Ag and Food Interprets . . .

- **Chances for a food additives law from this Congress look good**
- **Fertilizer materials manufacturers build pilot plants to woo mixers**
- **Pesticides manufacturers like Miller Amendment despite new problems**
- **Role of fats in circulatory diseases coming to light**
- **Can industrial uses for crops solve surplus problems?**

Food Additives Legislation

House committee may approve additives control bill; industry split on FDA-approved bill

ONCE MORE Congress is taking a look at proposals to update the Federal Food, Drug, and Cosmetic Act to control chemicals and other substances added to foods. For 10 years, congressional committees have held hearings and taken reams of testimony, but have failed to take any action on controversial amendments to the Act.

This year, as the House Subcommittee on Health and Science opened hearings on a dozen food additives control bills, chances began to look good for some kind of action. It is too late in the session for either the House or Senate to debate food additives legislation. But the House committee seems in the mood to write a new control law, and it may report a bill before the end of the year.

Committee chairman Rep. John Bell Williams (D.-Miss.) opened the hearings with the comment: "Ten years ago the House appointed a select committee headed by Rep. Delaney to look into food additives. Ten years should be a sufficiently long incubation period even for legislation as difficult as this."

Procedure Is the Issue

All the bills now under study require that an additive be tested before it is used in food, all have procedures for notifying and gaining approval of the Food and Drug Administration for new additives, and all provide ways of appealing adverse FDA decisions.

At recent hearings before the House committee, MCA representative Lawrence A. Coleman said FDA should not have power to license food additives

Everybody concerned agrees that pretesting food additives is a good thing, and is necessary to keep food quality at its present high level. But industry and FDA disagree sharply on questions as to how best to get a new additive approved and how to appeal adverse FDA decisions. Not even all segments of industry agree on the most desirable way to get a new additive approved.

Two bills, H.R. 6747 and H.R. 8390, represent the opposing points of view. H.R. 6747, sponsored by the Administration and supported by FDA, is approved in part by the Grocery Manufacturers Association. The other bill is approved by the National Canners Association and the Manufacturing Chemists' Association.

Under terms of H.R. 6747, a new additive would be handled this way: The manufacturer asks FDA approval to use the additive and submits all his test data relative to toxicity of the material. He must also show what "functional value" the additive has. FDA either approves the additive for use or denies the request. The manufacturer can appeal an adverse decision to the U. S. Court of Appeals, but the court is limited to an administrative review of the FDA ruling.

On the other hand, H.R. 8390 would treat a new additive somewhat differently: The manufacturer notifies FDA that he plans to use the new additive and gives FDA all his pharmacological and toxicological test data. FDA has no power to approve the additive for use. However, FDA can obtain an injunction forbidding use of the additive until the matter has been adjudicated by the courts. Regular court procedures will apply; evidence can be introduced and witnesses called and cross-examined.

Licensing Draws Fire

Both the Manufacturing Chemists' Association and the National Canners Association oppose the procedure outlined in H.R. 6747 for approving new additives. This section, they say, would give FDA the power to regulate the food industry by licensing the use of additives. Licensing, said an MCA spokesman, contradicts many of the fundamental concepts of our legal system. As the law now stands, FDA sets the rules and punishes violators. Under the bill, the manufacturer "must beg leave of the Administration" before he can use an additive, despite his test results that show no hazard exists.

On the other hand, a representative of the Grocery Manufacturers Association told the committee GMA approves the licensing type of control proposed in H.R. 6747, although it does have some qualms about it. This is a complete reversal of the position

taken by GMA last year. Some reasons for the change: FDA insists that a new law contain this principle; the policy is firmly embedded in the new drug and pesticide chemical amendments to the Act.

On other provisions of the FDA-backed bill, industry shows a united front. Industry men unanimously condemned the appeal provisions of the bill. Under the rules of the Administrative Procedures Act, the court must uphold FDA if a substantial part of the record supports FDA's decision, even though the weight of the evidence shows FDA should be overruled. In the industry bill (H.R. 8390) a regular trial, not just an administrative review, would take place, and the court decision would be based on the preponderance of the evidence.

