

# JOURNAL OF DAIRY SCIENCE

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Vol. XXXII, No. 8, August, 1949

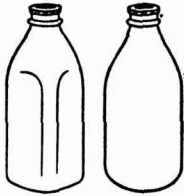
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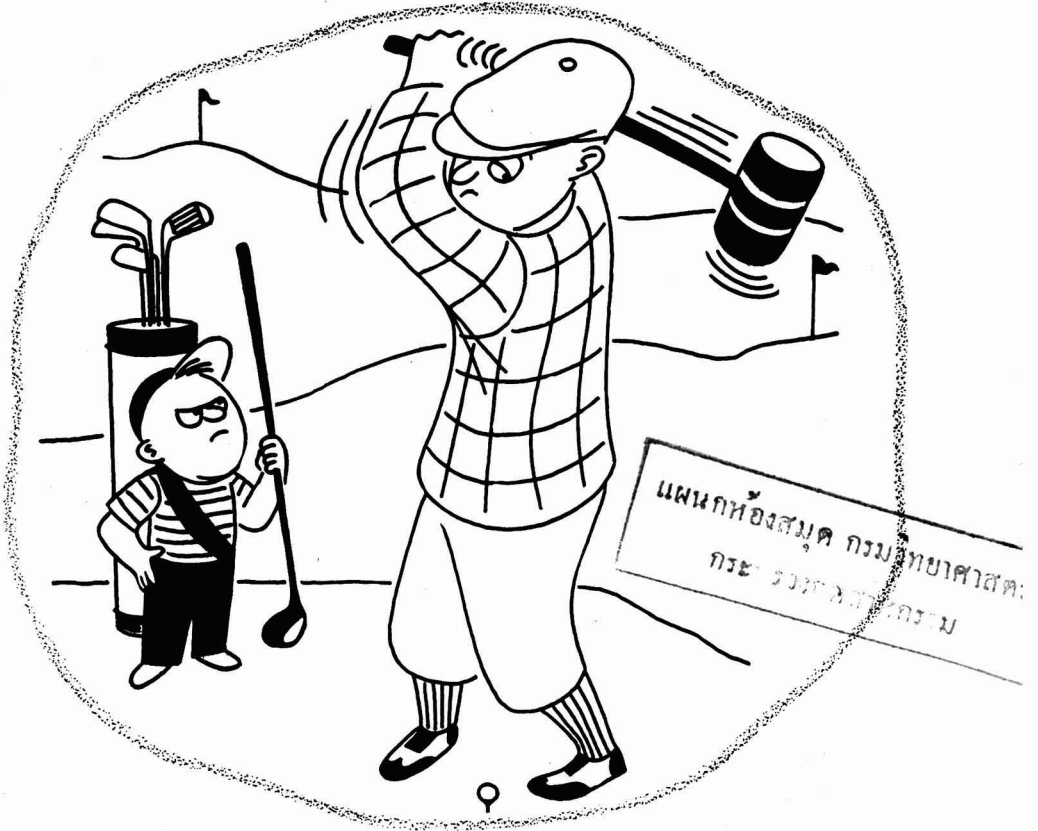
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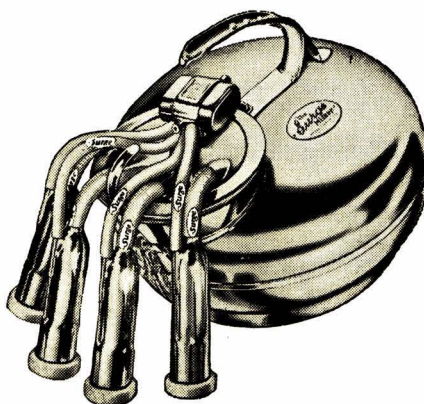
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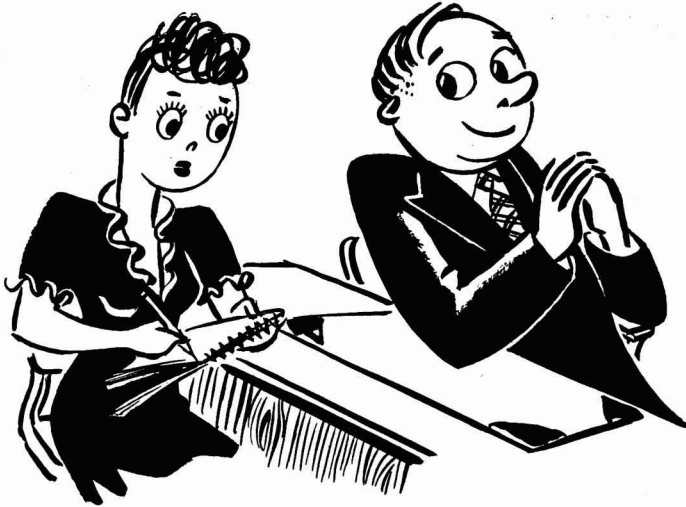
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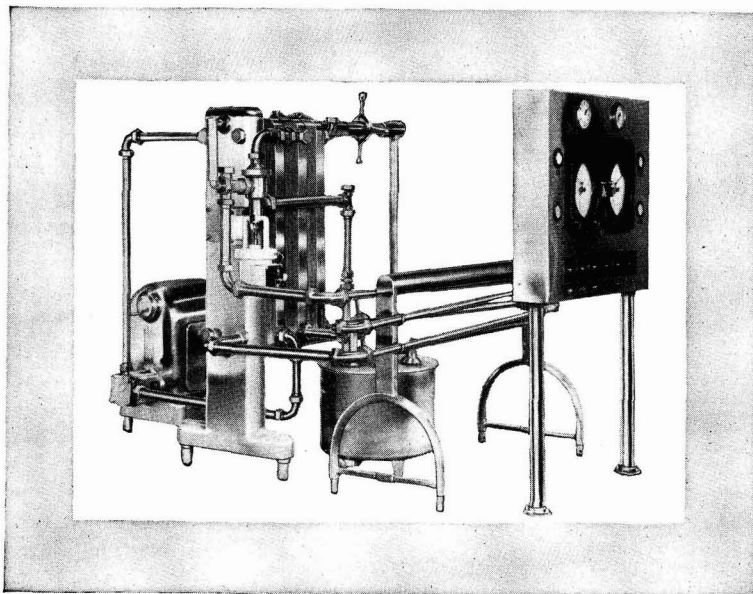
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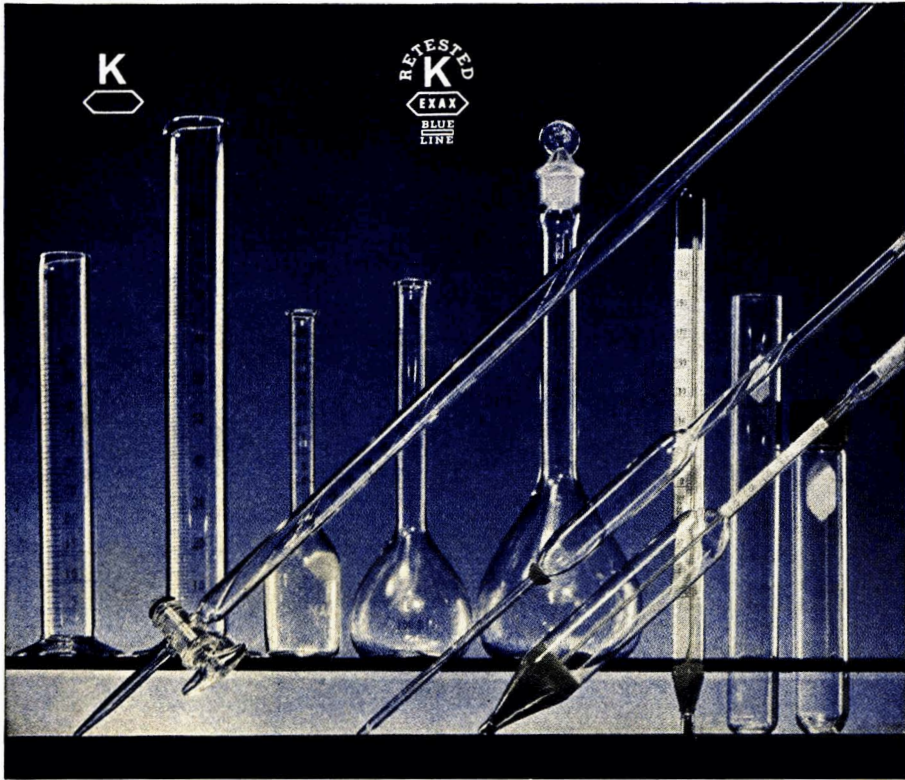
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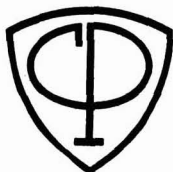
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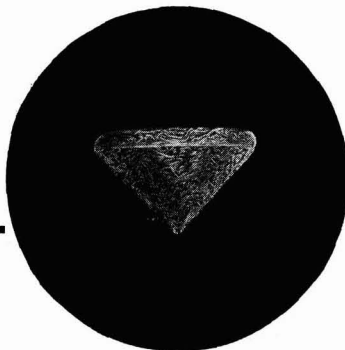
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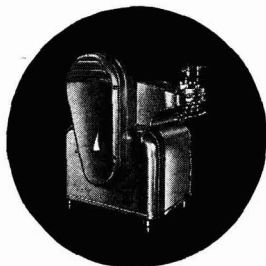
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# JOURNAL OF DAIRY SCIENCE

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AUGUST, 1949

NUMBER 8

## ABSTRACTS OF PAPERS PRESENTED AT THE FORTY-FOURTH ANNUAL MEETING

### MANUFACTURING SECTION

#### M1 **Body of Cultured Cream.** E. S. GUTHRIE, Cornell University.

Pasteurization temperatures near 165° F., with a holding period of 30 min., gave the smoothest, driest, and most viscous body in the final product. Homogenization pressures of approximately 3,000 lb. to the in.<sup>2</sup> resulted in the smoothest, driest and most viscous body when homogenized in a single stage. Rehomogenizing at pasteurization temperatures, or a few degrees below, increased the firmness, dryness and viscosity of the body. A total of 5,000 or 6,000 lb. pressure to the in.<sup>2</sup> in both stages apparently was the limit. Above those pressures the cultured cream was grainy and showed some whey.

The use of rennet made a firmer and more viscous body than when rennet was not employed. Its adaptability is limited by regulations of boards of health.

#### M2 **The Anti-oxidant Properties of Nordihydroguaiaretic Acid in Cream.** V. N. KRUKOVSKY, D. A. THEOKAS, AND F. A. WHITING, Cornell University.

Storage tests on frozen cream and butter indicated that apparently the activity of an as yet unknown plasma factor was responsible for the sensitization of fat to deterioration which, in the presence of ascorbic acid, manifests itself by the development of metallic-to-fishy flavors and losses in content of vitamins A and E in the fat. Experiments were performed, therefore, to learn whether the addition of the fat-soluble anti-oxidant nordihydroguaiaretic acid (NDGA), to cream would result in the stabilization of fat against the foregoing type of deterioration, under the environmental conditions which render fat unstable in a comparatively short time. NDGA was added at the rate of 0.005% of the bulk fat to milk prior to pasteurization at 82.2° C. for 30 min. and separation. The stability of fat was determined in cream held up to 30 d. at 0 to 1° C. following its storage for 15 to 247 d. at sub-zero temperatures, using the re-emulsification test.

NDGA anti-oxidant was effective both in preventing the oxidized flavors in cream, and in the stabilization of fat and the fat-soluble vitamins during storage for 247+30 d. NDGA also caused an apparent increase in the tocopherol content from approximately 2,000  $\gamma$  (winter fat) to 3,200  $\gamma$  per 100 g. of fat, suggesting a possibility that the anti-oxidant activity centered in the fat phase of the cream was responsible largely for its stabilization. In contrast to this, the oxidized flavors were promoted in the control cream after 10 d., and the fat became unstable after 20 d. at 0 to 1° C., following storage for 15 d. at sub-zero temperatures.

#### M3 **The Relation Between The Degree of Solidification of Fat in Cream and Its Churning Time.** J. R. BRUNNER, Michigan State College, AND E. L. JACK, University of California.

The degree of solidification of the fat in cream at the time of churning is measured by a thermal method (J.D.S., 26: 169. 1943). Experimental results seem to indicate that the portion of fat solidified in creams that churn in 40 to 45 min. range from 20 to 35% in creams cooled from the temperature of pasteurization to the churning temperature and from 55 to 65% for creams held cold and then warmed to the churning temperature. In general the fat losses in the buttermilk were greater when the first cooling procedure was used, whereas the employment of the second cooling procedure resulted in the production of butter with a tendency toward crumbly body defect.

#### M4 **The Stability to Drying of Added Vitamin A to Spray Dried Milk.** F. C. OLSON, G. W. GRUBER, R. KOZLIK, AND K. BROWN, Maple Island Farm, Inc. Stillwater, Minn.

Vitamin A ester concentrate was added to milk before drying in concentrations of 750 to 20,000 U.S.P. units/g. of dry powder. Vitamin A was determined by the glyceryl dichlorhydrin method on the condensed milk and dry powder. When

an emulsifier is added to the vitamin A oil so as to mix the vitamin A thoroughly, there is no loss of Vitamin A in drying.

**M5 The Effect of Variations in Acidity on the Keeping Quality of Dried Milk.** G. R. GREENBANK AND P. A. WRIGHT, Bureau of Dairy Industry, USDA.

Theoretically the natural antioxidants in milk may be regenerated by the addition of a proton after they have become inactive or reduced in activity. The protons may be supplied by acids. Lactic acid was used in these experiments and was added to the raw milk before processing. The control sample was processed in the same manner, but the milk was not acidified. The maximum pH that will increase the keeping quality of the dried milk is being studied. The decrease in pH necessary to promote better keeping quality is not detectable by the average person. The acidified samples had better keeping quality.

Evacuation of container and release of vacuum with nitrogen, evacuation and release with CO<sub>2</sub>, canned samples held under high pressure of CO<sub>2</sub>, pressure being released before closing the cans and cans held under pressure of CO<sub>2</sub> and then evacuated and the vacuum released with nitrogen have been compared. Those samples packed by the third method had much better keeping quality than the others. This may be the result of the action of CO<sub>2</sub> as an acid or the decrease of partial pressure of oxygen in the fat. The exact cause is being studied.

**M6 A Method of Measuring Ice Crystal and Air Cell Size of Ice Cream by Microscopical Examination.** L. F. BLANTON AND W. S. ARBUCKLE, North Carolina State College.

A rapid, accurate method for measuring ice crystal and air cell size of ice cream has been developed. The method involves the embedding of thin sections of ice cream in an oil with a refractive index of 1.420 and examining microscopically at -15° F. at a magnification of 100 times. The microscopic field is projected on a ground glass screen and measurements of the length and width of air cells and ice crystals are taken with a millimeter scale and converted to microns. Statistical analysis has been made on the data taken from a number of similar mixes frozen on three different freezers and an experimental design for measurement studies is proposed.

**M7 The Use of Whey in Sherbets.**<sup>1</sup> F. E. POTTER AND D. H. WILLIAMS, Bureau of Dairy Industry, USDA.

Swiss, Cheddar and cottage cheese whey, as well as sweetened and plain condensed Swiss or

Cheddar whey, and dehydrated whey were used in sherbets. Sherbets from concentrated wheys were made to contain 5 per cent whey solids, and the addition of sugar, stabilizer and flavor produced a sherbet containing 4.25 per cent whey solids.

The sherbets could be frozen to any desired overrun on the continuous freezer, but with the batch freezer overruns greater than 70 per cent were obtained before the sherbet was frozen properly. Removal of a major fraction of the protein through heat coagulation did not materially alter whipping properties. Addition of more than 0.6% fat to the whey sherbet formula reduced the overrun to less than 50% when frozen on the batch freezer. The homogenization of whey sherbets containing fat increased the overrun.

Sherbets from cottage cheese whey had an acceptable titratable acidity of 0.35% but sherbets from low acid whey had approximately the same titratable acidity as milk sherbets and therefore required the addition of citric acid.

Sherbets of 1 or 2 per cent butterfat and 5 per cent whey solids could not be distinguished consistently from ice cream mix sherbets when whey of a good quality was used. The whey sherbets were more refreshing than the sherbets from ice cream mix.

**M8 The Effect of Some Emulsifying Agents on the Physical-Chemical Properties of Ice Cream.** J. J. SHEURING, University of Georgia, Athens, H. PYENSON AND P. H. TRACY, University of Illinois.

A standard mix was prepared, frozen in a 40-quart batch freezer, packaged in pint paper cartons and stored at -15 and 5° F. One set of samples was heat-shocked by placing them at 40° F. for 0.5-hr. periods weekly for 4 weeks and then returning to the storage cabinet each time. Sorbitan monostearate, glycerol monostearate and a mannitol ester of stearin were studied with and without the use of gelatin as a stabilizer.

In the amounts used in ice cream, the emulsifying agents were not detected by modified Babcock procedures but were detected in most cases by other extraction methods. They have no preservative action, produce no marked differences in pH, acidity and viscosity in ice cream mixes when used alone or in combination with gelatin. Heat-shocking of samples containing emulsifying agents and storing at elevated temperatures (5° F.) reduced body and texture scores to about the same degree. The emulsifying agents did not offer any protection against heat-shocking.

<sup>1</sup>This work was done with funds from the Agricultural Research and Marketing Act of 1946.

**M9 Some Factors Influencing Shrinkage in Ice Cream.** J. J. SHEURING, University of Georgia.

This study was undertaken to investigate the effect of air cell size, ice crystal structure, protein destabilization, external and internal pressures, temperatures of storage and ice cream porosity upon shrinkage. Although the study is not complete, the following information has been obtained: (a) ice cream shrinkage is not due to decrease in air cell size due to lowering temperatures, (b) porous ice cream does not shrink as much as a non-porous product, (c) shrinkage probably is caused by collapse of air cells due to changes in external pressure and (d) the internal pressure of ice cream does not change noticeably during the hardening process.

**M10 The Manufacture of "Cultured" Ice Cream.** W. H. E. REID, J. H. GHOLSON, C. B. AGEE, AND R. M. HANCKEL, Missouri Agricultural Experiment Station, Columbia.

