containing ground corn cobs, soybean meal, molasses, urea, bone meal, and the tallow provides a rate of weight gain roughly comparable to that of steers on a standard ration of ground shelled corn, soybean meal, and brome hay. The economy of gain, on the basis of current feed and fat prices, was highly in favor of the steers fed beef tallow pellets. Feed costs per hundred pounds of weight gain, Matsushima reported, were $26.49 for the steers fed beef tallow pellets, $27.67 for those fed the standard ration, and $31.96 for a group fed the same ingredients as those receiving beef tallow pellets, but with corn oil replacing tallow as the added fat component. Preliminary estimates that a suitable addition to cattle rations would be 0.5 to 0.75 pound of fat per day for each 1000 pounds of live weight indicate that virtually the entire annual surplus might conceivably be worked off in cattle feeds. If 10 million cattle were each fed 1/4 pound per day for 100 days, for example, 250 million pounds of fat would be consumed. The total cattle population in the United States is currently estimated at 94 million head.

The nutritional value of fats in feeds now seems to be well established, but as pointed out by E. E. Rice of Swift & Co., physical characteristics, palatability, stability, prejudices, and price must also be considered in deciding whether to attempt large-scale use of fats as feed additives. Price has limited the use of fats in this way in the past, he said, but at current prices calculations indicate that low-grade fats can be added to rations for virtually all meat animals with considerable economic advantage. In many cases, he said, the improved efficiency of feed utilization attending the use of fats makes these materials worth 5 to 10 times as much in the feed as the corn they would replace.

In addition to nutritional economies, the use of 2 to 3% of fats often improves feed palatability and virtually eliminates troublesome dusting which with ordinary mixed feeds is a major problem for the manufacturer and at least an annoying one for the livestock feeder. If all mixed feeds now produced were enriched with 1% of added fat, Rice estimated, 700 million pounds of fats per year would be required, or an amount about equal to the total 1952 fat surplus. Addition of 3% of fat would require over two billion pounds per year, or nearly the entire current annual production of fats mentioned by Dr. Kraybill.

To ensure against the development of rancidity in fat-fortified mixed feeds, it would probably be necessary in all cases to use antioxidants to stabilize the fats. Pilot scale studies and actual commercial scale tests on stabilization have indicated, according to L. R. Dugan, Jr., of the American Meat Institute Foundation, that stabilization can be accomplished economically by incorporation of antioxidants during or, in some cases, even before the rendering process, rather than after. While this investigation is not yet completed, said Dugan, and results are not entirely consistent, it does seem likely that practical, inexpensive methods of large-scale stabilization of low-grade fats can be developed. Feed users thus can plan to take increasing advantage of the availability of this plentiful energy source.

Color Plays an Important Role in Food Preference

Physical and chemical methods are necessary for objective determination of color

CHICAGO.—Color is an important factor in determining food preference; people learn to expect certain colors in their food and any variation from the expected color will lower the preference. Sometimes a variation in color will become identified in the consumer's mind with lowered quality, said Howard G. Schultz, Quartermaster Food and Container Institute, at the symposium on color in foods here Nov. 3 and 4. The symposium was sponsored by the National Research Council and the QM Food and Container Institute and was attended by 128 chemists, physicists, and food technologists. This is thought to be the first meeting bringing together scientists from several fields interested in the problem of food color.

The quality of the light source, the physical and chemical make-up of the object, and the sensitivity characteristics of the eye determine the color as perceived by the eye. In order to consider color it is first necessary to standardize the light source and eye characteristics, said B. A. Brice, Eastern Regional Research Laboratory. Hue, saturation, and lightness must be taken into account.

Reflectance and transmittance data may be used to describe colors in standard terms by using the system established by the International Commission of Illumination (CIE) in 1931. Using this information and tabulated CIE data, the dominant wave length, excitation purity, and luminous reflectance and transmittance, corresponding to hue, saturation, and lightness can be calculated. These methods are somewhat unwieldy and are often replaced by simpler comparative tests.

Storage Changes. Pureed fruits and vegetables and preserved fruit products have been observed to undergo two types of discoloration on storage, according to G. E. Livingston and C. R. Fellers, University of Massachusetts. In the area of the food in contact with headspace gas there

G. E. Livingston (left), University of Massachusetts; E. E. Meschter, American Preserve Co.; C. R. Fellers, University of Massachusetts; and K. T. Farrell, Quartermaster Food and Container Institute, were among the speakers discussing colors in foods

is a local oxidative discoloration. In addition, there is diffused, slower, nonoxidative darkening which develops. In both cases it was noted that carotenoid of chlorophyllaceous pigments changed relatively little.

Anthocyanin pigments in pureed foods such as beets are gradually bleached while the tissue itself is darkened. Highly pigmented preserves will also discolor in storage. When no plant tissue is present discoloration is apparently brought about by originally colorless materials present, such as sugar, pectins, acids, etc. The Maillard reaction is not thought to apply in any of these cases because protein content is quite low.