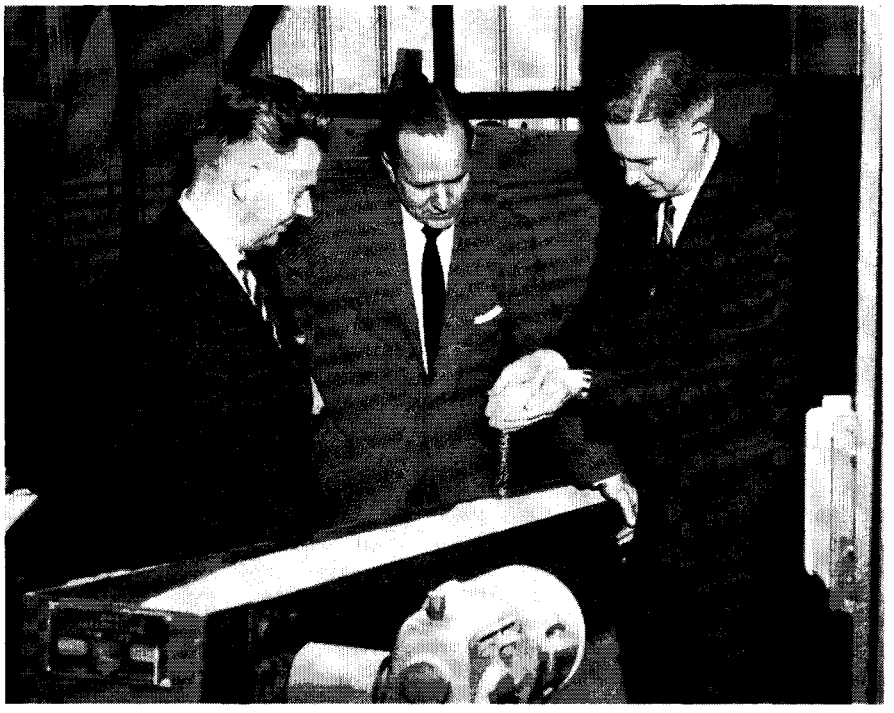
Another industry objection is to the requirement that an additive have "functional value." This term is not defined in the bill, and interpretation would be left to FDA. Even if it were defined by law, industry men told the committee, the question of functional value has no place in a pure food law. A law designed to assure the safety of food, they insist, should leave to the manufacturer, not the Government, the decision as to whether an additive has functional value.

Hearings are continuing and will probably cover a span of many weeks. Next on the committee docket is a roundtable discussion with a panel of experts on the scientific problems connected with food additives. Panel members were appointed by the National Academy of Sciences. Later, FDA representatives will have a chance to appear before the committee.

It is a little early to predict the outcome of the hearings with any certainty. But on the basis of the lines of questioning followed so far, and the attitudes of committee members, these things are likely to happen: the committee will approve a bill; the bill will favor the demands of the Food and Drug Administration.

Pilot Plants

Monsanto and Spencer will study technical problems for fertilizer mixers, pass results to the industry



John R. Brown, Jr. (right), research vice president of Spencer, shows Jack C. Denton (center), agricultural chemicals vice president, and Joe C. Sharp, technical service manager, how higher analysis granulated fertilizers can be produced in the company's new 250-pound-per-hour demonstration plant at its Jayhawk Works

THIS MAY, Spencer Chemical dedicated a new fertilizer-mixing pilot plant at its Jayhawk Works near Pittsburg, Kan. In July, Monsanto Chemical finished installing similar equipment near St. Louis. Both facilities are essentially sales tools, although the approach is less blatant than it might seem. Both firms are wooing the fertilizer mixer. But they intend to woo him by strengthening him. Their approach is to concentrate some of the money and brains of the big basic producer on technical problems that hamper the mixer, but on which he can seldom afford to spend much time or money.

By this move, Monsanto and Spencer commit themselves publicly to the idea that the best way to sell fertilizer raw materials is through the local manufacturer—the man who has a thorough knowledge of local people and conditions. Few basic producers contest this thesis. But shrinking profits have made it more and more difficult for mixers to stay in business. This attempt to strengthen mixers by giving them information—instead of credit and price breaks—would thus seem to be a pretty sound device.

Spencer and Monsanto will use their new equipment chiefly to study processes and raw materials that are used, or might be used, to make granulated, mixed fertilizers. Both firms will be able to handle a wide range of raw materials, turn out an even wider range of products.

Spencer has an ammoniator granulator, dryer, cooler, screens, and crushers, the whole backed up by heavy instrumentation. With this equipment, Spencer plans, for instance, to learn more about handling the large volumes of liquids—acids, nitrogen solutions, and the like—used to make higher analysis fertilizers; to work on better production methods for fertilizer grades now being made; to learn more about the metallurgy needed to reduce corrosion problems in dispersing acids in solution (by sparger) in the TVA ammoniator.