Variable amounts of dehydrated culture do not present special problems in calculating, processing, freezing of the mix or hardening of the ice cream. The distinctive cultured flavor becomes more pronounced with increased amounts of the dehydrated culture. With increased increments of the dehydrated culture, the body becomes more smooth and mellow, the texture becomes proportionally closer and the resistance to melting greater. Three per cent of culture seems to be most desirable to the majority of the consumers, 5% resulting in a slight powdery feel in the mouth and a cultured flavor which may be too pronounced for some consumers. The resultant ice cream shows slight excessive stability and has a tendency to be brittle. As the percentage of butterfat is increased, the cultured flavor tends to be submerged.

The general trend, when increasing the amount of dehydrated culture in vanilla ice cream, was an increase in the stability of the ice cream with increased increments of dehydrated culture. By replacing one-third of the sucrose with dextrose the ice cream has a smoother and more desirable melt-down. When the total solids are increased by increasing the serum solids and using 3% dehydrated culture as serum solids the stability decreases. If the total solids are increased by using a higher butterfat content and 3% dehydrated culture as serum solids, the stability of the ice cream increases.

**M11 Utilization of Dehydrated Whey Solids in Ice Creams and Sherbets.** J. H. GHOLSON, W. H. E. REID, R. J. BASNETT, AND R. M.

HANCKEL, Missouri Agricultural Experiment Station, Columbia.

Dehydrated spray process whey solids may be used in different flavored ice creams and sherbets without altering the processing, freezing or hardening procedure commonly applied in commercial ice cream plants. As much as 90% of the serum solids may consist of dehydrated spray process whey solids in the manufacture of ice creams and sherbets possessing a desirable flavor, body, texture and melt-down. Ninety per cent of serum solids in chocolate and strawberry ice creams also may consist of whey solids. Pineapple, orange and raspberry sherbets containing as much as 90% whey solids were very desirable in every respect.

The stability of flavored ice cream increases up to the point where 70% of the serum solids consisted of whey solids from spray process whey powder; 90% whey solids, tends to reduce stability again.

**M12 The Relative Sweetness of Certain Corn Sweeteners in Ice Cream.** L. D. HILKER, National Dairy Research Laboratories Inc.

Differences in the sweetness of the corn sweeteners used with sucrose in ice cream are recorded by a taste panel with the relative sweetness in descending order as follows: Cerelese, Sweetose, Hi-De and Frodex. Conditions which promote a high sweetness index of the corn sweeteners in ice cream are low percentage of corn sweetener, high ratio of sucrose to corn sweetener and high total sweetness. Selection of the panel, presentation to the panel of samples for comparison and evaluation of panel data are discussed. Tables suitable for use by ice cream manufacturers are given which show the amount of corn sweetener required to replace 15, 20 and 25% of the sweetness of ice cream having a total sweetness, as sucrose equivalent, of 15, 15.5, 16, 16.5 and 17%.

**M13 The Sizes of the Colloidal Protein Particles of Skim Milk.** T. F. FORD AND G. A. RAMSDELL, Bureau of Dairy Industry, USDA.

Sedimentation analyses of skim milk, made by using the laboratory centrifuge and the McBain air-driven ultracentrifuge, show that there are a limited number of different sizes of colloidal or acid-precipitable protein particles in skim milk. These sizes are definite, occur in two separate size ranges, and in each range the specific sizes are multiples of a unit. The particles are highly solvated, and the data indicate that all are spherical in shape. Although the specific sizes are definite, the distribution of sizes varies widely between milk samples, and is altered readily by

treatment. The particles in the two size ranges appear to represent two separate chemical entities, differing principally in phosphorus content. The diameter of the unit particle of the component present in the largest amount is about 640 Å. The gram particle weight of this solvated unit is about 94 million. The apparent molecular weight of the dry protein frame work is 33 million. The dominant particle in normal skim milk is composed of 16 of these units.

Calcium and casein nitrogen are removed together at the same rate as the colloids are removed from skim milk by centrifuging. This observation, combined with analyses of the separated colloids previously reported, leads to the conclusion that casein exists in milk as a calcium caseinate-calcium phosphate complex. If there is any concomitant free colloidal calcium phosphate, it is present in very small amount.

#### M14 Determination of Reducing Groups in Proteins and in Milk with *O*-iodosobenzoate.

B. LARSON AND R. JENNESS, Minnesota Agricultural Experiment Station.

A modification of Hellerman's (J. Am. Chem. Soc. 63: 2551. 1941) iodosobenzoate titration method for sulfhydryl groups in proteins has been developed. *O*-iodosobenzoate is added to a solution of the sample and after allowing 2 min. for reaction to occur, the solution is acidified and KI is added. The excess unreduced *o*-iodosobenzoate liberates iodine from the iodide and this can be titrated with thiosulfate. In Hellerman's original method starch indicator was used to detect the end point of the titration. This is subject to considerable error, particularly in titrating very dilute or opaque systems, because the end point is not sharp. Furthermore, proteins may adsorb or react with a considerable amount of the iodine liberated. In the present modification these difficulties are eliminated by an electrometric determination of the end point, which combines some of the features of "dead-stop" and amperometric titrations. The method has been applied to study of the sulfhydryl groups in proteins, including those of milk, and to determination of the effects of heat on some of the reducing substances of milk.

#### M15 Isolation of Minor Organic Compounds From Heated Milk. S. PATTON AND D. G. KEENEY, Pennsylvania State College.

Skim milk was heated to 122° C. for 60 min. Procedures used to remove, purify and concentrate minor organic substances included combinations of the following: addition of inorganic solute, solvent extraction steam distillation, and

normal and reduced pressure distillation. Data obtained concerning melting and boiling points, melting points of prepared derivatives, solubility characteristics, qualitative tests, etc., indicate the following types of compounds to be present in heated skim milk: (a) acids of the aliphatic series, such as acetic and butyric, (b) carbonyl acids, (c) sulfur-containing acids (nonamino), (d) mono and dicarbonyl compounds and (e) furan compounds. The specific identity of these components is being studied, the data being secured by the preparation of various crystalline derivatives.

#### M16 Milk Surfaces. II. Surface Tension Changes in Relation to Some Treatments of Milk. C. H. WHITNAH AND W. H. CHILSON, Kansas Agricultural Experiment Station, Manhattan.

A sample of freshly pasteurized milk was divided into three parts. Part 1 was not modified. Vitamin C was added to part 2. Copper sulfate was added to part 3. Immediately before studying the surface tension some of part 2 was homogenized in a hand homogenizer.

Surface tension then was measured on each of 4 samples at temperatures of 15, 20, 30 and 40° C. Another part of each sample then was diluted with water to 0.01% milk and to 0.001% milk. The time change of surface tension was measured at 25° C. These measurements were made after storage of 0, 2, 3, 4 and 8 days and on samples of fresh milk taken weekly beginning Feb. 7, 1949.

In all these samples of milk the temperature coefficient of surface tension was greater than previously reported for summer milk at Denver. Average temperature coefficient values were slightly less after addition of vitamin C and usually slightly more after addition of copper. These last two differences were of very doubtful significance.

For the diluted samples the differences in induction time before the first fall and in the rate of fall varied greatly. These variations are not related simply to the treatment of the milk nor to the age of the treated sample.

#### M17 Turbidity as a Means for Determining the Efficiency of Homogenization U. S. ASHWORTH, State College of Washington.

When 1 ml. of whole milk is treated with 5 ml. of 5*N* NH<sub>4</sub>OH and diluted with 244 ml. water at 50 to 55° C., the resulting turbidity as measured 30 min. later in a photoelectric colorimeter is proportional to the size of the fat globules and the concentration of fat. When the fat content is known, the proportionality constant *K*, relating

to the size of the fat globules, can be calculated by dividing the photometric density by the final concentration of fat in mg./ml. This value for  $K$  has been shown to be proportional to the percentage of homogenized milk added to unhomogenized milk. When the Evelyn colorimeter is used to measure the turbidity, unhomogenized milk gives a  $K$  value of 1.1, while properly homogenized milk gives a value for  $K$  of 2.3. There is a close correlation between the homogenization pressure used and the turbidity, also between the U.S.P.H.S. cream rising index and the value for  $K$ .

**M18 The Instability of Ascorbic Acid in Water, with Added Copper or Hydrogen Peroxide or Both.**<sup>1</sup> R. W. BELL AND T. J. MUCHA, Bureau of Dairy Industry, USDA.

The effect of different factors, particularly the source of the water, on the stability of ascorbic acid solutions was investigated. Water may contain impurities that accelerate the oxidation of ascorbic acid and only pure water should be used in preparing an ascorbic acid solution that is to be used in standardizing 2,6-dichlorophenolindophenol with which the ascorbic acid content of milk and other fluids can be measured in acid solution by direct titration.

Since ascorbic acid is likely to be used in increasing amounts for retaining the fresh flavor of milk, the importance of correctly standardizing the dye solution used in measuring the ascorbic acid content of milk becomes apparent.

**M19 Deferment of an Oxidized Flavor in Frozen Milk by Ascorbic Acid Fortification and by Hydrogen Peroxide Oxidation of the Ascorbic Acid of the Fresh Milk.**<sup>1</sup> R. W. BELL AND T. J. MUCHA, Bureau of Dairy Industry, USDA.

Experiments were conducted to determine how long the onset of the characteristic oxidized flavor could be deferred in frozen storage by  $H_2O_2$  oxidation of ascorbic acid in the fresh milk and whether fortification of the fresh milk with ascorbic acid would be as effective. Rapid and complete ascorbic acid oxidation in the fresh milk by  $H_2O_2$  was effective in delaying but not in preventing the defect, since in all experiments the oxidized flavor was detectable eventually. The same was found to be true when the milk was fortified with ascorbic acid.

Somewhat better results were obtained when the fresh milk was fortified heavily with ascorbic

acid than when an optimum amount of  $H_2O_2$  was added. Desirable properties of ascorbic acid for this purpose are mentioned and reasons for the stabilizing effect are described briefly.

**M20 Electrometric Titration of Milk and Dairy Products in the Determination of Titratable Acidity.** W. A. KRIENKE, Florida Agricultural Experiment Station.

A Model H Beckman glass electrode pH meter was used for "end point" determination in the electrometric titration of milk and various dairy products. The electrodes and a motor-driven glass stirrer were mounted in a holder to accommodate a 100-ml. beaker as the titration container.

With the stirrer in motion, 0.1  $N$  alkali was added until pH 8.3 was reached, the amount of alkali required recorded, six drops of 1 per cent phenolphthalein solution added and titration completed to the "pink end point." By observing the movement of the pH meter needle, only 30 seconds are required to add the alkali to the sample. The "fading end point" and a change in the titratable acidity value due to cautious and slow titrations thus are eliminated.

Ranges in pH values obtained on the various products at the pink-color end point were for whole milk 8.53 to 8.65, condensed skim milk 9.00 to 9.08, cream 8.68 to 9.02, ice cream mix 8.70 to 9.02, skim milk 8.53 to 8.63, chocolate milk 9.10 to 9.30 and evaporated milk 8.96 to 9.04. The color of strawberry and cherry ice creams so obscured the phenolphthalein end point that it could not be established with certainty even at pH 9.5.

**M21 A Re-evaluation of the Hortvet Formula and Freezing Point Value of Milk in Estimating the Percentage of Added Water.** W. A. KRIENKE AND L. R. ARRINGTON, Florida Agricultural Experiment Station.

Samples of whole milk representing herds and individual cows of the Jersey and Holstein breeds were collected over a period of several months and their freezing points determined with a Hortvet cryoscope, using the recognized official method. Portions of some of the samples were diluted with known quantities of distilled water and their freezing points determined. Mean freezing point values were  $-0.549^\circ C.$  for 29 samples from individual Jerseys,  $-0.539^\circ C.$  for 13 samples from individual Holsteins,  $-0.542^\circ C.$  for 14 samples of herds of Jerseys, and  $-0.535^\circ C.$  for 6 samples of herds of Holsteins.

When the accepted value of  $-0.550^\circ C.$  is used in the formula for estimating the percentage of

<sup>1</sup> This work was done with funds from the Agricultural Research and Marketing Act of 1946.

added water, a false interpretation results. If the freezing point values for the diluted samples likewise are used, the calculated per cent of water added will be in excess of the amount known to have been added. Therefore it appears that a value somewhat higher than  $-0.550^{\circ}$  C. must be established to permit better interpretations of water adulteration.

**M22 Preliminary Observations of the Effects of Ladino Pasture and Hay Feeding on Tocopherol Content of the Fat and Stability of Milk.** V. N. KRUKOVSKY, J. K. LOOSLI, AND D. A. THEOKAS, Cornell University.

Observations indicated that the levels of tocopherols in the milk fat are influenced by the type and qualities of the roughages fed to the cow and that the relationship might exist between the tocopherol content of the fat and the susceptibility of milk to oxidized flavors. Feeding ladino pasture resulted in tocopherol levels of the fat considerably higher than were found when ladino hay was included in the ration, but not as high as when the cows were transferred to birdsfoot pasture. A gradual increase was observed in the tocopherol content of the fat from 2,938  $\gamma$  (av. value) per 100 g. of fat at the end of ladino pasture to a plateau level of 4,350  $\gamma$  during the third and fourth weeks of birdsfoot pasture. Milk of poor keeping quality resulted during the ladino feeding (both pasture and hay), whereas the transfer of the cows from ladino to birdsfoot pasture resulted in an appreciable stabilization of milk, even in the presence of added copper. The transfer of the cows from birdsfoot pasture to hay feeding in the barn resulted in the decrease in the tocopherol content of the fat and greater susceptibility of milk to oxidized flavors depending upon the kind and quality of hay fed.

**M23 Effects of External Temperature and Pasturage on the Degree of Unsaturation of Milk Fat.** E. E. BARTLEY, E. W. BIRD, C. Y. CANNON AND J. H. ZALETEL, Iowa State College.

The objective of this study was to separate the effects of seasonal changes in temperature from the effects of pasture feeding to determine the relative importance of these two factors in producing the highly unsaturated milk fats encountered during the summer. Twelve Holstein cows freshening at various times during the experiment (duration 13 months) were divided into two similar groups. Both groups at first received prairie hay and a grain mixture. One of the groups continued on this ration for the entire trial

while the other group was placed on pasture during the grazing season, pasture grass replacing the hay. The cows receiving grass grazed only at night, while the other cows were placed in a drylot where they received hay. Daily records of the environmental temperatures were kept. Iodine and thiocyanogen values were determined on weekly samples of butterfat from each individual animal.

Pasture and stage of lactation have primary influences on the degree of unsaturation of milk fat, while changes in temperature appear to be of considerably less importance. Production of highly unsaturated fats at the peak of milk production, followed by a gradual decrease in unsaturation to about the fifth month and then a gradual increase continuing to the end of lactation, appear to be definite lactation trends.

**M24 Separation of Fatty Acids by Displacement Chromatography and its Application to Analysis of Butter Fat.** R. T. HOLMAN AND L. HAGDAHL, A. and M. College of Texas.

Using the displacement development technic and the absorption analysis apparatus of Tiselius, fatty acids from  $C_1$  to  $C_{22}$  have been separated. By using fatty acids as displacers and by choosing suitable solvent conditions, homologs of 1 carbon atom difference can be separated and measured. Unsaturated acids can be separated from saturated acids. Usual sample sizes of 50 to 200 mg. can be separated into the component acids with 90 to 100% recovery in chromatograms developed in 3 to 6 hr. Typical experiments were described and results shown. Application to analysis of dairy products were discussed.

**M25 Some Observations on Fat Fractions from Butter Oil.** A. T. MUSSETT, S. PATTON AND C. D. DAHLE, Pennsylvania State College.

Liquid and solid fat fractions were obtained by hydraulic separation of fresh butter oil using a Carver laboratory press. Separation at  $70^{\circ}$  F. gave approximately 30% solid and 70% liquid; at  $50^{\circ}$  F., 80% solid and 20% liquid; at  $32^{\circ}$  F., 90% solid and 10% liquid. The acid and iodine numbers of the 70 and  $50^{\circ}$  F. solid fractions were significantly lower than those of the corresponding liquids. The keeping qualities of the solid fats, as determined by organoleptic tests, were much superior to those of the liquid samples. A preliminary trial using the  $70^{\circ}$  F. solid fraction as the sole source of fat in dry whole milk has produced a product with improved flavor. The high melting fractions should constitute a suitable form in which to store fat for ice cream.



**M26 The Steam Distillation of Stale-flavor Component from Stale Butteroil.** R. McL. WHITNEY, KATHERINE PAULSON AND P. H. TRACY, University of Illinois.

A procedure was developed which was successful in distilling the stale-flavor component along with other volatile components from stale butteroil. The petroleum ether-soluble portion of this volatile fraction was found to contain approximately 10,000 times as much stale-flavor component per unit weight as the dried whole milk from which it was obtained originally. This procedure involves the steam distillation of stale butteroil under a pressure of approximately 70 mm. of mercury and at a temperature of approximately 45° C. The distillate is collected in water at 0° C. and, after distillation, this aqueous suspension is extracted with petroleum ether. The fraction containing the stale-flavor component then is obtained by removing the petroleum ether by aspiration.

It also was observed that the stale-flavor component apparently is synthesized in the stale butteroil during steam distillation, since the concentration of the stale-flavor component in the residual butteroil after distillation was the same as or greater than that in the original butteroil.

**M27 The Extraction of Stale Butteroil from Stale Dried Whole Milk by Organic Solvents.** R. McL. WHITNEY AND P. H. TRACY, University of Illinois.

In a search for a more efficient method for obtaining stale butteroil from stale dried milk, several different Soxhlet type extractions were investigated with variations in the type of powder, pretreatment of the powder and extracting solvent.

Spray-drying uncondensed, unhomogenized milk at low pressures yields a product from which much higher recoveries of butteroil are obtained than from a milk powder prepared in a similar manner from a condensed milk.

Hydration to 8% moisture of a dried milk prepared at low spray pressures from condensed unhomogenized milk results, upon extraction, in a high yield of butteroil. If a milk powder prepared in this manner is agitated with 95% alcohol plus sufficient water to hydrate the powder to 8% moisture, high recoveries of butteroil are obtained, provided the fat dissolved in the alcohol is recovered. Anhydrous ethyl ether and petroleum ether are suitable solvents.

Upon the development of a special solvent-removal technic to reduce the solvent concentration so as not to interfere with organoleptic tests, the stale-flavor component was found to be extracted

with the butteroil in the same proportion as it occurs in the fat in the dried whole milk.

**M28 Sanitary Standardization of Equipment Used in the Dairy Industry.** E. H. PARFITT, Evaporated Milk Assoc., Chicago.