Although anthocyanin pigments in strawberry products can be measured to provide an objective color determination, such a method is limited because there are other pigments present. E. E. Meschter, American Preserve Co., and R. W. Liggett, Toelle Laboratories, have developed a spectrophotometric color determination suitable for these products. Transmittance measurements using a 1-mm. light beam at three wave lengths enable one to calculate both the value of the red pigment and the degree of browning. The absolute and relative values of these measurements provide a means of objectively determining color which compares closely with evaluation by visual tests.

Evidence Presented for New Growth Factor

Chemistry and action of tetracycline discussed at symposium on antibiotics

WASHINGTON.—The increasing importance of antibiotic as growth stimulators was highlighted by the recent symposium on current research on antibiotics sponsored by the Food and Drug Administration and the *Journal of Antibiotics and Chemotherapy*.

Although the action of the antibiotics in growth stimulation is still not completely understood, it seems to be generally accepted that the mechanism is indirect and probably due to the effects on the intestinal microflora. The action of chlorotetracycline (Aureomycin) on the growth of pigs is, according to L. Y. Quinn, due to the elaboration of a growth factor within the intestinal tract. Dr. Quinn presented a paper on the action of chlorotetracycline in growth stimulation of swine. According to his report, the effect of the administered antibiotic is to stimulate the action of the fungus *Aspergillus flavus*. normally present in the intestinal tract. Additional evidence for the aspergillus growth factor is found in the fact that culture broth of aspergillus added to the ration of pigs caused a significant stimulation in growth.

An examination of the intestinal microflora of pigs which had been maintained on rations with Aureomycin added at growth stimulatory levels showed that there was an increase in the relative number of *Aspergillus flavus* organisms. Previous studies have shown that there was no growth stimulatory effect following the administration of antibiotics to germ-free animals. Thus, the increase in aspergillus was thought to be connected in some way with the growth effect noted.

Dr. Quinn and the others in the research group at Iowa State College have developed a bioassay technique for the unnamed growth factor based on the response of the bacteria *Streptococcus faecalis*. At present they are attempting to isolate the factor and determine its chemical constitution.

Bioassay of standard feed supplements shows that the aspergillus factor is not present in significant amounts in chemically purified vitamins, yeast extract, or other common growth stimulating mixtures.

A report on the action of orally administered antibiotics on the microflora of the rumen was presented by W. B. Hardie of Pfizer Research Laboratories. Although the inclusion of antibiotics in the rumen caused an initial drop in the cellulose hydrolyzing activity of rumen microorganisms, when chlorotetracycline and oxytetracycline are used the microflora return to normal levels if the antibiotics are administered over a long period of time.

Present analytical methods do not reveal any antibiotics in the tissues of animals fed antibiotics in growth supplementary amounts, according to H. P. Broquist and Richard Kohler of Lederle Laboratories. They reported that extremely high levels of antibiotics by oral administration were required before present assay methods could detect appreciable quantities of the materials in the tissues of the animals. If the antibiotic is withdrawn, all trace of antibiotic disappears within three days.

A number of papers on the chemistry and action of tetracycline were presented at the meeting. This antibiotic is prepared by the chemical modification of chlorotetracycline (Aureomycin). The preferred method of preparation is by a catalytic hydrogenation in the presence of palladium or charcoal.

The papers on the mechanism of action and pharmacology of this new antibiotic indicated that it is a broad spectrum antibiotic, with a low order of toxicity. The clinical reports indicate that the material is similar in action to chlorotetracycline and oxytetracycline (terramycin).

On the Cover

Fertilizers and Better Management Are Improving Farming

With the advancement of scientific knowledge in such fields as chemistry and agronomy accompanied by the development of agricultural economics and farm management has come the realization that profitable farming calls for more than plowing, planting, and hoeing. Tradition is being replaced by the scientific approach.

The cover picture illustrates modification of tradition. Scientific management, technological developments, and the application of fertilizer have made it possible for farmers to realize profits from grazing on land which was marginal or inferior for cotton production.

Farming in the South was, for many years, an extractive industry, taking wealth from the soil. We have learned that elements taken from the soil must be replaced by fertilizer in pasture and forage land as well as harvested crops.

Industry

Spencer Forms Research Group To Study Agricultural Chemicals

Spencer Chemical has announced that it will build a laboratory and greenhouse at its Jayhawk Works, Pittsburg, Kan., to be used by a newly formed biological research group.

Otto L. Hoffmann, who joined Spencer in 1952 as a plant physiologist in the agronomy section of the sales development department, will head the new research program. The group will be engaged in evaluating chemical compounds as herbicides, fungicides, nematocides, and plant growth regulators, looking toward the development of new products in the agricultural chemicals field.

Plans for the laboratory are still in the formative stage, no site at Jayhawk having been selected as yet.