Monsanto, whose equipment line-up is similar to Spencer's, says it will be able to duplicate the four general systems commonly found among fertilizer manufacturers:

- Pug mill process
- Nongranular, dry fertilizer process
- Continuous ammoniator process
- Batch ammoniator process (similar to processes resulting from conversion of conventional, nongranulation units to granulation units).

Monsanto will also use its IBM 702 computer with the system. It has used this machine a good deal to study formulations and process economics (AG AND FOOD, November 1956, page 925), checking the results in customers' plants. But the close control possible with the research equipment will allow the company to check the computer's performance to a degree impossible in a commercial plant.

Monsanto proposes to pass along what it learns to the entire industry. It will use its equipment in three gen-

eral ways: in long range planning, for dealing with production problems common to geographical areas and groups of mixers, and for working on production problems for individual customers.

Spencer says the success of its program depends on getting the information it develops into the hands of as many fertilizer makers as possible, customers or not. It will work first on basic, industry-wide problems. Depending on its progress with these, Spencer plans gradually to work its way through the list to the more specific problems that beset smaller groups of mixers.

This kind of information, made freely available, should put the mixer in a better position to improve both his processes and his profits. And it should give him confidence that at least two big suppliers want him to stay in business and are not likely to go around him, directly to the grower.

That mixers have not been flush with such confidence is shown, perhaps, by a rumor that found its way back to Monsanto recently. In brief, it held that Monsanto was putting up a mixed fertilizer plant, would soon be selling direct to growers. The rumor was not true. The "mixed fertilizer plant," apparently, was the firm's new research facility which, it says, could produce only a small fraction of the average mixer's output, even if it ran full time. (Spencer's capacity, about 250 pounds an hour, hardly makes it competitive as a production unit either.) It does seem significant, however, that enough people were willing to believe the rumor to keep it alive.

Industry and The Miller Bill

Companies feel that the Miller Amendment, now in force for a full year, will benefit industry in spite of many problems it raises

The Pesticide Chemicals Amendment to the Federal Food, Drug, and Cosmetic Act (commonly known as the Miller Amendment) has been in effect for about a year. The pattern of its impact on the agricultural chemicals industry, and of the changes which it will bring about, is now beginning to emerge.

The Miller Amendment recognizes the importance of pesticides in our agricultural economy and sets up orderly procedures to ensure that the consuming public is protected from dangerous residues resulting from their use. Briefly, it provides that the basic manufacturer of a pesticide chemical must submit subacute and chronic toxicity data to the Food and Drug Administration. On the basis of these data the FDA then establishes residue tolerances for the chemical on various crops. The manufacturer must also submit the results of field residue tests to USDA in order that the Department can be assured that use of the pesticide as recommended on the label will not result in residues in excess of the established tolerances.

The problems faced by the agricultural chemicals industry in complying with the Amendment involve increased expenditures of both time and money for the development of a new pesticide chemical. Analytical methods have had to be developed to determine the very small amounts (frequently less than 1 p.p.m.) of residues. Basic manufacturers have found that the development of analytical techniques of the required sensitivity and accuracy has posed problems ranging from serious to critical. At least one such company has established a new laboratory solely for this work, and has staffed it with additional personnel. One manufacturer reports, "Some [problems] have been very difficult and some of the most important compounds have not yet had their residue picture clarified on all important crops because of analytical uncertainties."

At least a few manufacturers feel that some of the requirements of the USDA and the FDA are unrealistic and add unnecessarily to costs. One of them has said:

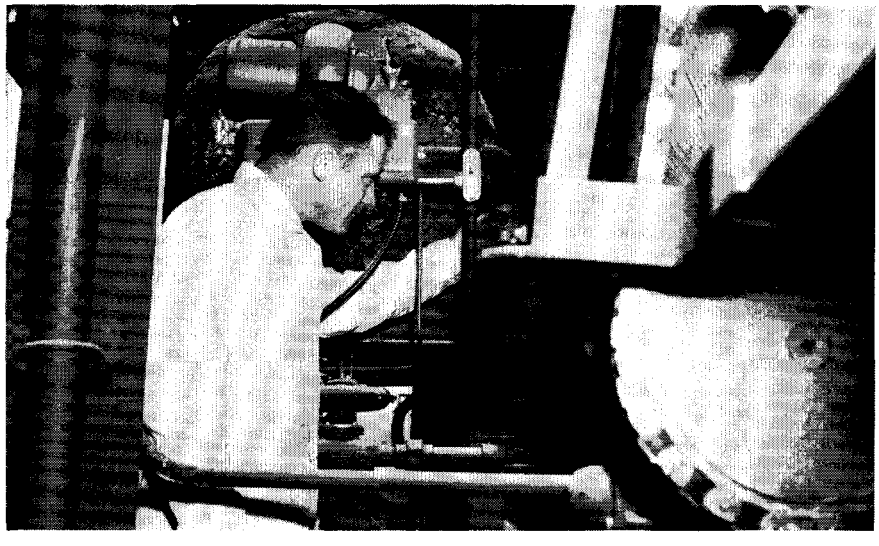
"The greatest problems arise when trying to prove to the satisfaction of USDA and FDA that no residues are present. We believe that in many cases where chemicals of low mammalian toxicity are involved, the sensitivity required to show that no residues are present is too demanding. After all, the real objective is to show that the use of the chemical will not endanger public health."

Obtaining subacute and chronic toxicity data satisfactory to the FDA is also an expensive and time-consuming process. No reputable manufacturer would put a new pesticide chemical on the market without obtaining toxicity data it felt to be adequate. How much the Miller Amendment has increased the burden on a company depends, therefore, on the scope of its toxicity program prior to the Amendment's enactment. The time required to bring a new chemical onto the market may be somewhat shortened through the issuance of temporary permits by FDA. Ordinarily, FDA will issue such permits on the basis of subacute toxicity data provided that chronic toxicity studies are so far along that they will be completed before the temporary permit expires.

What Will It Cost?

How much do these and allied problems add to the expense of introducing a new product? The added cost will depend on many factors such as the size of the company, the extent of its research and development program, the characteristics of the new

Sensitive process controls and measuring devices in the pilot plant will enable Spencer's research staff to study potential improvements in fertilizer manufacture



chemical, and the complexity of the problems encountered. Something in the range of $100,000 to $200,000 appears to be a minimum, however, and some estimates are as high as $1 million. One of the smaller manufacturers in the industry says that the Miller Amendment has added so much to the cost of introducing a new pesticide "that we do not hope to develop new products; we are too small a company."

Increased time also will be required. And here there is greater unanimity of opinion. The lowest estimate of the additional time was one year, and a few manufacturers feel that as much as five years more might be needed. Most, however, agree that the Miller Amendment will add about two years to development time.

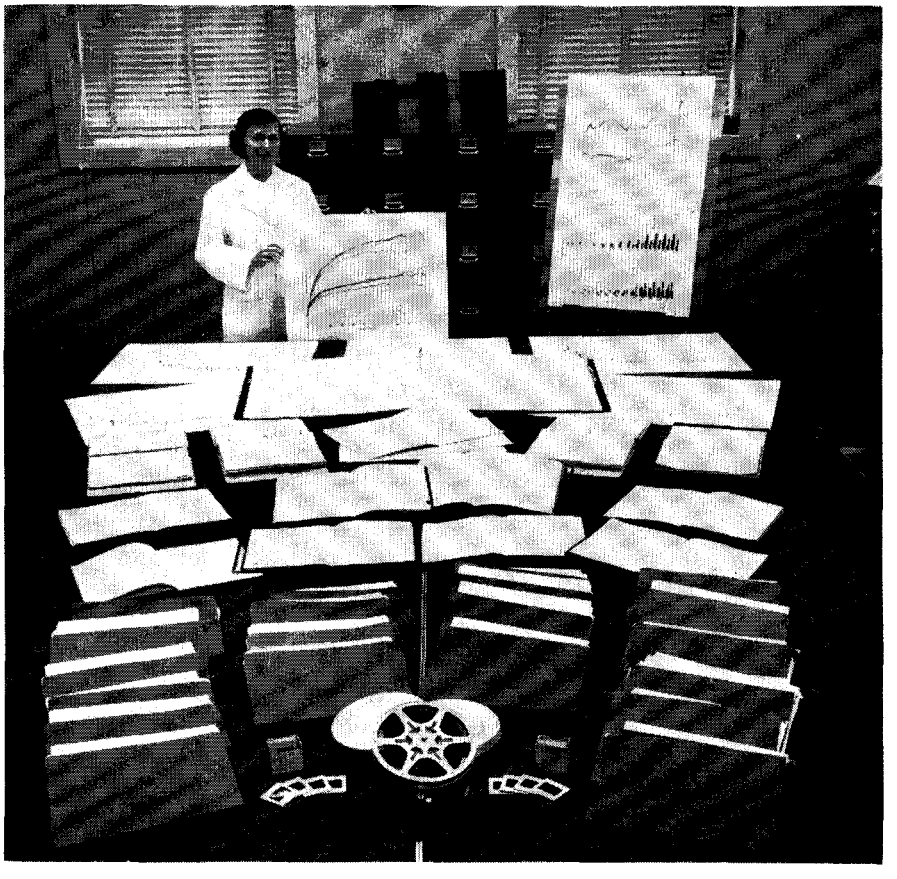
Establishing a sufficiently broad market for a new pesticide also poses some problems. Since FDA sets individual residue tolerances for each crop, the manufacturer must carry out field residue tests on each crop for which he intends to recommend use of the product. The amount of such field testing that can be economically justified obviously is limited.