To secure uniformity of design and to reduce the cost of equipment the dairy industry has created a committee known as the Sanitary Standards Committee. This committee represents the seven branches of the dairy industry. Equipment common to all branches of the industry is being reviewed for the purpose of writing sanitary standards that will meet the approval of the International Association of Milk and Food Sanitarians and the U. S. Public Health Service. On approval by these two latter organizations, these standards are published and companies fabricating equipment meeting these standards designate their equipment as 3-A.

Standards for finish of stainless steel, minimum knuckle radius, minimum slope for drainage, maximum size for ease of cleaning, ease of disassembly, etc., have been developed for pipe line fittings, milk storage tanks, weigh cans and receiving tanks, and homogenizers.

Tentative standards are now in the hands of the industry and regulatory groups for approval of the following pieces of equipment: milk transportation tanks, heat exchangers (plate, surface and tube), milk filters, milking machines, milk pails and strainers, can washers, electric motors and, for point-of-sale equipment, ice cream cabinets and soda fountains.

**M29 Nutrition of the Lactic Group of Streptococci and its Relation to Bacteriophage Multiplication.** E. B. COLLINS, F. E. NELSON AND C. E. PARMELEE, Iowa Agricultural Experiment Station.

Sodium acetate and/or Tween 80 were found essential, as shown by turbidity measurements, for the growth of 9 of 32 strains of *Streptococcus lactis* and 22 strains of *Streptococcus cremoris* in a chemically defined medium based upon that of Niven (J. Bact., 47: 343-350. 1944). Reticulogen, a commercial liver extract, could be substituted in somewhat smaller quantities for sodium acetate and Tween 80 and also was the only supplement which permitted rapid growth of one strain of *S. cremoris*, which did not become turbid until after 24 hr. in the medium supplemented with sodium acetate and Tween 80. Neither sodium acetate nor Tween 80 alone would suffice for serial transfer of most cultures; however, sodium acetate alone was effective for more cultures than was Tween 80 alone. Most strains

of the lactic group which had been in the laboratory for considerable time were found to be *S. cremoris*, while all recently isolated strains were found to be *S. lactis*, on the basis of ammonia formation from arginine and growth at 40° C.

With two *S. lactis*-bacteriophage combinations, multiplication of both bacteriophage and organism were affected similarly by the omission of individual components from the unsupplemented complete medium of Niven. Bacteriophage multiplication seems to be associated closely with organism multiplication for these two combinations. However, with a third *S. lactis*-bacteriophage combination, bacteriophage multiplication does not occur in the defined medium which is adequate for organism growth.

Further studies of the relationship between organism multiplication and bacteriophage multiplication in defined media are being made.

**M30 Thermal Death Time Studies of Coliform Bacteria in Milk.** J. C. OLSON, JR., H. MACY AND H. O. HALVORSON, University of Minnesota.

Each of 139 coliform cultures was assayed for heat resistance at 135° F. A multiple-tube technique similar to that used by Slatter and Halvorson (*J. Dairy Sci.*, 30: 231-243. 1947) was used. Thermal death times at 135° F. varied from less than 5 min. to over 150 min. The most heat-resistant cultures were, almost exclusively, members of the *Escherichia coli* section as described by Parr (*Bact. Rev.*, 3: 1-48. 1939). On repeated trials under similar conditions of culture manipulation, thermal death time variations of a pure culture of *E. coli* ranged from 39 to 74 minutes at 140° F. Similar variations occurred at other temperatures.

In two trials the *z* values (*Bull. Nat. Research Council. U. S.*, 7: Part I, no. 37. 1923) of thermal death time curves for suspensions of *E. coli* (50,000 cells/ml.) in milk, prepared from cultures grown in milk at 37° C. for 16 hr., were 10.5 and 10.8. For suspensions prepared from from cultures grown at 37° C. for 24 hr., *z* values of 10.0 and 11.0 were obtained. The *z* values of thermal death time curves for similar suspensions of *E. coli* prepared from cultures grown at 20, 30 and 37° C., each at a comparable stage of growth, were 9.7, 11.4 and 11.5, respectively. With suspensions containing 5 million cells/ml., prepared from cultures grown at 37° C. for 24 hr., *z* values of 11.7 and 13.0 were obtained.

The slope of a curve plotted on semi-logarithmic paper by connecting with a straight line two points, one representing low-temperature, holding (143° F. for 30 min.) and the other representing high-temperature, short-time pas-

teurization (160° F. for 15 sec.), may be expressed by a *z* value of 8.25. Significantly all *z* values of thermal death time curves obtained were greater by a considerable margin than the *z* values of the "pasteurization curve". The data obtained in this regard provide evidence in support of the theoretical explanation advanced by Ball (*Ind. Eng. Chem.*, 35: 71-84. 1943) for the observed differences in bacterial destruction by the two processes.

**M31 Studies on Acid Production, Loss of Bacteriophage and Resistance of a Bacteriophage-sensitive Culture of *Streptococcus lactis*.** H. F. FORD AND F. J. BABEL, Purdue University.

The influence of bacteriophage on the acid-producing ability of a culture of *Streptococcus lactis* and the duration of bacteriophage in a sensitive culture were studied. The acid-producing ability of the culture studied was influenced greatly by an initial inoculation of bacteriophage; however, after secondary growth occurred, future transfers of the culture were approximately as active as the same culture maintained in a bacteriophage-free condition, although the one culture carried bacteriophage. Some of the cultures given an initial inoculation of bacteriophage and carried through several transfers finally became free of bacteriophage. The loss of bacteriophage did not influence the rate of acid production of the culture.

The time required for a sensitive culture to become free of bacteriophage when given an inoculation of bacteriophage was dependent upon the temperature of incubation. A culture inoculated with bacteriophage and carried at a temperature of 37° C. became free of bacteriophage after 11 transfers. The same initial culture inoculated with bacteriophage and incubated at 26° C. for 10 propagations and further incubated at 21° C. lost bacteriophage after 35 transfers. Also, the same initial culture inoculated with bacteriophage and incubated at 21° C. was not free of bacteriophage after 127 transfers.

A culture inoculated with bacteriophage and transferred until the culture was bacteriophage-free was not sensitive to the bacteriophage with which it was treated but was sensitive to other bacteriophage preparations.

**M32 Variations Encountered in the Grading of Raw Milk with the Methylene Blue and Resazurin Reduction Tests.** R. K. LEWTON, D. M. MARKLAND AND F. J. BABEL, Purdue University.

Excellent correlation was obtained between the methylene blue reduction test and the resazurin



reduction test when both tests were read at the time the dyes were reduced completely. However, when comparisons were made on the grading of raw milk by the methylene blue test and the triple-reading resazurin test read at the pink end point (Munsell Standard P 7/4), the resazurin test placed considerably more test samples in the poorer classes than the methylene blue test. Variations in the results obtained could be explained partially on the basis of the body-cell count.

The plate count and direct microscopic count classified 66% of the samples alike and there was a difference of one grade with 29% of the samples. The methylene blue test classified 72% of the samples the same as the plate count and there was a difference of one grade with 24% of the samples. The resazurin triple-reading test classified 41% of the samples the same as the plate count, 20% in a classification one grade lower, 18% two grades lower and 17% three grades lower than the plate count. Approximately 4% of the samples were graded higher by the resazurin test.

Most of the samples of raw milk showing extreme differences in classification, when using the plate count and resazurin triple-reading test for grading, had plate counts of 50,000 or less.

**M33 Standards for Grades of Milk for Use in Manufactured Dairy Products.** C. J. BABCOCK AND H. J. EMERY, Manufactured Dairy Products Division, Dairy Branch, PMA, USDA.

One of the main obstacles to quality improvement is the lack of uniform and generally recognized standards of grades for milk and cream. Such standards would provide a uniform basis for buying milk and cream according to quality and for otherwise carrying out quality improvement work. The U. S. Department of Agriculture, in cooperation with dairy industry organizations and state agencies, therefore is formulating standards for milk and cream grades. The response to the tentative draft of these standards indicates a need for such standards. A summary of the comments received from industry organizations and State agencies will be presented.

**M34 The Effect of Certain Metallic Ions on the Germicidal Activity of Quaternary Ammonium Germicides.** W. S. MUELLER AND D. B. SEELEY, University of Massachusetts.

A study has been made on the effect of metallic ions on the germicidal action of quaternary ammonium compounds. Elements were selected from the periodic table in such a manner as to

compare light and heavy metals, metals of different atomic weights and metals of different valences. Salts that contained an anion which showed no measureable interference were used so that the effect of the cation alone could be studied. The study also involved an understanding of the effect of pH on germicidal action since the pH values of the salt solutions varied.

Valence and pH were the two most important factors determining the interfering power of a cation. Monovalent, divalent and trivalent cations had interfering power approximately in the ratio of 1:100:10,000, respectively. Trivalent ions frequently inactivated the quaternary 100% in concentrations as low as 10 p.p.m. Five times as much quaternary was required for 100% kill at pH 3 than at pH 10. When adjusted to pH 7, the cations lost their interfering power. Atomic weight had little or no effect on inactivating power. The salts seem to interfere by competing for the cell surface and thus blocking the germicide cation.

**M35 Optimum Consumer Preference for Dry Milk in Bread.** E. L. JACK AND (MRS.) V. M. HAYNES, University of California.

A group of 320 boys ranging in age from 8 to 16 years in a self-contained unit of the California Youth Authority have been fed breads containing different quantities of non-fat dry milk solids as part of their regular diet. The percentages chosen were 0, 6, 10 and 14% non-fat dry milk solids, based on the amount of flour. These breads each were fed for a 2-mo. period during which accurate bread consumption and total food consumption records were kept. Aliquot samples of each meal were composited for chemical analyses and height and weight records were kept at the beginning and end of each period.

The data show that the diets were superior to the recommended allowances of the National Research Council in caloric, protein, vitamin and mineral values. The bread consumption averaged for each 2-mo. period was 100% for the water bread, 103.8% for 6% bread, 105.6% for the 10% bread, and 114.5% for the 14% bread. The breads were essentially uniform in appearance.

**M36 The Utilization of Roller and Spray Dried Sweet Cream Buttermilk in Bread Making.** J. V. REGER, W. B. COMBS, S. T. COULTER AND R. B. KOCH, University of Minnesota.

Dry sweet cream buttermilk and nonfat dry milk solids obtained from the same source of mixed herd milk were adjusted to various moisture levels and stored at 100° F. and 42 to 45° F.

for 1 yr. Baking tests showed that prolonged storage at 100° F. was detrimental to the baking quality of the milk powders, especially with the roller dried samples of high moisture content (5-6%). No differences were noted in the baking quality of milk powders stored for 1 yr. at 42-45° F. Breads made utilizing the buttermilks, particularly spray dried, gave consistently larger loaf volumes than when nonfat dry milk solids were used.

Additional heat treatment of buttermilk, which was obtained from sweet cream pasteurized for 30 min. at 165° F., did not affect the baking quality of the dried product. Buttermilk powders again were associated with larger loaf volumes as compared with nonfat dry milk solids.

The addition of 0.17% soybean lecithin emulsified in butter oil and added to skim milk before drying produced the same loaf volumes when added to the bread formula as did the buttermilk powders. Additions of butter oil alone to skim milk showed no beneficial results with respect to loaf volume.

A lactic acid culture (3%) was added to sweet cream buttermilk and when 0.01, 0.05 and 0.1% developed acidities were obtained, the buttermilks were neutralized to the original acidity. Resulting powders, when added at a 6% level to the bread formula, produced no detrimental effects which could be attributed to the amount or to the type (NaOH or Lime) of neutralizer, even after storage for 2 mo. at 100° F.

**M37 The Relation of Surface Growth to the Ripening of Minnesota Blue Cheese.** H. A. MORRIS, W. B. COMBS, S. T. COULTER, University of Minnesota.

Green cheese from each of two lots were segregated into three groups and processed to produce various amounts of slime during the ripening period. The cheese were examined chemically and organoleptically initially and at 3, 6 and 9 mo. of age. In addition, portions of the cheese were analyzed to determine whether ripening had proceeded inward from the exterior of the cheese. Moisture, sodium chloride, total volatile acidity, total nitrogen, amino nitrogen, pH and fat content of the cheese were determined. The microscopic and macroscopic characteristics of the surface microflora were observed.

The initial development of yeasts and some mold on the surface of the Blue cheese was followed by a predominance of rod forms of bacteria and some micrococci at later stages.

Because of the pronounced effect of *P. roqueforti* on the ripening of this cheese, it is difficult to determine the influence of the surface microflora on the changes noted in the various portions

of the cheese. However, cheese with normal surface growth had a higher total volatile acidity, amino nitrogen and pH, a finer flavor, and a more desirable texture than cheese with no surface growth. Cheese slimed for 4 mo. had excellent body and texture, but also had an undesirable limburger-like flavor due to the absorption of aroma from the slime. These cheese had the highest total volatile acidity, amino nitrogen and pH.

**M38 The manufacture of Blue Cheese from Pasteurized Homogenized Milk.** I. I. PETERS AND F. E. NELSON, Iowa Agricultural Experiment Station.

A study was made of the separate influences of: (a) heat treatment of milk before and during homogenization, (b) setting acidity, (c) dipping acidity, (d) cooking temperature, (e) dipping temperature, (f) early salting and (g) draining temperature upon texture, mold growth, body and flavor of ripening blue cheese.

As a result of these studies, the following make procedure was adopted: Fresh, raw milk was pasteurized at 142° F. for 30 min., cooled to 110° F. and homogenized at 2,000 lb. pressure. The milk was set at 90° F. and ripened with 1% lactic cheese starter to 0.19% acidity. Lipase from *Candida lipolytica* was added at a rate to give the desired degree of ripening and the milk set with 90 ml. rennet per 1,000 lb. of milk and allowed to set for 70 min. The curd was cut into 0.5 in. cubes and held in the whey, being stirred at 30-min. intervals, until the whey acidity reached 0.24%. Part of the whey was drawn off, leaving only enough in the vat to cover the curd, and the curd cooled to 84° F. with cold water in the outer jacket. The remaining whey was drawn off, 0.01% mold powder mixed with 1.5% cheese salt, based on the calculated yield of cheese, incorporated into the curd, and the curd hooped. The cheese was drained overnight at 84 to 86° F., dry-salted, punched and cured in the usual manner.

This procedure permitted manufacture from pasteurized, homogenized milk of a cheese with sufficiently open texture, abundant mold growth, good body and adequate flavor.

**M39 The Determination of Free Tryptophane in Cheese.** A. B. EREKSON, Lakeshire-Marty Company. Plymouth, Wis.

A test for free tryptophane based upon the one reported by Dugan (J. Assoc. of Official Agr. Chemists, 31, 1, 1948) was developed using a 2-g. sample of cheese, 90% acetone to extract the tryptophane and to precipitate the proteins, para-dimethylaminobenzaldehyde as the color

reagent and  $\text{KNO}_2$  as the oxidizing agent to hasten the reaction. Quantitative results were obtained by comparison with a standard graph from readings with an electrophotometer.

Cheese with a mild flavor had from 15 to 91  $\gamma$  of tryptophan/g. while cheese high in flavor contained up to 889  $\gamma$ /g. Experimental cheddar cheese made from raw and pasteurized milk and cured for 9 mo. at 55 to 60° F. showed an average of 297.3  $\gamma$  for the raw milk cheese and only 117.3 for the pasteurized milk cheese. The raw milk cheese was much higher in flavor than the latter.

**M40 Filter Paper Chromatography as a Means to Determine the Amino Acids and Amines Developed in Cheddar Cheese During Ripening.** F. V. KOSIKOWSKY, Cornell University.

Two-dimensional filter paper chromatography was applied to the water extracts of a number of Cheddar cheeses. Solvents used were phenol and a mixture of collidine and lutidine. A butyl alcohol solution of ninhydrin was employed as a color developer.

Using this method a large number of free amino acids from individual cheeses simultaneously were pictured as colored areas on Whatman No. 1 filter paper sheets. Also observed on the same chromatograms were amines and, in some instances, a number of unidentified chemical compounds.

In one series of eight commercial Cheddar cheese analyzed, the following amino acids and amines were interpreted from the chromatograms as being present in most of these cheeses: leucine, valine,  $\alpha$ -amino-n-butyric acid, alanine, threonine, glycine, asparagine, glutamic acid, aspartic acid, arginine, lysine, proline, tyrosine and glutamine. Methionine as methionine sulphoxide tentatively was identified as being present in a smaller number of the cheeses. The presence of tyramine and tryptohane also was considered in some of the cheeses, but their spots are more difficult to identify. Other free amino acids may have been present in these Cheddar cheeses, but additional technics may be required to reproduce them on chromatograms.

**M41 Manufacture of Cottage Cheese from Reconstituted Non-Fat Dry Milk Solids.** C. E. PARMELEE AND W. S. ROSENBERGER, Iowa Agr. Expt. Station.

A method for the manufacture of cottage cheese from non-fat dry milk solids is presented. The method has been used successfully with commercial low heat treatment non-fat dry milk solids from three sources. The method is presented as a means of holding cottage cheese markets during periods of extreme shortage of fluid skim milk, as the cost does not permit competition with cottage cheese from fluid skim milk when prices are normal.

PRODUCTION SECTION

**P1 Differences in Production Type, Size and Breeding Efficiency of Cow Families.** K. A. TABLER, W. J. TYLER AND G. HYATT, JR., West Virginia University, Morgantown.

Nineteen cow families in the Reymann Memorial Ayrshire Herd at the West Virginia Agr. Expt. Station were studied to determine if there were differences between families in production, type, body size and breeding efficiency. In addition, family selection was compared with selection on individual performance as a means of obtaining improvement in the milk production of the herd. The data consisted of the individual milk, butterfat, butterfat test, type, body size (height at withers and weight) and breeding records collected between 1922 and 1948 on 401 cows. All normal females were kept until they completed at least one lactation.

Analyses of variance showed that differences between families in body size and breeding efficiency were not significant. However, there were highly significant differences between families for milk, butterfat, butterfat tests and type. When sire differences were eliminated, the remaining

variations between families were not statistically significant.

Two methods of selection based on the first record were compared. If each year (beginning in 1928) two-thirds of the first calf heifers with the highest milk production had been retained and the lowest third culled, the offspring of the selected parents during the next 10 yr. would have averaged 8,625 lb. of milk and 10,434 lb. during the following 10 yr. But if the cows and their offspring in the 12 families (two-thirds of all families) with the highest average milk production in 1928 had been kept, the averages of their daughters during the first and second 10 yr. periods would have been 7,759 and 9,767 lb. of milk, respectively.

