intravenous or subcutaneous injections if residues persist in the milk for longer than 96 hours.

Where facts are not available, one should so select. One should read all labels and follow the directions. If drugs or chemicals are labeled "Use Only By or Under the Supervision of a Veterinarian," consult a qualified veterinarian before using any of them.

FEED ADDITIVES AND IMPLANTS

Feed additives include substances used as components of feeds for improving growth and feed conversion, managing incipient diseases, improving the general well being of poultry and livestock, preventing or treating specific diseases and parasites, improving market qualities, preserving the feed and those affecting the physical appearance of the feed.

Additives to the feed and water of animals which yield products for human consumption are included under the regulations by various interpretations and are considered food additives, regardless of whether residues of the additive become a component of the human food derived from the animals.

Feed additives have proved beneficial to stock production, but the misuse of feed additives and implants can result in danger of producing an unsafe product and, hence, of causing and in detrimental effects on the animal and the quality of the animal product itself.

The anti-cancer, or Delaney Clause of the 1958 amendment, has been applied to limit the usage of diethylstilbestrol and the arsenic feeds, but holders of prior "sanction" for the use of these drugs are permitted to continue by the "grandfather clause" of the 1958 Additives Amendment, which exempts those used in accordance with "a sanction granted prior to the enactment" of the amendment.

Regulation of drug usage in commercial animal feeds in Texas is directed by the Texas Commercial Feed Control Act of 1957. The Texas Feed Control Service issues periodic lists of accepted drugs for use in animal feeds. These lists define the limits of safe usage set up in the "sanctions" and are in agreement with the FDA. However, the Texas Feed Control Service, in addition to considering safe usage, limits the concentrations of feed additives to such materials as which there is evidence of efficacy.

Implants or injections for growth promotion are considered food additives and under the regulations. Such implants, even though their purpose is growth stimulation, are regulated for use in Texas under the Livestock Residue Act, which is administered by the State Health Department. However, with the exception of the antibiotics, restrictions for the usage of implants and injections have not received a definition or interpretation. Recommended usages of implants do not appear in the regulations prepared by the Texas Feed Control Service. Implanted drugs generally result in greater and more protracted residues within tissues than ingested drugs. Surgical removal of the implant is necessary to reduce such residues.

Safe usage of feed additives and implants may be achieved if the following rules are used as guides:

1. A feed ingredient or implant should be used only in accordance with its stated purpose and its prescribed dosages and restrictions.
2. New or unusual feed ingredients should be avoided unless there are statements of general recognition of safety or provisions have been made for their safe use.
3. When certain drugs are included in feed, they must be discontinued at or before the specified time prior to slaughter.

FOOD ADDITIVES

All known food additives are classified generally on the basis of their being regarded as safe or proposed as generally regarded as safe, and provisions for establishing safety, including tolerance levels, are set forth in the laws.

The FDA classifies food additives according to intended usage. These are: chemical preservatives, buffers and neutralizing agents, thickening agents and stabilizers, non-nutritive sweeteners, nutrients, sequestrants, color, anti-acids, antioxidants, indirect additives and miscellaneous.

Indirect additives are materials such as those which migrate into the food from equipment or food packages. Waxes, such as those used on paper cartons, are included in this grouping along with rubber-like or plastic parts of food processing equipment that come in contact with the food.

Miscellaneous food additives are those which do not fit the foregoing classifications, but are added to foods to accomplish intended physical or technical effects.

Well-known common substances, such as salt, pepper, sugar, vinegar, spices, baking powder and monosodium glutamate, are considered safe for their intended use. Supplemental lists of substances regarded as safe and substances proposed as being regarded as safe are publicized by the FDA.

Many questions concerning the legality of food additives cannot be answered at this time. When questions on questionable materials are completed, their status will be published by the FDA in the Federal Register.

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A&M CONTACTS

In case of a need for interpretation of regulations on the use of chemicals in agriculture, A&M personnel and others may contact the following authorities at College Station by letter or telegram, or in an emergency by telephone:

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FEED ADDITIVES:

Jack Price
Texas Feed Control Service
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IMPLANTS FOR GROWTH PROMOTION:

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