For those crops of large acreage which afford an adequate potential market there is no great difficulty. But what of specialized crops, often of high unit value, total acreage of which does not present a large enough potential market to warrant the cost of field testing? If such a crop is sufficiently important to the economy of a state, one solution is for the state experiment station to do the field residue testing. Most manufacturers favor this approach. Another suggested solution is that an organization of growers underwrite the cost of the field work necessary to qualify a pesticide. Apparently, this has not yet been done to any extent.

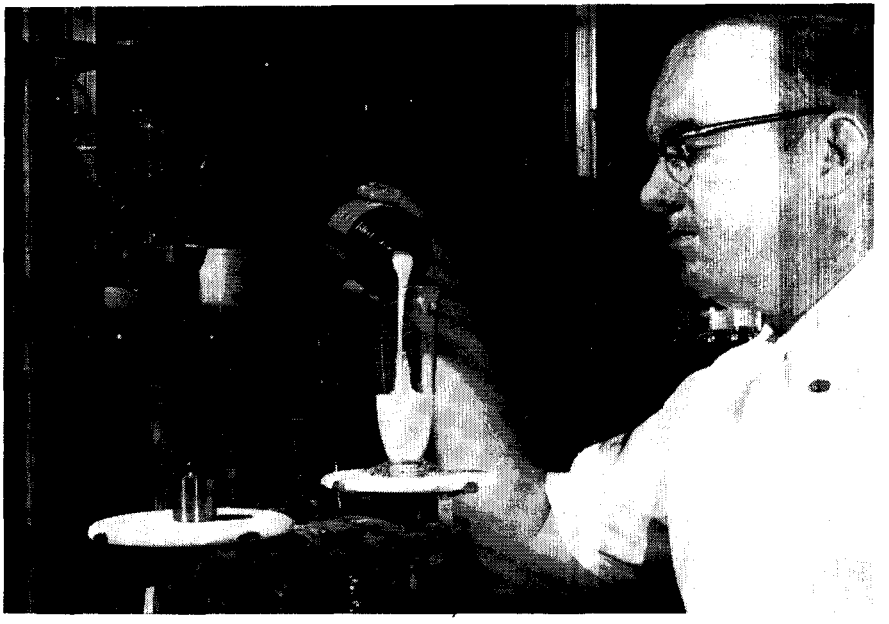
Existing Products Also Affected

The Miller Amendment affects existing products as well as those which may be developed in the future. All pesticides previously registered with USDA have had to be reviewed in light of the tolerances established by FDA, and of the results of field residue tests to determine whether their labels were in compliance with the new law. W. G. Reed, head of the Pesticide Regulation Section, USDA, has reported that of the more than 35,000 labels registered with the department a "significant percentage" bearing on raw agricultural commodity uses will need some changes.

Impact on the individual manufacturer will vary, of course, with the



Above are the records of safety tests run by Du Pont on its Manzate fungicide in order to back up the label below. Included are 4500 notebook pages, 3000 sheets of correspondence, movie film, slides, 50 graphs, and other data



A sample of Saff, Abbott's derivative of safflower oil, for use in management of atherosclerosis. Saff has a high unsaturated fatty acid content (46% linoleic acid), which is believed to reduce blood cholesterol

number of labels registered and the types of materials produced. Several manufacturers, some with more than 100 labels registered, feel that no revision of labels will be necessary. And one large company estimates that only about 5% of its 1000 registered labels will have to be modified. At the other extreme is a company with 500 registered labels of which 90 to 95% will require revision to comply with the Amendment. Such a program is obviously of considerable magnitude and places a real burden on the company concerned.