**P2 Prolonged Gestation of Genetic Origin in Cattle.** S. W. MEAD, P. W. GREGORY, AND W. M. REGAN, University of California, Davis.

Twenty-seven cases of prolonged gestation (310 to 350 days) have been observed in a large herd of registered Holsteins. Birthweights of calves

have ranged from 110 to 168 lb., averaging 145 lb.

With the exception of two lighter weight calves, normal delivery has been possible. Four have been delivered by Caesarean section. Of these none has survived more than a few hours. All other calves were dismembered. As a result, the future reproductive capacity of these cows has been impaired greatly. During the ninth month of pregnancy, there appears to be a complete absence of all physical changes normally occurring.

Pedigree analyses indicate that all calves manifesting this anomaly are homozygous for an autosomal recessive gene. It is concluded tentatively that prolonged gestation is caused by an hormonal imbalance between the fetus and mother, when the fetus is of the mutant genotype. This unique genetic material should prove valuable for certain physiological studies.

**P3 Estimation of Changes in Herd Environment.** C. R. HENDERSON, Cornell University, Ithaca, N. Y.

Accurate appraisals of the results of breeding programs and most efficient estimates of breeding values of individuals whose own records and whose relatives' records were made in several different years require quantitative measures of the effects of changing herd environment. Least squares or modified least squares methods for obtaining such measures give biased estimates when records of cows culled from the herd are either above or below the herd average. This bias results from the lack of perfect repeatability of records. In contrast, the method of maximum likelihood automatically takes into account incomplete repeatability and annual culling levels and utilizes all of the records in such a way as to obtain the most precise estimates possible of the yearly environmental effects.

The maximum likelihood method has been utilized to obtain annual correction factors for several New York dairy herds. The method is illustrated with data from one of these herds and less accurate but less laborious modifications are described. Examples are given of the use of the correction factors for estimating the genetic improvement in the herd, predicting the breeding values of cows and evaluating sire proofs. Application of the method to computation of age correction factors also is discussed.

**P4 The Number of Proved Sons Necessary to Evaluate the Transmitting Ability of a Sire.** W. E. WASHBON AND W. J. TYLER, West Virginia University, Morgantown.

One hundred seventy-four Holstein sires with eight or more D.H.I.A. proved sons were studied to determine the least number of proved sons necessary to estimate most accurately the performance of those to be proved later. The data included average butterfat production of the proved sons' daughters, average difference of daughters' production as compared to their dams and per cent of proved sons that maintained or increased butterfat production in the herds in which they were used. Averages of the first three to ten proved sons, respectively, were compared with averages of the following three, five and ten sons.

Highly significant correlations ( $r=0.35$  to  $0.65$ ) indicated that the average butterfat production of the daughters of the first three proved sons was nearly as accurate as data on more sons in estimating the average butterfat production of the daughters of the next three, five or ten proved sons of a sire.

Similarly, the significant correlations ( $r=0.24$  to  $0.40$ ) for the sons' daughters' increase or decrease in butterfat production from their dams indicated that data on the first three or four proved sons were nearly as accurate as data on a larger number in predicting what might be expected from the next three, five or ten proved sons in this respect.

For per cent of sons improving production the correlations were significant when the first four, five and six sons were compared with the next ten sons ( $r=0.30$ ).

A sire's future granddaughters' butterfat production and its difference from their dams' production apparently can be estimated nearly as well from the performance of the first three or four sons as from a larger number. The per cent of a sire's future proved sons that likely will improve production is more reliable if the prediction is based upon the performance of at least the first four or five proved sons.

**P5 Calf Mortality, Sex Ratio and Incidence of Twinning in Two University of Minnesota Herds.** K. MILLER AND L. GILMORE, Minn. Agr. Expt. Station, St. Paul.

The University calf records at Grand Rapids and St. Paul have been analyzed with respect to prenatal and postnatal mortality for the first 6 mo. and for other information such as the sex ratio and incidence of multiple births.

At University Farm for the 12 years 1934 to 1945, inclusive, 50 of the 592 births, among Guernseys, Holstein-Friesians and Jerseys, were born dead. Ninety-one died during the first month, 36 more by the end of the sixth month

and 391 were in the herd at the end of 6 months of age. The 24 remaining calves were mostly bulls that were destroyed, sold for breeding purposes or utilized in an experiment, and are excluded from the above groups. The principal causes of death were pneumonia and scours, although some genes for lethals or lack of vigor appear to have some influence.

In the Grand Rapids herd during the 36 years 1912 to 1947, inclusive, 1,007 high grade and purebred Guernsey calves were born. Of these, 61 were born dead, 61 died during the first month and 50 from 2 to 6 months. Twenty-two deaths resulted from scours and 15 from pneumonia.

The sex ratio of 52 per cent for 1,143 Guernseys from both herds is higher than that previously reported for this breed and is close to the average for all cattle reported. For 229 Holstein-Friesians the ratio was 52%. For 159 Jerseys the ratio of 46% is lower than that reported elsewhere for this breed.

Twinning occurred in 1% of the 996 Guernsey births in the Grand Rapids herd as compared to 3% of 169 births in the St. Paul herd. For Holsteins and Jerseys the incidence was 5 and 1%, respectively. In 30 pairs of twins there were 19 bisexed pairs. No triplets were born in over 1,165 births.

**P6 Observations on Mammary Gland Development of Dairy Heifers Induced by Hormone Injections.**<sup>1</sup> J. F. SYKES, T. R. WRENN, AND P. C. UNDERWOOD, Bur. of Dairy Industry, USDA, Washington D. C.

Two heifers were injected with stilbestrol, three with stilbestrol plus progesterone, two with stilbestrol plus a crude pituitary extract and two with stilbestrol plus progesterone plus a crude pituitary extract. Injections were started at 1 mo. of age and continued to 9 mo. Examinations of mammary tissue were made at 5 mo. of age and at autopsy (9 mo. of age). No visible increase in the size of the mammary glands was produced by these treatments. As judged by palpation, the glands of the experimental heifers appeared to be slightly smaller than those of two control heifers. A small amount of secretion was obtained from all the experimental heifers but was not sufficiently copious to make comparisons possible.

Histological examination of mammary glands of all injected heifers showed marked glandular development, with evidence that this development was not altogether normal. At 5 mo. of age only those heifers which received steroid hormones showed lobule-alveolar development, the extent

<sup>1</sup> This work was done with Bankhead-Jones special research funds.

of this development being unaffected by progesterone. At 9 mo. of age, however, all heifers showed lobule-alveolar development and in general the heifers which received pituitary hormones in addition to the steroid hormones were further advanced than heifers receiving only steroid hormones. Again progesterone did not appear to influence the extent of development.

Weights of pituitary, thyroid and adrenal glands, and of the ovaries and bioassays of the pituitary gland indicated that the steroid hormones produced at least a partial functional hypophysectomy which was counteracted to some extent by the injection of the pituitary preparation used.

**P7 Effect of Temperature and Drying on Male Hormone in Cow Manure.** C. W. TURNER, Mo. Agr. Expt. Station, Columbia.

In previous studies of the male hormone content of dairy cow manure, the fresh product was dried in a Freas electric oven at a temperature of 45° C. This drying temperature was selected since it had been shown that with increasing temperature up to 85° C., the biological activity of the male hormone present was inactivated when assayed by feeding to chicks for a period of 4 wk. It seemed of interest to determine the biological activity of the fresh product and of manure dried by other methods.

Surprisingly, the feeding of amounts of fresh manure equivalent to 10% of dry manure was without biological activity. Further, when the cow manure was heated for varying periods of time at 45° C. without drying, biological activity was not demonstrated. It thus appeared that drying, rather than heat, plays a role in converting biologically inactive male hormone to an active form. An alternative suggestion is that the enzymes and bacteria present in fresh manure may inactivate the hormone before it is consumed. A number of experiments designed to obtain answers to these questions will be presented.

**P8 Effect of Mild Hyperthyroidism on Milk Production in Dairy Cattle.** C. W. TURNER, Mo. Agr. Expt. Station, Columbia.

The inheritance of the capacity for high milk production depends upon the rate of secretion of the hormones which influence the growth of the secretory tissue and the initiation and maintenance of milk secretion. It has been demonstrated that the thyroid hormone when available in insufficient amounts depresses milk secretion and by mild replacement therapy stimulates milk secretion up to the point where some other hormone limits production.

It seems reasonable to believe that in the selection of cows for high milk and fat production that high thyroid secretion rate is essential and when combined with high secretion rate of other hormones outstanding cows are bred. However, since selection at this time is not based upon the secretion rate of the various hormones, in many cases cows are bred with an inheritance for milk production considerably above their actual production simply because of a deficiency in the cow's thyroid hormone secretion rate. By the simple process of feeding thyroprotein, this deficiency is overcome and the full inherited potentialities of the cow are then realized. It should be emphasized that the feeding of thyroid hormone has exactly the same effect upon the cow as the secretion of optimum amounts of hormone by the animal's own thyroid.

The question is being raised as to the physiological effect of a mild hyperthyroid condition occurring either through inheritance or induced by thyroprotein feeding. The effect on feed consumption, energy metabolism, heart rate, respiration rate, body temperature and longevity will be discussed.

**P9 Effects and Economy under Tennessee Conditions of Thyroprotein Feeding during Lactation Decline.** E. W. SWANSON, University of Tennessee, Knoxville.

Twelve cows were paired carefully according to production, size, age, and time of parturition and were assigned randomly one of a pair to a control group and the other to a thyroprotein-fed group. The cows were fed to try to maintain desirable production and body condition. Following evidence of a definite downward trend in the lactation curve (average of 122 d.), thyroprotein was fed at the rate of 15 g. per day. Small responses in milk production but very little change in fat test occurred. Slight temporary increases in pulse, body temperature and respiration occurred following the thyroprotein feeding. These values returned to normal after 8 w. of thyroprotein feeding, and at this time the extra milk production stimulus also had ceased. During this time the thyroprotein-fed cows lost slightly in body weight, while the control cows gained. Thyroprotein feeding plus more concentrates was continued until the end of the lactation. The thyroprotein-fed cows again were normal in weight at the ninth lactation month. For an average of 183 d., thyroprotein feeding resulted in 0.76 lb. more milk produced and 0.54 lb. more concentrates consumed per cow daily. The same cows are being continued for a second lactation to measure the carry-over and/or repeatability of the effects.

**P10 Size of Thyroid in Cows from Southern States.** W. W. SWETT AND C. A. MATTHEWS, Bureau of Dairy Industry, USDA.

At most of the field stations operated by the Bureau of Dairy Industry in the southern states, many individual cows have failed to produce satisfactorily and the production level of one herd has declined despite the fact that sires known to possess good transmitting ability have been used and environmental conditions have been maintained on a reasonably uniform basis.

A number of cows with particularly low producing records, from families of high producers, were shipped to Beltsville for slaughter. In two average-sized Guernseys from the station at Columbia, S. C., the weight of thyroid was found to be only 56% of the average for Guernseys obtained in the Bureau's anatomical studies. In seven Jersey cows shipped to Beltsville from the station at Jeanerette, La., the weights of thyroid were only 56% of the average found in Jerseys only slightly larger in the Beltsville herd. Also, in 14 other Jerseys from the Jeanerette herd that were slaughtered in La., very low thyroid weights were found. Anatomical studies of cows from various areas showed a definite tendency for the thyroids of cows in the southern states to be much smaller than the thyroids of cows of the same breed in northern states.

**P11 Factors Affecting Heart Rates of Dairy Cows.** J. W. THOMAS, Bureau of Dairy Industry, USDA.

Heart rates were observed on approximately 40 cows for varying periods of time up to three lactations. All observations were made under standardized conditions in order to eliminate factors that are known to affect heart rate.

The heart rate of producing cows increased when they consumed T.D.N. at 120 to 130% of requirement. The maximum increase in heart rate was not attained until 30 to 40 d. after the increase in T.D.N. consumption was initiated.

Feeding thyroprotein also increased the heart rate of producing cows. An additional effect on heart rate was noted when thyroprotein and extra T.D.N. were fed simultaneously. Thyroprotein produced only a transient increase in heart rate when T.D.N. was consumed at 100% of requirement.

Heart rate was faster in early lactation than during the second half of the lactation period. A rapid decrease in heart rate usually was accompanied by a rapid decrease in milk production. Most cows show a definite increase in heart rate immediately after they have been dried off. This increase is not a result of the pre-



calving increase. Heart rate increased rapidly in the dry cow just before calving. At 70 to 90 d. before calving it averaged 65 beats/min., at 30 to 50 d. it averaged 72, and at 0 to 10 d. it averaged 92.

A cow usually had a more rapid heart rate during estrus than immediately before or after estrus.

#### **P12 Milk Substitutes for Young Dairy Calves.**

H. D. WALLACE, J. K. LOOSLI AND K. L. TURK, Cornell University.

Nine milk-substitute formulas have been studied in preliminary trials using 75 male and female Holstein calves. The Cornell dry calf starter method of feeding was followed, except that approximately 275 lb. of whole milk were replaced with 40 to 50 lb. of a dry milk substitute. Whole milk feeding was discontinued at 14 d. of age. Mixture VI, which has given the best results, was made up in per cent as follows: dried skim milk, 30; dried whey, 30; apple pomace, 10; linseed oilmeal, 10; dextrose, 9.738; oat flour, 5; dried brewers' yeast, 4.9; irradiated yeast, 0.1; stabilized vitamin A powder, 0.220; and trace minerals, 0.042. Average gains for ten calves on this mixture were 96.7 and 104.1% of the Ragsdale standard at 8 and 16 wk., respectively. A mixture containing dried banana meal promoted growth which closely paralleled the Ragsdale standard. A mixture containing 20% finely ground beet pulp gave poor results. Another mixture containing 20% of a high fat soya flour caused severe scouring and growth was subnormal. With a few exceptions calves on all mixtures have exhibited a rather rough appearance from the 3rd week through the 7th or 8th week, but after that age they grow at a rate approximately normal.

#### **P13 Milk Replacements in the Rations of Dairy Calves.** J. B. WILLIAMS AND C. B. KNODT, Pennsylvania State College.

Trials are being conducted to determine the value of various products such as dried skim-milk, dried whey, dried grain distillers solubles, dried blood flour, beet pulp and various other products in the development of milk replacements. The calves in these trials are limited to 50 lb. of whole milk including colostrum and receive the milk replacement in water at 100° F., beginning on the 5th day through the 56th day. Of the four formulas studied, the following has produced calves equal in appearance and rate of growth to calves receiving 300 lb. of whole milk: dried skim milk, 50; dried whey, 10; dried grain distillers solubles, 10; blood flour, 10; dried

brewer's yeast, 4.90; dextrose, 7.75; oat flour, 5.0; irradiated yeast (9F), 0.10; stabilized vitamin A (2,220,000 I. U./lb.), 2.20; and mineral mixture, 0.042. One replacement containing 20% beet pulp gave subnormal growth and resulted in a loss of hair, general muscular weakness, excessive lacrimation and papilledema. This condition was not corrected by the administration of Vitamin A, pantothenic acid, or biotin. Two other mixtures containing 10% beet pulp resulted in some loss of hair but gave normal growth.

#### **P14 Diurnal Variations in Concentrations of Fat in Blood Plasma of Calves Fed Various Types of Oils.** H. B. BARKER AND N. L. JACOBSON, Iowa State College.

Previous routine determinations of fat in the blood plasma of calves fed reconstituted milks containing various oils revealed that the highest values were from diets containing either crude or refined soybean oils followed, in order, by butter oil and hydrogenated soybean oil. Since the stage in the absorption cycle represented by blood samples collected 9 hr. after ingestion was unknown, possible differences in the rates of absorption of the respective oils were considered in the etiology of the responses.

The test diets used in ascertaining the diurnal changes of the fat levels in the blood plasma were reconstituted milks containing 3% of one of the following oils: crude soybean, hydrogenated soybean and butter. Each type of milk was fed at the rate of 10 lb./100 lb. body wt. daily to individual calves over a period of 3 consecutive weeks. In two trials, one after the 2nd week and the other after the 3rd, samples of blood were collected at 3-hr. intervals during the interim between feedings to determine changes in plasma fat values. The results from 12 such trials, involving six different calves on each oil revealed no marked differences in the form of curves; all increased to a maximum level during the first 6 hr. and subsequently receded to the initial level by the 12th hr. The differences in plasma fat concentrations resulting from ingestion of the different oils were similar throughout the period.

#### **P15 The Hydrogen Ion Concentration and Dry Matter of the Feces of Young Dairy Calves Raised on a Limited Whole Milk—Dry Starter Method.** R. E. JOHNSON, H. D. EATON, J. H. KRAMER, E. L. JUNGHERR, W. N. PLASTRIDGE AND L. NEZVESKY, University of Connecticut and Storrs Agr. Expt. Station.

Diarrhea occurs frequently in young dairy calves and may be a predisposing factor in calf

mortality. The terms "diarrhea" and "scours" have been used subjectively in calf studies.

To evaluate these terms more objectively in future studies, pH and dry matter were determined on feces obtained from 15 calves which apparently were free from looseness of the bowels and which were raised under a limited whole milk-dry starter system. Feces samples were obtained from 1 through 14 d. of age, and in addition on the 18th, 21st and 28th days. At the first day of age pH values were between 5.4 and 6.2 and thereafter a gradual decrease in acidity occurred. Between the 14th and 21st days, a change from acidity to alkalinity occurred. At the 28th day, the pH values ranged from 7.2 to 8.4. In contrast to pH, a wide degree of variability occurred in the dry matter. In all calves, the dry matter increased to a maximum level at 3 to 4 d. of age. Thereafter, a marked drop occurred and the lower level was maintained throughout the remainder of the 28 d.

**P16 The Influence of Pasture and Rumen Inoculation on the Establishment of Certain Microorganisms in the Rumens of Young Dairy Calves.** W. D. POUNDEN AND J. W. HIBBS, Ohio Agricultural Experiment Station.

Rumen inoculations with cud materials from cows on pasture were given 6 of 12 calves which were fed milk and placed on lawn pasture at 4 d. of age. Rumen protozoa and certain bacteria, used as indicators of the presence of varieties characteristically associated with hay ingestion, readily were established in all inoculated calves. The bacteria were established in a relatively less degree in two calves which received grain supplement. Protozoa did not develop in the uninoculated calves. Some characteristic bacteria became established in four of the six uninoculated calves by 6 wk. of age, but were limited to one of the observed varieties and were relatively few in number. The incidence of diarrhea among these calves was low and did not appear to be influenced by the inoculations.