Industry's Opinion

One difficulty, at least in the eyes of the industry, lies in the administration and interpretation of the amendment. Possibly this difficulty is inherent in establishing the machinery to administer any new law. One major company points out that "certain administrative policies and attitudes adopted by the government agencies have proved to be the most burdensome aspects of the program. We believe that in the over-all interest of pesticide research and development some of these policies could be modified without creating any hazards to public health." Other companies, while voicing much the same complaint, feel that these difficulties will be ironed out as the agencies concerned gain more experience in administering the amendment.

Despite the problems it has raised, most companies feel that, on balance, the Miller Amendment will be beneficial to the agricultural chemicals industry. The measure will increase the supply of good, wholesome food, improve the public's opinion of pesticide chemicals, and protect reputable companies from the inroads of unscrupulous operators. On the other hand, the increased costs could be very detrimental to the operations of the smaller firms. The majority of the criticism leveled at the amendment has come from the medium-sized and smaller companies in the industry.

Fats in Human Nutrition

Interest in fats now goes beyond their importance in nutrition, to spotlight possible role in circulatory diseases

OVERSHADOWING the cigarette *vs.* cancer controversy in some areas is the controversy raging about fats in diet, as they may or may not contribute to heart or other diseases. Opinions vary widely, and include:

- All fats contribute to high levels of cholesterol in human blood; they thus lead to heart disease, and should be avoided if possible.
- Saturated fats (generally animal fats, but also hydrogenated vegetable oils) cause formation of much cholesterol in blood.
- Unsaturated fats (from vegetable sources) lower cholesterol in blood and keep it low.
- Cholesterol content of foods, regardless of source, has much less significance than total caloric value of a diet.
- No conclusion of any kind as to how fats or any other materials influence heart or other diseases can be made on the basis of research completed to date.

Ag and Food Interprets

Very few deny that some fats—maybe limited in chemical composition—are essential to good human nutrition. According to Hazel Stiebeling, head of USDA's Institute of Home Economics, the questions now at hand are: What is the range in the quantity of different kinds of fat needed in nutrition, and how will the rest of the diet affect quantities of these fats that can be used advantageously? Are the proportions of the different fats we now use satisfactory? Under certain circumstances, should there be less or more of some fats?

If data from observations on human subjects serve as a primary guide in searching for an ideal fat intake, says C. G. King, executive director of the Nutrition Foundation, estimates will range from 20% to 45% of total calories. Obviously these estimates mean little without knowledge of specific ingredients of the fat consumed, and related variables. Included in the list of variables are quality and quantity of protein intake, consumption of vitamins B_6 and E, inositol, and choline, age, sex, and hereditary background of the individual under study, and the degree to which the diet as a whole is balanced.

Fat Consumption

The fat content of both the total food supply and household food purchases has increased gradually over the years. Per capita fat intake in the United States runs about 38% of total calories, according to a USDA survey of dietary practices. These data agree with an estimate recently made by a group in Harvard's department of nutrition.

Of course, not all fat available is eaten. Approximately 150 grams of fat per person per day now enters the kitchen, but some of that is thrown away; how much is not known. Surveys of fats consumed run as far back as 50 years—with conflicting conclusions. Thus it is not known whether there has been an increase in the actual per capita proportion of total calories ingested as fats.

If a change in total fat consumption per capita during just the past 20 years has occurred, it has not been great enough to constitute a major factor in public health, according to some opinion. And decreased physical energy output by many individuals in recent years has been more important than any changes in dietary fats, says King.

Beyond the question of total fat intake, high interest is focused on the relative and absolute intakes of three

polyunsaturated fatty acids: linoleic, linolenic, and arachidonic. Again, estimates indicate no major change in absolute intakes.

Of the three, linoleic has a dominant position because of its wide distribution in edible fats and because it can be converted to other fatty acids including arachidonic. Its effectiveness in lowering serum cholesterol concentrations has been demonstrated in many different species of animals and in limited formula feeding studies in man.