Characteristic rumen microorganisms became established only in relatively limited numbers in an uninoculated, 2-mo. old calf when it was turned out on pasture for 7 wk. with four inoculated calves of similar age. The marked difference in microorganisms was rectified following rumen inoculation. Prior to inoculation, this calf had persistent mild diarrhea while on pasture but gain in weight was similar to an inoculated twin.

**P17 The Influence of Pasture and Early Rumen Development on the Changes in the Plasma Carotenoids, Vitamin A and Ascorbic Acid**

**and the Liver Storage of Carotenoids and Vitamin A of Young Dairy Calves.** J. W. HIBBS AND W. D. POUNDEN, Ohio Agricultural Experiment Station.

As a measure of the influence of pasture and early rumen development in meeting the vitamin needs of calves, an experiment was conducted using 12 calves tethered during the day on a lawn pasture beginning at 4 d. of age. One-half of the calves were inoculated with cud material from older animals, which were eating pasture, and a 14% protein grain mixture was fed *ad libitum* to half of the calves. Three calves fed in the barn served as controls. Milk feeding was limited in all calves to the rate of 0.9 lb./10 lb. of body weight at birth. Blood samples were drawn for analysis on the 4th and 7th days of age and weekly thereafter for 6 wk. Ten calves were slaughtered at 42 d. of age and their livers were analyzed for carotenoids and vitamin A.

The calves on pasture maintained much higher blood levels and liver storage of carotenoids and vitamin A during the first 6 wk. after birth than the controls. Plasma carotenoids averaged 255  $\gamma$ /100 ml. at 42 d. of age. The plasma ascorbic acid at 14 d. of age also was higher in the pasture fed groups.

Rumen inoculations were not shown to affect the blood or liver vitamin levels observed.

All calves grew well and no adverse effects due to the consumption of pasture were observed.

Data also are presented showing the changes in plasma carotenoids, vitamin A and ascorbic acid before and after turning five older calves (average 71 d. of age) out to pasture. These calves had been raised until the pasture period in the barn, three with and two without rumen inoculations.

It is concluded that good pasture grass, when available, can be utilized by calves, even at an early age, as an effective means of meeting their vitamin needs and as an economical source of other nutrients.

**P18 Carotene Requirements for Young Dairy Calves.** R. F. ELLIOTT<sup>1</sup>, Cornell University.

Studies were carried out involving 19 Guernsey and 16 Holstein calves in an attempt to determine the amount of carotene necessary to promote normal growth, maintain adequate plasma levels and obtain liver storage of vitamin A. A daily intake of 3.2 mg. of carotene/100 lb. body weight was not sufficient for normal growth. This carotene intake did not maintain adequate plasma vitamin A levels or liver stores in Guernsey calves up to 60 d. of age, even though the calves were

<sup>1</sup> Present address: University of Kentucky.



allowed colostrum. The Holstein calves were able to make an average gain of 53 lb. in 60 d., even though the plasma vitamin A levels were below normal and no liver storage occurred. Daily intakes of 6 mg. of carotene for Holstein and 10 mg. for Guernsey calves for each 100 lb. body weight were sufficient to maintain only borderline plasma levels and slight liver storage of vitamin A. Normal growth occurred at these levels of intake.

**P19 The Plasma Levels of Carotene and Vitamin A in Calves from Dams Milked Prepartum and in Calves from Dams Milked Postpartum.** H. D. EATON, A. A. SPIELMAN, R. E. JOHNSON, AND L. D. MATTERSON, University of Connecticut and Storrs Agricultural Experiment Station.

Prepartum milking results in a marked decrease in both the carotene and vitamin A content of colostrum. Since colostrum contributes a large proportion of the carotene and vitamin A ingested by the young calf, it is of value to know what effect prepartum milking of the dam has on these metabolites in the young calf.

A total of 36 calves, 18 of which were from dams milked twice daily for 10 d. prior to the due date and 18 of which were from dams milked only after calving, were used. All calves were fed weighed amounts of colostrum and milk from their respective dams for the first 7 d. after birth and herd milk thereafter. After the first week, all calves had free access to hay, starter and water. Blood samples were drawn at birth and at weekly intervals thereafter until 4 wk. of age.

There were no significant differences in the blood plasma levels of carotene and vitamin A at birth. However, for the remainder of the experimental period, 1, 2, 3 and 4 wk. of age, both the blood plasma carotene and vitamin A were significantly higher in those calves from dams milked postpartum ( $P < 0.01$ ), as compared to those values for the calves from dams milked prepartum.

Prepartum milking results in significantly lower blood plasma levels of carotene and vitamin A in young calves.

**P20 Effect of Type of Dispersion on Rate of Absorption of Carotene and Vitamin A by Dairy Calves.** G. H. WISE, N. L. JACOBSON, R. S. ALLEN AND S. P. YANG, Iowa State College.

Carotene and vitamin A, respectively, were dispersed in a reconstituted milk, containing 10% non-fat milk solids and 3% hydrogenated soybean oil, and were fed to calves at the rate of 100,000

I.U./100 lb. body wt. Subsequent changes in the concentrations of carotene and vitamin A in plasma of blood collected at 3-hr. intervals over a period of 15 hr. were used as an index of absorption. Employing the nipple system of feeding calves, uptake of carotene from an oil concentrate (50,000 I.U./g.) in the milk was greater when dispersion was accomplished by homogenizing at 3,000 lb. pressure than when effected by stirring. A similar comparison of dispersions of a natural ester vitamin A oil (30,000 I.U./g.) revealed no difference between homogenization and stirring. The rate of absorption of vitamin A, however, was greater than that of carotene.

Vitamin A oil (100,000 I.U./g.) dispersed by means of an emulsifying agent (Tween 80)<sup>1</sup> was absorbed more readily and apparently to a greater degree than the unemulsified oil. The differences were more pronounced when given via nipple than when delivered by stomach tube into the rumino-reticular cavity. The slower absorption from the latter procedure substantiates previous observations indicating that the method of administering vitamin constituents affects the rate of absorption.

**P21 Studies on the Site of Absorption and Conversion of Carotene to Vitamin A in the Dairy Calf.** R. F. ELLIOTT<sup>2</sup>, Cornell University.

An operative technic was used as a method for studying the sites of absorption and conversion of carotene to vitamin A in the dairy calf. Blood samples taken from various sites along the intestinal tract showed a seemingly significant increase in plasma vitamin A values following the ingestion of carotene concentrate. The carotene plasma values showed a marked decline in most cases in contrast to that expected if carotene was absorbed as such into the blood supply leading from the small intestine. The carotene values of fresh liver tissue from biopsy samples showed a corresponding increase but were smaller than the increase in vitamin A. Evidence was presented in support of the view that the intestinal wall is a site of conversion of carotene to vitamin A in dairy calves.

High-carotene blood plasma was given intravenously to two Guernsey and two Holstein calves to study further the function of the liver in carotene conversion. Since the intestinal tract was by-passed in this way, it was assumed that any increase in plasma vitamin A or in liver stores would be due to conversion of carotene to vita-

<sup>1</sup> Vitamin preparations supplied through the courtesy of Distillation Products, Inc., Rochester, N. Y.

<sup>2</sup> Present address: University of Kentucky.

min A in the liver. Decreases in the plasma carotene values occurred in Guernsey and Holstein calves with no rise in the plasma vitamin A values. The liver vitamin A values did not increase in Guernsey calves injected intravenously with high-carotene plasma. Large increases were observed in Holstein calves, but only equal to that observed in a control calf. No positive evidence was obtained to show that carotene in blood plasma is converted to vitamin A in either the Guernsey or Holstein calf.

**P22 Calf Losses in a Dairy Herd Consisting of Five Breeds.** E. E. ORMISTON, University of Illinois.

The losses of dairy calves even in well-managed herds limit the opportunity for selection of only the more desirable animals in a constructive breeding program.

The losses occurring in a herd of five breeds, from 1935 to 1947, inclusive, are reported. A total of 809 heifer calves was born, of which approximately 6% were abortions and stillbirths. Of the normal heifers born 24% died before they were 1 yr. of age. Seventy per cent of these calf losses occurred within the first 60 d. and in approximately one-third of the deaths, pneumonia was identified as one of the responsible agents. There was no significant difference in the losses between the five breeds.

The herd was maintained under what generally are considered good management practices and was free from contagious abortion. Accurate records were kept of the history of each calf with a clinical report of the cause of death in practically all instances.

**P23 The Influence of Variations in Environmental Temperature and Thyroid Status on Growth and Feed Consumption in the Male Mouse.** M. MAQSOOD AND E. P. REINEKE, Michigan State College.

Groups of young male mice were fed 0.1 or 0.2% thiouracil or several different levels of thyroprotein for periods of 3 to 4 wk. at environmental temperatures of 24 and 30° C. Their daily food and water consumption and weekly body weights were recorded throughout the experimental periods and compared with normal control values obtained under the same environmental conditions.

Thyroprotein, when fed as 0.025 and 0.05% of the feed at 24° C., caused an increase of 13 and 24% in body weight gain, respectively, and the mice consumed 20 and 30% more feed per day when compared with the control group. The increase in food and water consumption increased

with the increase in dosage of thyroprotein but there was no direct relation between the amount of feed consumed and the weight gained at 24 and 30° C. The mice fed 0.005% thyroprotein at 30° C. consumed 0.8 g. less feed/g. gain in body weight and gained 8 and 31% more weight when compared with the two control groups. Thiouracil administration caused a decrease in body weight gain and food and water consumption.

Raising the environmental temperature from 24 to 30° C. caused a tenfold reduction in the optimal thyroprotein dosage in the mouse, indicating that the demand for thyroxine is comparatively less at high than at low temperatures.

**P24 Factors Affecting Heat Tolerance of Dairy Cattle.**<sup>1</sup> R. E. McDOWELL AND R. A. HILDER, Bureau of Dairy Industry, USDA.

Studies have been conducted under controlled environmental temperature conditions with Holstein cows at Beltsville to determine the effect of stage of lactation and plane of nutrition on heat tolerance. In comparing dry cows and lactating cows at 65° F., there was no difference in body temperature between the two groups. At air temperatures of 90 and 100° F., there was little change in the body temperature of the dry cows, but there was a definite increase in body temperature in the lactating cow group. Greatest rises in body temperature are associated with higher feed intake at high environmental temperatures in both dry and lactating cows.

In these studies respiratory rate tended to parallel environmental temperature in all groups. Environmental temperature appeared to have no direct effect on pulse rate.

**P25 The Comparative Heat Tolerance of Red Sindhi X Jersey and Other Breeds of Dairy Calves.**<sup>1</sup> R. A. HILDER AND R. E. McDOWELL, Bureau of Dairy Industry, USDA.

The effect of high environmental temperatures on body temperature, respiratory rate and heart rate have been studied on four groups of calves: Red Sindhi X Jersey crossbreds, purebred Jersey, purebred Holstein and crossbreds of various combinations of European breeds. Part of the studies were carried out under natural climatic conditions at Beltsville during the summer of 1947, and part were done in a room in which air temperature was controlled. In their ability to maintain normal body temperature, the groups rank as fol-

<sup>1</sup> This work was done with funds from the Agricultural Research and Marketing Act of 1946.

lows: Red Sindhi X Jersey, purebred Jersey, crossbreds of European breeds, and purebred Holstein. The difference between the Red Sindhi X Jersey group and the purebred Jersey group was slight except during prolonged exposure to high environmental temperature. The Red Sindhi X Jersey group definitely was lower than the other groups in respiratory rate. In these studies environmental temperature appeared to have no direct effect on heart rate.

**P26 Reactions of Dairy Cows to Higher Temperatures.** S. BRODY,<sup>1</sup> Missouri Agricultural Experiment Station.

The lowest temperature at which cows begin to show decline in milk production and feed consumption and rise in rectal temperature is between 70 and 85° F., varying with body size and milk-yield level—the greater the body size and milk yield the lower this “critical temperature.” The highest temperature used was 105° F., when chamber and skin temperature met, obviously an important biological constant; the rectal temperature then was between 106° F. (Jerseys) and 108° F. (Holsteins); milk production and feed consumption then virtually ceased.

Respiration rate increased in “acclimatized” cows from an initial 25/min. at 50° F. to maxima of 90 in Holsteins at 95° F. and 130 in Jerseys at 105° F.; in “unacclimatized” cows the maximal respiration rates of 118 in Holsteins and 155 in Jerseys were reached at 95° F.

Rectal temperature began to rise earlier (at 70° F.) and the rate of rise was steeper in the larger cows; its rise was least in cows with the greatest rise in respiration rate; its rise was least in cows that drank the most water. One cow increased her water consumption (with corresponding increase in urine output) from 10 gal. at 50° F. to over 45 gal. at 100 F.

A sharp rise (100%) in blood creatinine was found. A decline in blood cholesterol resulted. A decline (40%) in heat production occurred with increasing temperature above 80° F.

**P27 The Effect of Increasing Environmental Temperatures on the Composition of Milk.**

J. W. COBBLE AND A. C. RAGSDALE, University of Missouri.

Changes in the composition of milk where cows are subjected to high environmental temperatures were studied on a group of ten cows in the Psychoenergetic Laboratory at the Univer-

sity of Missouri. Five cows were used as controls and five were subjected to various temperatures over a 5-mo. period. The temperature on the experimental cows, three Jerseys and two Holsteins, was increased systematically from 50 to 105° F. by 5 to 10° F. During the last 14 d. of the experiment the control cows were subjected to a rapid increase in temperature up to 100° F. Some 850 samples of milk were collected and determinations made for total solids, fat percentage, solids-not-fat, lactose, chloride and nitrogen.

Data from these studies indicate a rise in the fat percentage, total solids and chlorides with an increase in temperature above 80 to 90° F., varying with breed and individual. Solids-not-fat, lactose and nitrogen, to a lesser extent in the Jerseys, showed a downward trend at the same temperature levels. All constituents studied returned to approximately normal levels with a return to 60° F. reading.

In the rapid change of temperatures up to 100° F. over a 14-d. period, extreme increases were observed in the total solids, solids-not-fat, fat percentage, chlorides and nitrogen. Lactose dropped to a low level.

Results obtained in composition of milk indicate breed differences, as well as an individual difference in ability to withstand high environmental temperatures.

**P28 The Influence of Temperature on the Carotenoid and Vitamin A Content of Milk Fat.**

O. T. STALLCUP AND A. C. RAGSDALE, University of Missouri.

Studies have been made on the effects of environmental temperature on the carotenoid and Vitamin A content of milk fat of four Holstein and six Jersey cows in the Psychoenergetic Laboratory at the University of Missouri. Two Holsteins and three Jerseys were kept in a chamber in which the temperature was raised from 50 to 105° F. over a 5-mo. period. Two Holsteins and three Jerseys serving as controls were kept at a temperature approximating 50° F. for the duration of the experiment. The animals were fed the regular grain mix used in the University herd. Cod liver oil furnishing 75,000 units of Vitamin A and 10,000 units of Vitamin D was added at the time the animals were changed to 80° F. The animals were fed 2 lb. of beet pulp/day and alfalfa hay *ad libitum* as the sources of roughage. The carotenoids and Vitamin A were determined by the method of Boyer *et al.* Milk samples were taken at approximately weekly intervals throughout the trial.

There was variation in both the experimental and the control groups with regard to the caro-

<sup>1</sup>A summary of results prepared for publication (Missouri Research Bulls. 423, 425, 433, 435, 436) by staff members of the Climatic Project on which the Missouri Agricultural Experiment Station and the USDA (BPISAE) are cooperating.

tenoid content of the fat. In most cases these variations tended to follow the consumption of hay rather than the pattern of ambient temperatures. The Vitamin A content of the milk fat was less variable, there being little difference in the values of either group except in the case of some of the experimental animals when they were taken from the hot chamber and feed consumption was increased markedly.

**P29 The Carotene Requirements of Guernsey Cattle for Reproduction (Progress Report).**

A. H. KUHLMAN AND W. D. GALLUP, Oklahoma A. and M. College.

If the carotene intake per pound body weight during the last 90 d. before calving is used as a basis for determining the carotene requirements of Guernseys for reproduction, the 32 calving records now available show extremely large and seemingly inconsistent variations between individual cows. In 20 cases in which the average daily carotene intake during the last 90 d. before calving ranged from 38 to 81  $\gamma$  per lb. body weight, reproduction was unsatisfactory in more than one-half of the cases at all levels within the range of carotene intake in this group. Of the twenty calves, only nine were normal at birth, four had a constricted optic foramen, three were born prematurely, one died of convulsions, and three were extremely weak. Twelve cows with carotene intakes ranging from 83 to 158  $\gamma$  daily during the last 90 d. before parturition produced eight normal calves, two weak calves which died and two dead calves.

No positive conclusions can be drawn from information available now except that, in general, the carotene requirements for Guernseys for reproduction appear to be much higher than for Jerseys and there seem to be much greater individual variations in the Guernsey breed than were found in Jerseys.

**P30 Vitamin A Absorption Studies in Ruminants.** R. P. NIEDERMEIER, V. R. SMITH AND L. H. SCHULTZ, University of Wisconsin.

Changes in plasma vitamin A levels were used to study absorption of this vitamin from the abomasum, small intestine and large intestine of goats. Massive doses of aqueous dispersed vitamin A were administered by direct injection into the part of the tract being studied, and when necessary that portion of the tract isolated by ligation and severance. Controls were treated the same way except for injection of vitamin A. Vitamin A was determined on pre-treatment blood samples and on samples taken at 2-hr. intervals for the first 10 hr. of the post-treatment period.

After the administration of 250,000 I.U. of vitamin A, the following blood plasma increases in vitamin A levels were obtained: An increase of 10  $\gamma$  per cent when injected into the abomasum, an increase of 20 and 50  $\gamma$  per cent in two trials on the small intestine, and 14  $\gamma$  per cent in the large intestine. In all cases the peak was reached within 10 hr. after treatment, with a drop to near pre-treatment levels in 24 hr. With oral administration the maximum increase of 9  $\gamma$  per cent was reached in 12 hr. with no appreciable drop in 72 hr.

**P31 Relation Between the Carotene in the Feed and the Vitamin A Potency of Butter.** H. G. WISEMAN AND J. B. SHEPHERD, Bureau of Dairy Industry, USDA.