Interest in arachidonic acid increases because of growing evidence that it is the biologically active form in which the unsaturated fats exert their influence on cholesterol metabolism. Other evidence points toward arachidonic acid as a constituent of an important enzyme system in heart muscle, cytochrome oxidase. This evidence may also furnish clues to its functional relationship with methionine, choline, riboflavin, and vitamin B_6.

Role of Other Materials and Diet

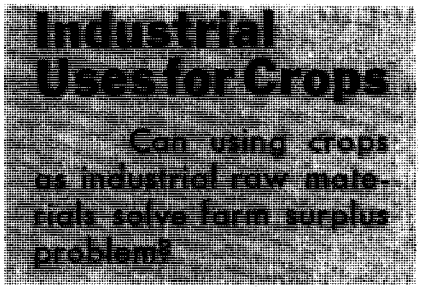
Vitamin B_6, methionine, steroid hormones, and other substances are believed to play an important role in the body's use of cholesterol. Their exact functions remain as yet unknown. Some of these materials may affect cholesterol synthesis; others, cholesterol transport; and still others, the elimination of cholesterol or its conversion to bile acids. Recently more attention has been given to the steroid hormones, as sex differences appear more significant in cholesterol metabolism.

Medical and public health authorities are unanimous in their opinion that there is insufficient evidence to justify any major departure from what nutritionists now regard as a well-balanced diet. They agree that "overweight" in terms of excess body fat represents statistically a serious health risk. Gross overweight correlates with increased incidence of most diseases prominent as causes of death in the United States today including, roughly in order, coronary heart disease, cancer, cardiovascular disease which results in brain lesions, diabetes, liver disease, and risks of surgery. But the degree to which variations in fat intake *per se* can be identified as causing any of these diseases remains uncertain in the opinion of most physicians, statisticians, and nutrition scientists who study the problem.

Workers at Columbia University's Institute of Comparative Medicine, in collaboration with others at the USDA's Eastern Regional Laboratory and at E. F. Drew & Co., are experimenting with "tailor-made" fats. One of these is a mixture of triglycerides of saturated, medium chain fatty acids reconstituted from coconut oil. When included in human diets, this fat seems to facilitate weight reduction and often leads to decreases in the serum cholesterol level. Another similar mixture, but with long chain fatty acids, gave high serum cholesterol levels comparable with those associated with lard. Other workers, including Roslyn B. Alfin-Slater at the University of Southern California, are investigating acetyl fats or acetoglycerides. Nutritional experiments remain limited so results are inconclusive.

Last month Abbott Laboratories added another facet when it released a new material which uses safflower oil as a basic ingredient and contains a high proportion (46%) of linoleic acid. The product (called Saff) is for lowering blood cholesterol levels, and will be supplied for physicians' use as an aid in managing heart disease. New products designed for essentially the same purpose have also been launched recently by Armour (Arcofac) and by Pfizer (Linodoxin).

On the other hand, one of the baffling problems in dealing with health aspects of fats in humans is a lack of techniques to measure effects of lesions associated with heart attacks, cerebral hemorrhages, or diabetes. Use of radioactive carbon and hydrogen, and parallel labeling of important nutrients and intermediates with heavy isotopes, to follow a series of metabolic pathways simultaneously, bring hope for rapid progress in studying nutrition and health problems.



With another harvest season approaching, all signs point to additional crop surpluses. More and more people are looking toward industrial uses for crops as a way out of the surplus dilemma. Last spring's report by the President's Commission on Increased Industrial Uses of Agricultural Products highlighted the possibilities. And with ever-increasing farm productivity, questionable effectiveness of the soil bank as a brake on total production, and rising costs of storing surpluses, the report should grow in significance in the months and years ahead.

The commission's primary recommendation is to step up spending to encourage industrial uses of crops, and for research. Right now, about $16 million a year is spent this way. The commission thinks that at least three times as much should be used. And along with the study of uses for existing crops, the commission proposes that money should be provided for researching new crops, for trial commercialization of processes, and for incentive payments to industry. In fact, the report places so much importance on research that it calls on Congress to declare the fostering of basic research in agricultural products and their uses a national policy.

An important point in the commission's recommendations is that research should be done by the federal government as well as by other agencies. Hopes are high that universities, contract research organizations, and industry will get money that will permit them to do research in crop uses.