The vitamin A potency of butter in I.U./lb. has been shown by results at Beltsville to be, in general, related to the carotene intake by the equation  $Y = 12,912 + 8,937x$ ,  $x = \text{Log intake (mg./day)}$ . From this equation it is evident that even for "winter butter" a much greater carotene intake (480 mg./day) is required than for any other normal function of the cow. To improve the vitamin A potency of "winter butter" for human use much better methods of carotene preservation in forages are needed, yet methods which for the farmer are economically feasible.

The losses in carotene in the harvesting of comparable lots of alfalfa as field-cured hay, barn-dried hay and as silage have been measured during the past 3 yr. at Beltsville. Silages have shown nearly 9 times as much carotene as field-cured hay not exposed to rain, and 20 times more carotene than that which was exposed. Silage showed less loss in dry matter and protein than field-cured or barn-dried hays. Butter obtained from cows fed this silage had three times the vitamin A potency of butter from cows fed U. S. no. 2 field-cured hay.

If high quality alfalfa silage can be produced regularly it appears economically practical to raise the vitamin A potency and yield of milk or butter during winter feeding.

**P32 Further Studies on the Relation of Soybeans to the Vitamin A Requirements of Dairy Cattle.** M. F. ELLMORE AND J. C. SHAW, University of Maryland.

Calves on a ration containing 30% raw soybeans and receiving 48  $\gamma$  of carotene/lb. of body weight exhibited a 40% decrease in plasma carotene and 30% decrease in plasma vitamin A. Calves on the same ration but receiving 64  $\gamma$  of carotene/lb. of body weight exhibited a similar decrease in plasma carotene and vitamin A. The

addition to soybean oil of a combination of N.D.-G.A., Tenox 2, and quercetin sulfonic acid at a level of 0.4% of the oil did not prevent the adverse effect of soybeans.

**P33 Role and Sources of B<sub>12</sub> in the Normal Mammal.** A. M. HARTMAN, L. P. DRYDEN AND C. A. CARY, Bureau of Dairy Industry, USDA.

The authors reported some years ago, as the result of work with rats, that a chemically still-unidentified nutrient (*X*) occurs in milk, non-fat milk solids, cheese, commercial casein, liver extracts and leafy foods and feeds (roughages), but is practically absent from yeast and grains; that this factor is required for growth, development, reproduction and lactation; that growth without it is particularly poor on diets containing lactose; and that high levels of protein are very deleterious, may even be lethal, when fed in diets deficient in *X*.

Insofar as growth is concerned, B<sub>12</sub> now has been shown to function like *X* even with animals on high protein diets; the relation of B<sub>12</sub> to the utilization of protein, especially in relation to the utilization of high-protein diets, suggests a fundamental function of this vitamin in the normal mammal.

As a result of this work it is obvious that the foods and feeds with *X* activity possess B<sub>12</sub> potency, but a B<sub>12</sub> deficiency in our animals may be overcome by feeding crystalline B<sub>12</sub>, or materials like liver extracts which contain B<sub>12</sub> in a dialyzable form, or milk or the above milk products or leafy foods or feeds which contain a chemically still-unidentified, non-dialyzable material which produces the same result in the animal as B<sub>12</sub> or diets (like one containing an excessively high level of riboflavin) which induce the development of bacteria in the animal that synthesizes a B<sub>12</sub>-active material.

Evidence indicates that cows ordinarily may synthesize enough B<sub>12</sub> to maintain the B<sub>12</sub> potency of the milk. There are suggestions, however, that some results on protein requirements of milking cows may have to be reconsidered in this connection.

**P34 The Vitamin D Content of Roughages.**

G. C. WALLIS, C. A. SMITH AND R. H. FISHMAN, Standard Brands and Agricultural Experiment Stations of Florida, Illinois, Kansas, Michigan, New York, North Carolina, South Dakota, Texas and Washington and The California State Polytechnic College.

A nation-wide survey of the vitamin D content of roughages has been made. Sixty-two samples of hay and other roughages representative of the

kinds produced and curing methods used in the various sections of the country are included. Hay samples were graded and classified by the USDA.

The results revealed striking and unpredictable variations in the vitamin D content of roughages. The lowest value obtained in this study was 59 U.S.P. units of vitamin D/lb. for a sample of sun-cured oat and vetch hay. The highest was 1,407 units for a sample of sun-cured peanut hay. Sun-cured alfalfa hay varied from 64 to 1,044 units of vitamin D per lb., a 16-fold variation. Dehydrated alfalfa meals ranged from 82 to 268 units/lb. Strangely enough, the low value for sun-cured alfalfa hay was less than the low value for dehydrated alfalfa meal. Sun-cured prairie hay varied from 499 to 681 units/lb. mow-cured soybean hay from 163 to 681 and silages of various kinds from 61 to 105 units/lb. of wet silage. Information also will be presented on the vitamin D content of sun-cured timothy hay, clover, soybean and lespedeza hay, various kinds and grades of mixed hays, sorghum fodder and winter range grasses.

These results emphasize the fact that wide and unpredictable variations exist in the vitamin D content of roughages. Many factors are concerned in determining their vitamin D content besides the extent of sunshine exposure during curing. Much careful research is needed yet to discover these factors and to properly evaluate their effect on the vitamin D content of roughages.

**P35 The Effect of the Proportion of Roughage in the Ration on the Growth of Dairy Heifers.** K. E. HARSBARGER AND G. W. SALISBURY, University of Illinois.

Differences in growth of 15 Holstein heifers fed rations containing from 55 to 94% roughage have been measured. Five rations with three heifers on each have been tested. The four experimental rations were made up principally of timothy hay, soybean meal and corn. The control ration was made up of clover hay, corn silage and limited grain. The experimental rations contained from 48.2 to 61.5% TDN and approximately 7.2% digestible protein. The timothy hay and grain were ground and mixed together in order that all components of the rations would be consumed in the same ratio.

The average daily gain in live weight at the end of 12 wk. was above normal for all rations except the experimental ration containing 94% timothy hay. However, the TDN consumed per pound of gain in live weight above the estimated maintenance requirement was approximately the same for all rations except the experimental ration containing 55% timothy hay. The ration containing 70% timothy hay produced the largest

rate of gain and required the least amount of TDN/lb. of gain.

**P36 Preliminary Report on the Influence of Soil Fertility on the Health, Reproduction and Milk Production of Dairy Cows.** C. W. DUNCAN, K. M. DUNN, R. E. ELY, S. T. DEXTER AND C. E. MILLAR, Michigan Agricultural Experiment Station.

A long-range experiment was started in 1945 to study the characteristics of various species of plants when grown on natural soil highly depleted of mineral nutrients, and on the same soil with large additions of lime and mineral fertilizers. The products from a 200-acre farm so handled were fed to two groups of dairy cows. Since the two rations must be composed of the same species, and since forage legumes such as the clovers and alfalfa would not grow on the depleted soil, grass hays were grown, together with corn, wheat, oats and soybeans as concentrates. At the outset, it was recognized that this would not constitute a thoroughly satisfactory dairy ration, due to the lack of a legume hay, and that, in agricultural practice, alfalfa or clover would be grown on the improved soil.

The chemical composition of the crops grown on the fertilized and depleted soils has been determined for each crop year. The oats, corn, and soybeans show a remarkable uniformity in composition from year to year. In the first harvest year, the hay from the fertilized fields was stemmy and was not consumed readily. To correct this difficulty, the amount of nitrogen fertilizer was decreased and the hay was cut earlier than on the depleted fields. The total digestible nutrient and digestible protein intakes are now approximately equal for both groups. The milk and fat production records of the cows receiving the unfertilized hay definitely were higher in the first lactation period than those of the cows receiving the fertilized hay, but this difference has diminished. No difference can be noted in the general well-being of the cows on the two rations. Herd health has not been a problem with these cows. At the present time the data show a slightly higher number of services per conception for the cows receiving the feed grown on the fertilized soil, although little significance can be attached to these at this time.

Systematic chemical analyses have been made on the colostrum, milk and blood of all the cows since the beginning of the experiment. These data show no differences that would indicate a nutritional superiority of the crop species grown in highly fertilized soil over the same crop species grown on the depleted soil. As would be antici-

pated, crop yields on the fertilized soil were far greater than those on the depleted soil.

**P37 Conservation of Nutrients and Feeding Value of Wilted Silage, Barn-cured Hay and Dehydrated Hay.** R. E. ELY, L. G. SCHOENLEBER, J. B. SHEPHERD, H. G. WISEMAN, C. G. MELIN, W. H. HOSTERMAN AND R. E. WAGNER, Bureau of Dairy Industry, BPISAE, PMA, and USDA.

Comparable plots of second cutting 1948 forage were harvested and stored as wilted silage, barn-cured hay and dehydrated hay. The forage was principally alfalfa with a small percentage of grass. All forage was harvested with a field chopper. Supplemental heat was used in barn hay drying. One-half of each kind of forage was cut and harvested on July 13, 14 and 15, and the balance on July 19, 20 and 21. Part of the forage harvested by each method was rained on before being stored. The forages all were of about equal quality with an official grade of U. S. no. 2 leafy alfalfa light grass mixed hay.

Nutrient preservation in the wilted silage, barn-dried hay and dehydrated hay was, respectively: dry matter 77, 79 and 84%; protein, 77, 77 and 81%; and carotene, 17, 15 and 25%. Average daily milk production per cow on wilted silage, barn-dried hay and dehydrated hay was 33.9, 36.1 and 35.2 lb., respectively. Initial production was about the same on wilted silage and dehydrated hay, and about 1.5 lb. higher on the barn-dried hay. The 30-d. declines in production were 10.2, 7.8 and 7.1%, respectively. The labor and equipment requirements were about equal for the wilted silage and barn dried hay, but the labor required for the dehydrated hay was somewhat higher.

**P38 Observations on Time Required for Dairy Cows to Eat Grain, Silage and Hay.** K. E. HARSHBARGER, University of Illinois.

The principal objective in this study was to determine the average rate at which dairy cows eat grain, silage and hay. Time studies were completed on Ayrshire, Brown Swiss, Guernsey, Holstein and Jersey cows.

The average rates of eating ranged from about 2 to 3 min./lb. for grain, 1.75 to 2.75 min./lb. for silage and 7 to 16 min./lb. for hay. For every type of feed, the rate of eating was highest for Holsteins and lowest for Jerseys, with other breeds intermediate. In addition to breed differences, there are many other factors that affect the rate of eating feeds by dairy cows.

Information on the time required by cows to consume grain is of considerable practical im-



portance in connection with the design and operation of milking parlors. When cows are milked in a milking parlor by the rapid milking procedure, they generally do not have sufficient time to eat grain allowances during the actual milking process.

**P39 How Hay Feeding to Cows on Pasture Affected Milk Production and Body Weight.**

D. M. SEATH, University of Kentucky.

No appreciable increase in milk production or body weight change resulted from feeding alfalfa hay free-choice to milking Holstein and Jersey cows on pasture during a 45-d. experimental period from July 17 to August 30, 1948. Two experimental groups of 5 cows each received hay and were compared to a third five-cow control group not receiving hay while grazing on orchard grass-alfalfa pasture. Not over 20% of the herbage consisted of alfalfa and the grazing took place following the harvesting of the early spring growth for silage and hay. Hay consumption varied from slightly less than 6 lb. per head daily during the first 13 d. of the experiment, when receiving first cutting alfalfa hay, to slightly more than 14 lb. during the last 32 d. of the experiment when second cutting alfalfa was being fed. Relatively dry weather during the last 2 wk. of the experiment caused the pasture herbage to appear dry and lacking in succulent growth. In spite of this, the group not receiving hay produced as well as did the groups receiving hay during this period. All three groups produced at a lower level than did ten comparable cows within the regular experiment station herd grazing bluegrass pasture. Besides the difference in pasture, this latter group had access to more ample shade than was available to the three five-cow groups.

**P40 A Method for Estimating the Feed-replacement Value of Pasture Forage.**

W. B. NEVENS, R. W. TOUCHBERRY AND J. A. PRESCOTT, JR., University of Illinois.

This investigation had for its objective the design of a simple method for the measurement of the feed-replacement value of pasture herbage. Fifteen pairs of high-producing cows were selected. The cows of a pair were nearly alike in weight, stages of lactation and gestation and level of milk yield. One cow of each pair was assigned at random to the "pasture group" and the other to the "dry-lot group". The pasture group was allowed access to a pasture of known area and was given grain mixture as the only supplementary feed. The dry-lot group received only silage, alfalfa hay, beet pulp and the same kind of grain mixture as that given the pasture group. The experiment lasted 18 wk.

The production of the two groups was not significantly different. The method of calculating the feed-replacement value of the pasture is to find the difference between the amounts of feed, other than pasture, given the two groups of cows. For this experiment, the difference amounted to 3,554 lb. silage, 1,935 lb. hay, 169 lb. beet pulp and 510 lb. grain mixture. Dividing each of these amounts by 38.38, the yield per acre of FCM (fat-corrected milk) in cwt., gives the feed-replacement value/100 lb. FCM.

**P41 Distribution of Intravenously Injected Radioactive Phosphorous ( $P^{32}$ ) in the Body of the Dairy Cow.**

N. P. RALSTON, MAX KLEIBER, A. H. SMITH AND A. L. BLACK, University of California.

A venous catheterization technic has been adapted for accurate injection of materials into the blood stream of dairy cows. This method allows the drawing of frequent blood samples over prolonged periods. A series of experiments has been conducted, concerning phosphorous metabolism, employing this method.

Two of these experiments were terminated by slaughtering the cows in order to study the distribution of the injected radioactive phosphorous in the tissues.

**P42 The Effects of Lactose Feeding on Lactase Production.**<sup>1</sup>

JESSIE FISCHER, T. S. SUTTON, J. L. LAWRENCE, H. H. WEISER AND G. L. STAHLY, Ohio State University.

Three groups of rats were fed rations containing carbohydrate as follows: (I) 67% cornstarch; (II) 31.6% lactose (supplied by non-fat dry milk solids) plus 32.8% cornstarch; and (III) 31.6% USP lactose plus 35.4% cornstarch. Rats in groups II and III exhibited diarrhea. Diarrhea disappeared entirely in group III but occasionally was observed in group II during a 6-mo. feeding period. The rats then were killed and the total lactase activity of the small intestinal mucosa of each rat was determined. In 4 hr. the following average percentages of lactose were hydrolyzed: (I) 37.6%, (II) 48.2%, and (III) 42.7%. These differences were not significant.

In another experiment, three groups of rats were fed rations containing 67% carbohydrate as follows: (I) 67% cornstarch, (II) 15% USP lactose plus 52% cornstarch, and (III) 35% USP lactose plus 32% cornstarch. Rats from each group were killed and total small intestinal lactase determined at 0, 1, 4, 8 and 18 wk. No relationship between lactase concentration and lactose feeding at these two levels was found.

<sup>1</sup> Research supported by the American Dry Milk Institute, Inc.

These results considered in conjunction with a study of lactase activity of the cecal contents of some of these same rats reported elsewhere<sup>1</sup> indicate that any significantly greater lactase activity in response to lactose feeding is microbiological rather than mucosal in origin. However, the available data are not conclusive proof that the disappearance of diarrhea with continued lactose feeding is a result of microbiological changes alone.

**P43 Blood Sugar Studies in Relation to Ketosis in Ruminants.** L. H. SCHULTZ, V. R. SMITH AND H. A. LARDY, University of Wisconsin.

This study was undertaken in an effort to obtain additional information regarding the relationship between blood sugar and blood ketone levels in ruminants. Goats were used in all of the studies. By means of daily injections of 80 units of protamine zinc insulin it was possible to maintain blood sugar levels below 30 mg. % for a week with no increase in blood ketones or particularly adverse effects upon the animal. Intravenous injection of alloxan at the rate of 90 mg./kg. of body weight caused an initial hyperglycemia, then a hypoglycemia and finally a marked and permanent hyperglycemia. There was a gradual but marked increase in blood ketones. Daily subcutaneous injections of 1 g. of phlorhizin for a period of 1 wk. resulted in the excretion of approximately 40 g. of glucose daily but caused no marked changes in either blood sugar or blood ketone levels. Oral administration of 15 g. of ketogenic fatty acids (particularly butyric and caproic) caused marked but very transitory changes in blood sugar levels. First there was a hyperglycemia, then a hypoglycemia and finally a somewhat longer period of hyperglycemia. The lowered blood sugar immediately followed the peak of ketone body production.

**P44 Biochemical and Histopathological Studies of Fasting Ketosis and Spontaneous Ketosis of Cows.** J. C. SHAW, P. V. SAARINEN, B. C. HADJILOS AND E. C. LEFFEL, University of Maryland.

Most of the biochemical alterations observed in the blood and various organs of cows with spontaneous ketosis can be produced by fasting cows in the early postpartal period. All the blood lipid fractions are low in both fasting and spontaneous ketosis. The plasma organic acid-soluble phosphorus is low in both cases. The inorganic phosphorus varies widely in both cases. Phosphatase values decrease in both fasting and

<sup>1</sup> Society of American Bacteriologists, Proceedings of Annual Meeting, 1949.

spontaneous ketosis. Ca, Na, K and Cl values are normal in both cases. In the early stages of spontaneous ketosis the liver fat often approaches normal values. The fatty liver observed in the later stages of spontaneous ketosis appears to be due primarily to fasting. The increase in the liver fat in both fasting ketosis and the later stages of spontaneous ketosis appears to be due mainly to glycerides. The ester cholesterol increases in both cases but tends to be higher in spontaneous ketosis. The total cholesterol in the liver varies within normal limits in both cases. Of particular significance is the fact that at the same low level of blood glucose, ketonemia is much more marked in spontaneous ketosis than in fasting ketosis. The liver glycogen is depleted markedly in both cases. Cows exhibiting fasting ketosis do not show clinical symptoms known to be associated with spontaneous ketosis though the blood glucose values may be very low. In fasting ketosis as well as in spontaneous ketosis, the liver, kidneys, and all of the endocrine glands exhibit fatty phanerosis. In the later stages of spontaneous ketosis there is a marked degeneration of the epithelial cells of the various organs and endocrine glands, and severe damage to the convoluted tubules of the kidneys always has been observed. In most cases of spontaneous ketosis significant alterations have been observed in the anterior lobe of the pituitary. Also, in spontaneous ketosis the adrenal glands always are enlarged, with the degeneration of the epithelial cells being most marked in the zona glomerulosa.