Grain the Biggest Headache

Grains make up America's biggest crop, taking 60% of acreage, with corn and wheat making up the lion's share. As of November 1956, wheat is the largest crop in terms of money—about $2.7 billion per year. But corn, which dollar-wise checks in second at $2 billion per year, makes up the largest volume. The 1956–57 supply of corn is 4.6 billion bushels. About 3.1 billion bushels will probably be used, leaving a carryover of about 1.4 billion bushels. Of this total, about 1 billion may be considered surplus.

One of the commission's major recommendations for corn is the production of alcohol for butadiene. Other large new outlets that it sees are in metallurgy, insecticides, defoliants, and paper. These uses alone might take up to 410 million bushels of corn each year. Along similar lines, Corn Industries Research Foundation has recommended ten specific research projects aimed at increasing non-food uses of corn (chiefly starch). The big outlet, which could use up about 100 million bushels of corn per year, is in the metallurgical industry. During concentration of low grade iron ores, starch is used to coagulate dirt and other foreign matter, simplifying their separation. A process for aluminum ore works much the same way. In other metallurgy uses,

starch has been used to bind and pelletize ore powder for drying and transport. CIRF notes that if only a few pounds of starch were used for every ton of ore processed, effect on the corn surplus would be tremendous.

With wheat, emphasis is on a wide range of products derived from wheat gluten. About 5 million bushels of wheat a year is processed for starch and gluten (protein). Gluten is used in adhesives, coatings, paper sizing materials, hormone-type weed killers, and insecticides and fungicides. The weed killers research program is based on USDA findings that wheat gluten amino acids can be combined with known weed killing compounds to increase their activity.

Several other programs now in progress in both government and private laboratories show some progress in using crops as industrial raw materials. For example, plastics may some day become a major outlet for sugar. Research has already turned up a family of sucrose phenol-formaldehyde resins that compare favorably in properties and cost with conventional phenol-aldehyde resins.

Another project generating some interest is one in which USDA researchers are looking for outlets for whey—the liquid left from milk in cheese making. Disposal of whey poses a problem because of its perishability. Feeds account for the largest proportion of whey used, and a search for practical biological methods of producing feed supplements is under way.

Principal solid in whey is lactose—the only sugar produced by the animal world. But only 4% of nearly half a million pounds of lactose in cheese whey is separated and refined. Lactose doesn't compete as a sweetening agent with other sugars, but some of it is used in foods and in candies. Non-food uses found so far range from silvering mirrors to making explosives. Fermenting whey is a fairly promising process. In this way, lactose can be converted into intermediates for riboflavin and butanol. Whey's protein also may have some potential use. More than 80 million pounds of it is made each year, but only a small part of it is ever recovered. A cheap method of separating the usable portions is lacking.

Neither sugar nor whey presents quite the surplus problem posed by the grains and cotton. But new uses for them could help by making sugar beets and dairy cattle more profitable. In turn, these operations would use more land, and reduce the acreage devoted to crops now in surplus.

The cotton surplus problem, a constantly growing one, may be partly solved by projects for cotton fiber modification. In one of these programs, USDA's new fully acetylated (FA) cotton has emerged as an improvement over partially acetylated (PA) cotton. It isn't anywhere near commercial production yet, but laboratory tests show improved heat, rot, and abrasion resistance, higher tear strength, and better thermoplastic properties. FA cotton may cost more than PA material, which is now in limited commercial use.

New Plant Species

New industrially useful crops also are being looked into. Of some 250,000 species of higher plants which have been identified, about 150 are grown by U. S. farmers. But only 80 to 90 species are grown with an annual value of over $1 million. The commission proposes studies on a long series of new crops which may replace surplus ones.

Plant breeding to develop high amylose corn is progressing. The project started at Purdue, and has since extended to other research groups. The University of Missouri recently reported that it has produced a hybrid the starch of which is 82% amylose and only 18% amylopectin. Normally, corn starch is about 27% amylose and 73% amylopectin.

American Maize already is conducting with midwestern farmers a program for planting 30,000 acres a year to waxy corn. Starch from this corn is more like tapioca than ordinary cornstarch, and it has many uses in the food field. Farmers get a premium price of 8% above the regular corn market; an increase in acreage is now planned. National Starch mills the waxy corn.

And Corn Products, working with plant breeders, has come up with a waxy grain sorghum.

Can research solve the many farm surplus problems? There is quite a bit of evidence that it can. USDA's utilization labs, for example, can point to some 115 developments that have been adapted for commercial use. This number excludes some developments that have no immediate commercial value, and others not economically feasible. An intensified program by USDA, by schools, and by industry could probably lengthen the list considerably.