**P45 Standards for Growth in Weight of Jersey Heifers.** C. A. MATTHEWS AND M. H. FOHRMAN, Bureau of Dairy Industry, USDA.

The average weights of 378 Jersey heifers, excluding twins and inbreds, born and raised in the Beltsville herd were used in preparing a standard of normal growth by 10-d. periods from birth to 365 d. of age. Average weights on 360 of these heifers were used in preparing a standard by months from birth to 21 mo.

Average weights at birth, 90, 180 and 365 d. were 55.6, 137.9, 277.0 and 519.3 lb., respectively, for the standard by 10-d. periods, and 55.7, 138.3, 277.1 and 519.7 lb., respectively, for the standard by months. The average weight at 18 mo. was 660.1 lb.

Slight irregularities in the growth curve for average weights were smoothed out by the fitting of 4th degree orthogonal polynomials to produce the standards for weights at specified ages and gains in weight during specified periods. The changes in the standard deviations with increase in age were smoothed out in the same manner.



Factors which divide a normal distribution into ten sections with an equal number of items in each were applied to these estimated standard deviations to provide a system for grading individual animals on the extent of the differences between their weights and the standard.

**P46 The Value of Wood Molasses for Growth of Dairy Heifers.** T. H. BLOSSER, G. W. SCOTT, R. E. ERB AND A. O. SHAW, State College of Washington.

Ten heifer calves (eight Holsteins and two Jerseys) ranging in age from 3 to 10 mo. were divided into two groups of five each. Both groups received chopped alfalfa hay and enough grain so that they were being fed total digestible nutrients at a level 5% below Morrison's (20th ed.) minimum standards for growing dairy cattle. In addition, one group was fed 2 lb. of wood molasses daily for the first 8 wk. (1st phase) of the experiment and 4 lb. of wood molasses daily for the next 7 wk. (2nd phase).

The wood molasses-fed group gained 1.22 lb./d. during the 1st phase and 1.37 lb./d. during the 2nd phase of the experiment. The control group gained 0.94 lb. daily during the 1st phase and 1.06 lb. daily during the 2nd phase. These differences were highly significant. The total of 1,540 lb. of wood molasses fed during both phases produced 155 lb. more gain in the wood molasses-fed than in the control group. Thus, 10 lb. of wood molasses produced 1 lb. of gain. There was no significant difference between the two groups in increase in height at the withers.

The major problem encountered was in regard to the palatability of the wood molasses. The calves did not relish it, although as the trial progressed they seemed to become more accustomed to its taste.

It is concluded that wood molasses is of value for growth of dairy calves.

**P47 Effect of Various Milking Procedures, Prepartum and Postpartum, on Composition of Mammary Secretions.** D. B. PARRISH, F. C. FOUNTAINE, G. H. WISE, F. W. ATKESON AND J. S. HUGHES, Kansas Agricultural Experiment Station.

Observations were made on composition of mammary secretions obtained by various milking procedures. Procedures used were: normal postpartal milking; partial postpartal milking of one-half of the udder; milking of cows and heifers commencing 8 to 12 days prepartal; milking one-half the udder throughout the gestation period, followed by normal milking postpartum; and single milkings 3 to 12 d. after commencement

of the normal dry period. Except in the latter case, milkings were made twice daily. Oxytocin was used in some of the trials.

Changes in the secretions were followed by determinations of quantities produced, specific gravity, and concentrations of fat, total solids, ash, lactose, protein, vitamin A, carotenoids and tocopherols. Observations also were made of condition of the udder and effect on later production of milk.

Cows and heifers that were milked commencing 8 to 12 d. prepartal produced secretions in the early stages that resembled colostrum and rapidly assumed the characteristics of normal milk in subsequent milking; only small, if any, further changes were noted at time of calving. Similar results were noted in the case of cows milked throughout the whole gestation period when quantities of secretions obtained totaled several pounds daily, whereas cows that tended to go dry in spite of continuous milking produced secretions at time of calving that had many of the characteristics of colostrum. Cows milked a single time 3 to 12 d. after commencement of the normal dry period frequently produced secretions in the early stages having a specific gravity lower than normal milk. No marked differences were obtained in the nature of the secretions when oxytocin was used.

Effect of the experimental procedures on content of various constituents of the mammary secretions and on condition of the cow will be presented and relation of the findings to theories of colostrum formation will be discussed.

**P48 Some Effects of Prepartum Milking on the Performance of Cows and Calves.** R. A. ACKERMAN, G. HYATT, JR. AND A. H. VAN LANDINGHAM, West Virginia University.

Forty-five Ayrshire cows and first-calf heifers were divided at random into a prepartum and control group. Of the 24 animals milked prepartum an average of 9 d., six produced less than 2 lb. the day preceding parturition; four 2 to 10 lb.; five 11 to 20 lb.; and nine over 20 lb.

Based on the total nitrogen and vitamin content, normal milk was produced at parturition by cows yielding over 20 lb. on the day before calving.

On the average, all prepartum groups reached their peak of production slightly later and maintained their production at near peak levels over a longer time than did the control group.

Daily observations of the amount of udder congestion and lymphatic edema, both before and after parturition, were recorded. There was considerable variation within groups. The results

indicated, however, that prepartum milking neither reduced the amount of congestion or edema nor the length of time required for the udder to become normal.

Calf feeding and management differed only in that calves from prepartum groups were given more cod liver oil the first 3 d. than those from dams in the control group. All calves received their dams' milk the first 4 d. No calf mortality or serious scours occurred. The average rate of gain of calves in all groups was satisfactory.

**P49 The Effect of Prepartum Milking on the Ascorbic Acid and Riboflavin Content of Colostrum at Parturition.** A. H. VANLANDINGHAM, C. A. FLANDERS AND R. A. ACKERMAN, West Virginia University.

Six cows, four Ayrshires and two Holsteins were milked 8 to 18 d., average 14 d., before parturition. Production on day before parturition varied from 10.3 to 24.6 with an average of 21.4 lb.

Wide variations were observed in the total nitrogen, ascorbic acid and riboflavin content of colostrum produced by cows milked before parturition. The composition of the colostrum at parturition was related to the level of production and the total amount produced before parturition.

Total nitrogen in colostrum on day of parturition averaged 727 mg./100 ml. Milk produced by 11 cows not milked prepartum averaged 737 mg. total nitrogen on the 3rd day following parturition.

Ascorbic acid decreased from an average of 18.5 mg./l. 3 d. before parturition to 4.7 mg. on the day of parturition and to 4.3 mg. on the 3rd day following parturition.

Riboflavin decreased from an average of 6.53 mg./l. 3 d. before parturition to 2.70 mg. on the day of parturition and to 1.90 mg. the 3rd day following parturition.

**P50 Effectiveness of Penicillin Infusions in Eliminating Mastitis Infections in the Bureau of Dairy Industry Herd.** W. W. SWETT, L. A. BURKEY, CECELIA R. BUCKNER AND P. C. UNDERWOOD, Bureau of Dairy Industry, USDA.

Beginning in 1944, penicillin was administered to a limited number of udder infections in the Bureau's dairy herd at Beltsville. At the outset the total dosage was 50,000 units. In some cases it was administered as a single infusion. In other cases 25,000 units was administered once daily on 2 consecutive days. About 65% of the streptococcal and one third of the staphylococcal infections were eliminated by these treatments.

From April, 1946, through December, 1947, penicillin was used exclusively. During this period each treatment consisted of two infusions daily on 2 consecutive days and the total number of units for the treatment was increased to at least 100,000. More than 90% of all streptococcal infections and 85% of all staphylococcal infections were eliminated when this four-infusion treatment procedure with increased dosage was followed.

The nature of infection found in this herd differed materially from that usually reported by other investigators. Only about 10% of the infections were caused by *Streptococcus agalactiae* and only 55% by streptococci of all kinds. Staphylococci accounted for more than 30% and coliform bacteria, pseudomonads, yeasts and cocci for the balance.

**P51 The Incidence and Relative Severity of Infections of Different Organisms in Mastitis.** L. A. BURKEY AND CECELIA R. BUCKNER, Bureau of Dairy Industry, USDA.

The view still widely accepted that *Streptococcus agalactiae* is the principal infecting organism in mastitis is not borne out from the standpoint of either prevalence or severity of mastitis in results obtained in the herds maintained by the Bureau of Dairy Industry at Beltsville. Studies during the last 4 yr. have shown that *S. agalactiae* was associated in only 7 to 15% of the infections of mastitis, whereas *Streptococcus uberis* was found in 19 to 30% and hemolytic staphylococci in 21 to 38% of the infected quarters. Results indicate that incidence of infections of different organisms is related in part to the ease of their elimination by treatment.

Of the seven species of bacteria encountered in mastitis, at least 20 distinct strains were found associated with these infections. Studies on the severity of mastitis, judged by the leucocyte count and the percentage of chlorides of the fore-milk, indicate that most of these strains are capable of causing severe infections of mastitis. However, these studies indicate that certain strains of *Streptococcus dysgalactiae* and *S. uberis*, enterococci and streptococci of the viridans group usually were associated with relatively mild infections. Likewise they indicate that mixed infections of strains of *S. agalactiae* and certain strains of *S. dysgalactiae* and *S. uberis* with hemolytic staphylococci were found associated with less severe infections. However, such a measure of the degree of severity is not an adequate basis for predicting the effectiveness of treatment.

**P52 A Study of the Reliability of Various Diagnostic Tests and the Efficiency of Certain**

**Therapeutic Measures in the Control of Mastitis.**

C. P. MERILAN, H. A. HERMAN, J. E. EDMONSON, K. L. TALLMAN AND O. S. CRISLER, University of Missouri.

A study of the reliability of various diagnostic tests and the efficiency of certain therapeutic measures in the control of mastitis has been made on the University of Missouri dairy herd over a 10-yr. period. A combination of the Hotis test and microscopic examination of incubated milk samples was used as a standard. The leucocyte count detected 71.92% of the positive samples and 84% which were negative to the Hotis and microscopic tests. The chloride test detected 53.5% of the positive samples and 78.4% of the negative samples. Agreement on 33.08% of the positive samples and 9.11% of the negative samples was shown in 1,852 comparisons of the bromothymol blue test with the Hotis and microscopic tests.

The fact that many cows affected with mastitis undergo "natural recovery" is recognized. In this study, approximately 38% of the untreated cows recovered.

The effectiveness of various treatments for mastitis was studied in 289 infected quarters of 140 cows. Only animals with at least two tests after treatment are included in this study. Treatment of 82 quarters with sulfanilamide in iodized mineral oil resulted in 73.17% of the quarters becoming negative to the Hotis and microscopic tests and 69.35% of the 186 infected quarters given penicillin infusions were negative within an average of 29 d. after treatment. Treatments with 4-4 diamino-diphenyl sulfone and Tyrothricin also were studied and results will be reported in detail.

**P53 Preliminary Observations on the Biochemical and Serological Characteristics of Coliform Organisms Isolated from Cases of Acute Mastitis.**

J. C. OLSON, JR., I. A. SCHIPPER AND M. E. SCHMITZ, University of Minnesota.

The object of this study was to obtain information regarding the heterogeneity or homogeneity of coliform bacteria isolated from cases of acute bovine mastitis. Consequently, extreme care was taken to exclude external coliform contaminants. In addition, all isolations were made from poured plates on which a large number of coliform colonies occurred. Sufficient colonies were picked from individual plates to make reasonably certain that representative cultures of types present on the plates were obtained. No evidence was obtained, during the study of any of the cases, which would indicate that organisms other than coliform were etiological agents. All cultures were classi-

fied according to *Bergey's Manual of Determinative Bacteriology* and according to Parr (Bact. Rev., 3: 1-48. 1939). Seventy-six cultures were isolated and classified. The cultures could be segregated into two sharply defined biochemical groups. The organisms of one group, consisting of 64 cultures isolated from various quarters of six cows, were typical of *Aerobacter aerogenes*. The majority of these cultures were capsulated. The organisms of the second group consisting of 12 cultures, isolated from one quarter of a cow not included in the six mentioned above, were typical of *Escherichia freundii*. These cultures were non-capsulated.

Serological studies now in progress employing both slide and tube agglutination technics indicate that at least two serological types are present among the 76 cultures.

**P54 Comparison of the Incidence and Severity of Mammary Edema of Cows Fed Roughages Alone or Roughages Plus Grain during the Dry Period.**

F. C. FOUNTAINE, D. B. PARRISH AND F. W. ATKESON, Kansas Agricultural Experiment Station.

Cows of the Ayrshire, Guernsey, Jersey and Holstein breeds were assigned alternately, within the breed, to two groups. So that they would be in a good state of flesh at time of turning dry, cows in group 1 were fed additional amounts of grain during the terminal 3 mo. of lactation. During the dry period their ration was limited to alfalfa hay *ad libitum*, plus atlas sorgo silage. Cows in group 2 were fed according to production during the terminal stages of lactation, and were fed alfalfa hay, sorgo silage and a 16% grain concentrate during the dry period.

Both prior to and subsequent to parturition there was no significant difference in the incidence and severity of mammary edema and congestion of cows in the two groups. The incidence of edema of varying degree of severity was 54% in the group fed grain during the dry period and 56% in the group that received only roughage.

**P55 Diluting Bull Semen on the Basis of Numbers of Spermatozoa rather than by Volume.**

C. BRANTON, M. H. NEWSOM AND T. E. PATRICK, Louisiana State University.

This report deals with a study of diluting bull semen to contain 16, 12, 8, 6 and 4 million spermatozoa/ml. regardless of the numbers of spermatozoa in the undiluted semen samples. Fifty ejaculates from 10 bulls, 6 of them Jerseys, 2 Holsteins, and 2 Guernseys, were diluted with egg yolk-citrate-sulfanilamide and used in routine breeding. The experimental design employed

consisted of two 5 × 5 Latin squares. Results on the basis of 30 to 60 d. non-returns to 1,895 first services showed, 62.8, 64.0, 66.8, 58.0 and 63.5% non-returns for semen diluted to contain 16, 12, 8, 6 and 4 million spermatozoa/ml., respectively. When tested statistically, these fertility levels were not significantly different.

**P56 Penicillin and Sulfanilamide in Semen Dilutors and Their Effect on Fertility of Semen from Relatively Fertile Bulls.** J. P. MIXNER, New Jersey Agricultural Experiment Station.

To determine the effect of penicillin and sulfanilamide in combination on fertility of semen from bulls of relatively high fertility a 3 × 3 latin square was designed and replicated three times using a total of six Holstein and three Guernsey bulls. The following three egg yolk citrate dilutors were compared: (a) containing 1,000 units penicillin/ml. dilutor, (b) containing 3 mg. sulfanilamide/ml. dilutor, and (c) containing 1,000 units penicillin plus 3 mg. sulfanilamide per ml. dilutor. The data accumulated were for 27 semen samples from nine bulls and used on a total of 520 1st and 2nd service cows and were based on 60 to 90 d. non-returns. The mean per cent fertility levels on the three dilutors were as follows: (a) 67.2%, (b) 74.4% and (c) 74.3%. An analysis of variance of the data indicated that there were no significant differences in these contrasted mean fertility levels.

**P57 A Comparison of Penicillin, Streptomycin and Sulfanilamide for Improving the Fertility of Semen from Relatively Infertile Bulls.** J. O. ALMQUIST, Pennsylvania State College.

In the present study seven relatively infertile bulls of the Western Pennsylvania Artificial Breeding Cooperative were used to compare yolk-citrate diluted semen and yolk-citrate diluted semen containing either 1,000 units of penicillin/ml., 1,000 units of streptomycin/ml., 1,000 units each of penicillin and streptomycin/ml. or 300 mg. % sulfanilamide. Each diluted semen sample served as its own control in that only half of the sample received one of the four treatments tested while the other half remained untreated. Two of the seven bulls were slaughtered soon after the beginning of the experiment because of extremely low fertility even though there was some indication of positive treatment response. The fertility of the diluted semen from the remaining five relatively infertile bulls showed a marked improvement when treated with penicillin, streptomycin or the combination. The control portions of 76 ejaculates were used for 1,814 inseminations

and the treated portions for 1,807 inseminations. Based on 90 to 120 d. non-returns, fertility was increased 21.7 percentage units by penicillin, 25.9 percentage units by streptomycin and 21.3 percentage units by penicillin plus streptomycin. Sulfanilamide gave a slight decrease of 2.9 percentage units. The control semen averaged 38.9% non-returns.

**P58 Fertility of Bull Semen Diluted from 1:100 to 1:300.** E. L. WILLETT, American Foundation for the Study of Genetics.

Two small-scale and two large-scale experiments have been conducted to determine the fertility of bull semen diluted above 1:100. Non-returns were computed at an average of 75 d. after service. Yolk-citrate dilutor was used in the first experiment and yolk-sulfanilamide-citrate in the others. Each semen collection, consisting of two or more ejaculates from a bull, was split three ways. One-third was diluted 1:100 and the other two portions were diluted at higher levels. The highest dilution studied was 1:300. The different dilution levels were rotated among different inseminator groups where the semen was used for breeding. In every experiment there was a downward trend in non-return rate with increase in rate of dilution, but no significant differences were obtained. When non-return percentages were plotted on a graph against numbers of spermatozoa per insemination, there appeared to be a curvilinear relationship with the rate of drop in non-returns increasing with decrease in sperm numbers. In the two large-scale trials with a total of 7,787 services from 54 collections from 18 bulls, for samples containing 6,000,000 sperm or more the regression coefficients were 0.43% and 0.52%—the decrease in non-return rate per million decrease in spermatozoa per insemination. For the samples containing less than 6,000,000 spermatozoa per insemination, the regression coefficients were 6.99% and 2.62%. The figure of 6,000,000 spermatozoa per insemination roughly represents, on the average, the dilution level of 1:200 when 1 ml. of semen is used per insemination.

**P59 Buffered Whole Egg as a Nutrient Extender for Bovine Spermatozoa.** H. O. DUNN AND R. W. BRATTON, Cornell University.

A satisfactory bovine semen extender has been prepared by mixing one part of whole eggs, from which the chalazae have been removed and which have been thoroughly beaten in a Waring blender, with three parts of a buffer containing 1.93% sodium citrate dihydrate and 0.4% succinylsulfathiazole (sulfasuxidine).

The livability and fertility of spermatozoa stored at 5° C. in the citrate-sulfasuxidine-whole egg formula (1.9 CSSWE) and in the standard 2.97% citrate-sulfanilamide-yolk formula (2.9 CSAEY) were compared. Sixty-nine split ejaculates were extended to give approximately  $16 \times 10^6$  live sperm/ml. extended semen. The estimated percentages of motile spermatozoa at 0 and 2 d. were 60 and 52 for the 2.9 CSAEY and 62 and 54 for the 1.9 CSSWE. The visibility of the spermatozoa and their rate of progressive motility was much greater in the latter. Based on 28 to 35 d. non-returns to 5,915 first-service cows, the percentage non-returns was 76.4 for the standard egg yolk formula and 74.3 for the whole egg formula. This difference is not statistically significant. Citrate-whole egg and citrate-sulfanilamide-whole egg, because of their high pH (7.8 to 7.9) were found to be spermicidal. The acidity of sulfasuxidine was found to be sufficient to alleviate this effect.

**P60 The Fertility of Bovine Semen Cooled with and without the Addition of Citrate-sulfanilamide-yolk Extender.** R. H. FOOTE AND R. W. BRATTON, Cornell University.

The cooling and extending procedures (a) semen cooled rapidly (from 30 to 5° C. in 5 min.) unextended, then extended 1:100; (b) semen cooled slowly (from 30 to 5° C. in 75 min.) unextended, then extended 1:100; (c) semen extended 1:100 and cooled rapidly; and (d) semen extended 1:100 and cooled slowly were compared using 11 split ejaculates extended with citrate-sulfanilamide-yolk. The mean percentage of motile spermatozoa during a 6-d. storage period for treatments a, b, c and d were 29, 47, 57 and 62, respectively. All treatments except c and d were significantly different from each other.

The fertility of semen cooled slowly with and without the addition of extender was determined on 64 ejaculates split two ways and used for insemination. When stored at 5° C. the estimated percentages of motile spermatozoa at 0 and 2 d. were 63 and 51 for the semen cooled in extender and 48 and 34 for the semen cooled without extender. The percentage non-returns on a 28 to 35 d. basis for 3,067 first services, and representing 32 of the 64 ejaculates, was 76 for the semen extended before cooling and 71 for the semen extended after cooling. The difference is statistically significant ( $< 0.05$  P).

**P61 Relation of the Eosin-aniline Blue Staining Method to the Quality of Bull Semen.** H. E. SHAFFER AND J. O. ALMQUIST, Pennsylvania State College.

Additional evidence that the eosin B-aniline blue staining mixture can be used to differentiate living and dead bull spermatozoa has been obtained. Spermatozoa rapidly lost their ability to remain unstained when undiluted semen was subjected to adverse conditions of temperature. The ability of the spermatozoa to remain unstained in the presence of the staining mixture did not appear to be dependent upon respiration, glycolysis or the presence of seminal plasma.

Field trials were conducted at the Nepa and First Pennsylvania Artificial Breeding Cooperatives to study the relationship between the percentages of unstained (living) sperm and fertility expressed on the basis of 90 d. non-returns. The study included a total of 197 ejaculates from 40 bulls. Each ejaculate was used to inseminate from 25 to 175 cows for a total of 10,344 services. A highly significant curvilinear regression was found between per cent 90-d. non-returns and per cent unstained sperm. The shape of the curve suggested that the staining method was of most value for detecting semen samples of relatively low quality. Under the conditions of this fertility study, however, it seemed to be of questionable value in predicting the potential fertilizing capacity of semen of relatively high quality.

**P62 The Effect of Frequency of Collection upon Semen Production and Fertility of Dairy Bulls Used in Artificial Breeding.** T. E. PATRICK, C. BRANTON AND M. H. NEWSOM, Louisiana State University.

This study was undertaken to determine the effect of various time intervals between collections upon semen production and fertility of dairy bulls. The duration of this experiment was 180 d. (three 60-d. periods). Two  $3 \times 3$  latin squares were used with six bulls being subjected to the following treatments: I, one ejaculate every 4th day; II, two ejaculates every 8th day; and III, three ejaculates every 12th day. Volume, motility and disposal were recorded on each ejaculate. Methylene blue reduction time was determined on samples having a motility of 50% or better and a concentration above 900,000,000/ml. Ejaculates meeting certain quality standards were diluted with egg yolk-citrate-sulfanilamide and used in routine breeding.

Analyses of the data on semen characteristics showed no significant differences between treatments for volume per ejaculate, percentage motility, methylene blue reduction time and percentage of shippable ejaculates. Fertility results involving 2,794 first services calculated on 30 to 60-d. non-return bases were as follows: Treatment I, 69.4%; II, 68.3%; and III, 67.0%. These dif-

ferences were not significant when tested statistically.

Data presented indicate that dairy bull semen can be collected once every fourth day with results equal to those obtained from less frequent service.

**P63 Clipping as an Aid to Control of Cattle Lice.** R. B. PRICE JR., W. C. PRIGGE, N. N. ALLEN AND R. J. DICKE, University of Wisconsin.

Twelve yearling dairy heifers, taken at random from a lot of 22, were clipped December 8. They were housed with the ten unclipped animals, running together in a large pen. When examined December 22, all of the unclipped heifers were infested lightly with lice, while no lice were found on the clipped animals. A second examination January 10 indicated an increase of lice on the long haired heifers, while the clipped animals remained free except for isolated lice found on two animals. On February 18, infestations had become fairly heavy on some of the unclipped heifers. Only very light infestations were found on any of the heifers which had been clipped, although their hair was well grown out. At that time, two of the previously clipped heifers were re-clipped and two of the long-haired animals were clipped. When examined 3 d. later, the freshly clipped animals were free of lice. A fifth long-haired heifer, heavily infested with lice, was clipped on one side only. When examined 3d. later, the clipped side was free of lice, while the unclipped area remained heavily infested. This was not the result of removal of the lice with the hair, as large numbers were found clinging to the base of the short hairs immediately after clipping.

No treatment for control of lice was applied to any of the heifers. Continued observations are being made through the early spring months. Those made to date indicate that clipping is a very definite aid in controlling cattle lice.

**P64 The Effect of Methods of Milking, Methods of Cooling the Milk and Types of Barns on the Total Bacteria Count and Coliform Count.** C. C. FLORA, P. M. REAVES AND C. W. HOLDAWAY, Virginia Agricultural Experiment Station.

Studies were made on cooling milk by two methods, pouring the uncooled milk into cans and setting the cans into a wet storage or cooling the milk over an aerator and cooling it before setting the cans into wet storage. An agitator circulated the water around the cans in the storage. The milk was not stirred. When the uncooled milk was placed in the wet storage, the bacterial count

increased at a somewhat greater rate during a 12-hr. storage period than when it was cooled over the aerator before placing in the wet storage. Similar trends were secured for the coliform count. In all cases the coliform count increased at a faster rate than the total count. The increase was very much greater in the uncooled milk.

Further studies compared milk produced when cows were housed and milked in a stanchion barn and milked with a standard type milking machine, when cows were housed loose and milked in a stanchion barn with standard type milking machine, when cows were housed in a tie-stall barn and milked with a combine type milker in a milking parlor, and when cows were housed loose and milked with a combine milker in a milking parlor. The milking parlor method gave lower total bacteria counts than milking with the standard type milking machine. Very little difference was found in the milk when cows were housed in the stanchion barn as compared to loose housing, both groups being milked in the stanchion barn.

**P65 Some Observations on Recovery in Dairy Production in Western Europe.** W. H. RIDDELL, University of Vermont.

The low point in dairy cow numbers in occupied countries and Switzerland occurred in 1944-5. For the Netherlands, this represented 75% of pre-war figures. Milk cow population in 1947 for eight countries (Belgium, Denmark, France, Netherlands, Norway, Sweden, Switzerland and United Kingdom) averaged 90% of 1934-8. Total milk production was approximately 80% due to limited import feed supplies and fairly widespread drought.

War-time reduction in livestock numbers for some occupied countries resulted in improvement in quality of dairy cattle and other livestock. In the Netherlands, where the decline was most severe, breed and livestock officials emphasized this improvement for all classes.

Percentage of cows in various forms of production testing has increased in post-war years. Except France, for which data were lacking, total cows tested in seven countries for 1947-8 were 2.5 million, approximating 28% of dairy cow population. Percentage range was from 8.5% for Belgium to 49.6% for Denmark.

Approximately one million cows were bred artificially in six countries for the same period, representing about 13% of dairy cow population. Percentage range was from 1.5% for Belgium to 33% for Denmark. Data were lacking for France, and Switzerland reported interest only in combating disease.



Dairy research was curtailed severely during war years in occupied countries.

**P66 Feeding Value of Dehydrated Sweet Potatoes Fed Wet as Compared with Corn-soybean Silage for Lactating Cows.** L. L. RUSOFF, B. J. BURCH, JR., J. B. FRYE, JR. AND G. D. MILLER, Louisiana State University.

It now is recognized that dehydrated sweet potatoes are approximately 90% as valuable as yellow corn meal as a source of carbohydrate in the grain ration. Using a latin square design, three groups of eight dairy cows each, consisting of five Holsteins and three Jerseys, were given a good grain mixture according to production. Approximately 8 lb. of alfalfa hay/cow/day and equal amounts on an air-dry basis of (a) corn-soybean silage, (b) dehydrated standard sweet potatoes wet with an equal weight of water or (c) dehydrated weevily-infested sweet potatoes wet with water were fed. There was no apparent significant difference in the milk production between the various groups on either silage or dehydrated sweet potatoes fed wet.

**P67 Effect of Excess Concentrate Feed Consumption on Milk Production of Dairy Cows in Hawaii.** L. A. HENKE, University of Hawaii.

Commercial dairymen in Hawaii often feed well above the requirements of the Morrison Standard. The general plan to feed 1lb. of grain for each 3 lb. of milk produced is inadequate in Hawaii for two reasons. Roughages fed are coarse and of low nutrient content; the concentrate mixtures largely are based on two by-products with low nutrient content, pineapple bran and cane molasses, to which are added such protein supplements as may be needed.

The effect of excess concentrate feeding was studied in three trials using 22 cows. The concentrate mixture consisted of 25% cane molasses, 43% pineapple bran, 30% soybean oil meal and 1% each of bone meal and salt.

Cows when fed according to the Morrison Standard consumed 15.41 lb. of the concentrate ration to produce 24.06 lb. of 4 per cent fat-corrected milk. Cows fed excess concentrates consumed 19.76 lb. of the concentrate mixture to produce 25.41 lb. This shows a profit on the cost of the added concentrates of 2.13% when selling milk on the wholesale basis (18 cents) and 59.34% on the retail basis (28 cents).

**P68 Influence of Various Udder Treatments Upon the Let-down of Milk.** C. E. KNOOP

AND C. F. MONROE, Ohio Agricultural Experiment Station.

Ten milking trials were conducted with 11 cows to determine the influence of various pre-milking treatments on the rate of milk let-down. The following treatments have been studied: (a) no treatment, (b) dry hand massage, (c) the use of a strip cup, (d) cleaning the udders with a damp cloth, (e) cleaning the udders with a towel removed from hot water (120° F.), (f) the same treatments as e, followed by the use of a strip cup and (g) a thorough bathing of the udder in hot water, together with the use of a strip cup.

The effects of the above treatments upon the let-down of milk were measured by collecting the milk produced during the 1st and 2nd 45 sec. of the milking period in a specially designed milking unit (Surge). Data also were obtained on the total amounts of milk produced and the time required to milk each cow after the various treatments.

Results indicate the desirability of some preliminary treatment. Merely removing one or two streams of milk from each quarter did not appear entirely adequate for a complete let-down. A 10 sec. massage of the udder with a damp cloth was just as effective as a like treatment with heavy towels removed from hot water at 120° F.

**P69 A Comparison of Milk Production between the Prepartum Milked Halves and the Non-prepartum Milked Halves of Bovine Udders.** M. L. DAWDY AND C. B. KNOTT, Pennsylvania State College.

Twenty-two first-calf heifers of the five major dairy breeds and 13 Holstein cows have been used in a comparison of the effects of prepartum milking upon milk production, by pre-partum milking one-half of the udder and non-prepartum milking the other half.

A comparison for the first 30 d. postpartum of 15 first-lactation heifers, having apparently balanced udders, resulted in an average production of 529.4 lb. for the 15 pre-milked halves and 490.2 lb. for the 15 non-premilked halves.

Milk production of separate halves, obtained once every 15 d., has been used to calculate the total monthly production of 13 Holstein cows and three Holstein heifers for the first 7 mo. of their lactations. Only nine udders appeared balanced, of which the prepartum milked halves averaged 5,061 lb. milk and the non-prepartum milked halves, 4,780 lb. or an average difference of 280 lb. of milk in favor of the pre-milked halves.

**P70 The Effect of In Vitro Treatments with Testosterone on the Oxygen Consumption of**

**Ejaculated Spermatozoa.** F. N. BAKER, A. B. SCHULTZE AND H. P. DAVIS, University of Nebraska.

Samples of semen from nine bulls were selected at random, divided and diluted 1:4 in citrate diluter. One portion of each ejaculate served as a control, the other was treated with testosterone so that the final concentration of testosterone in the diluted semen was 2.6 mg./100 ml. Oxygen consumption of the treated and control semen was determined by the direct method of Warburg. In nearly every instance treatment resulted in a marked decrease in oxygen consumption. The average oxygen consumption in mm.<sup>3</sup>/hour for 2 ml. of diluted semen was 25.7 for the control samples and 20.5 for the treated samples.

**P71 Complementary Effect of Acetylcholine and Thyroxine on O<sub>2</sub> Consumption of Bovine Semen.** A. B. SCHULTZE, University of Nebraska.

The mean O<sub>2</sub> consumption of 15 semen samples with an original spermatozoan concentration of over 800,000 per mm.<sup>3</sup> and less than 1,400,000 per mm.<sup>3</sup> and treated with 7 to 10γ% thyroxine was 64.11 mm.<sup>3</sup>/hr. for the untreated portion and 69.97 mm.<sup>3</sup>/hr. for the treated portion, a highly significant difference.

The mean O<sub>2</sub> consumption of 15 semen samples with an original spermatozoan concentration of 800,000 per mm.<sup>3</sup> or less and treated with 7 to 10γ% thyroxine was 51.71 mm.<sup>3</sup>/hr. for the untreated portion and 51.60 mm.<sup>3</sup>/hr. for the treated portion, a non-significant difference. When 0.0032γ% acetylcholine was added to bovine semen with a spermatozoan concentration of 800,000/mm.<sup>3</sup> or less and the control portion consumed 46.05 mm.<sup>3</sup> O<sub>2</sub>/hr. and the treated portion 46.12 mm.<sup>3</sup>/hr. (means for 9 determinations), a non-significant difference.

When 0.0032γ% acetylcholine plus 10γ% D,L-thyroxine was added to semen with a spermatozoan concentration of 800,000/mm.<sup>3</sup> or less the control portion consumed 51.44 mm.<sup>3</sup> O<sub>2</sub>/hr. and the treated portion 55.10 mm.<sup>3</sup> O<sub>2</sub>/hr. (means for 14 determinations), a highly significant difference.

**P72 Recovery of the Fertilized Ovum from the Living Cow.** A. E. DRACY, South Dakota State College, and W. E. PETERSEN, University of Minnesota.

A technic has been developed whereby the fertilized ovum can be flushed out of the uterus of the living cow without surgical intervention. The cow is inseminated when in estrus and the egg recovered on the 7th day. At this time it

descended the Fallopian tube and has not yet commenced nidation.

Instruments have been developed to facilitate entrance through the cervix. These consist of 5/16 inch stainless steel probe with a tight fitting cannula. The probe first is inserted through the cervix. This is accomplished by grasping the cervix by one hand in the rectum while the other hand is used for traction and manipulation of the probe. After penetrance of the probe the cannula easily may be slipped over the probe through the cervix and the latter is removed. A small Koreséal tube is passed through the cannula to the tip of the uterine horn on the side ovulation has taken place. Its course through the uterus may be guided manually from the rectum. Approximately 1 l. of flushing fluid is forced as rapidly as possible through the tube and the flushing caught in a separatory funnel from the cannula. Physiological saline has been used as the flushing fluid.

The material is permitted to stand in the separatory funnel for 15 to 20 min. when a few ml. of solution are withdrawn and observed under a 15 to 25 power dissecting microscope. The French type of separatory funnel has been found superior to the ordinary kind. The fertilized ovum gravitates to the bottom of physiological saline solution readily but often will adhere in mucous material that may stick to the walls of ordinary separatory funnels.

While there is great variation in the ease with which entrance through the cervix may be effected, in typical cases the whole procedure in flushing out the uterus need not exceed 10 min.

**P73 Factors Affecting the Interval Between Parturition and Subsequent Estrus in Dairy Cattle.** J. H. EDMONDSON, University of Missouri.

With the increased use of artificial insemination in breeding dairy cattle there have come many questions as to the length of time between parturition and the first estrus period. Through the detailed records kept on the Missouri Station herd, it has been possible to investigate this problem. The breeding records of 347 cows with 968 parturitions were studied.

Results showed that the average length of the interval from parturition to the first subsequent estrus period was 57 d. with a standard deviation of 28 d. There seems to be no relationship between the seasons of the year and the length of time from calving to the first estrus period after calving. The daily level of milk production did not appear to effect the interval between calving and occurrence of first estrus. A study of the effect of age on the length of the

interval from calving to first heat shows this interval becomes shorter with age until the 4th year is reached and increases in length for the 6th and 7th years when it decreases again. The interval between 1st, 2nd, 3rd and 4th calves, etc., followed a pattern similar to that of age; however, the similarity is not pronounced after the 4th or 5th calf.

**P74 Comparison of pH Values of In Vivo and In Vitro Determinations on Bovine Vaginal-Cervical Mucus.** D. B. ROARK AND H. A. HERMAN, University of Missouri.

*In vivo* and *in vitro* pH measurements on vaginal-cervical mucus were made simultaneously on ten cows during various phases of estrus. The pH determinations were made with a Beckman pH meter using a small glass electrode for the *in vitro* and a special silver-silver chloride electrode for the *in vivo*. Thirty paired observations showed, in each case, that *in vivo* pH was more acid than *in vitro*; however, the magnitude of the differences was inconsistent. The *in vivo* pH values averaged 6.57 and ranged from 0.40 to 1.33 (average 0.88) lower than *in vitro*. The differences between *in vivo* and *in vitro* pH values were significant at the 1% level.

It is believed that these differences in pH values are not due to losses of CO<sub>2</sub> from the results of an experiment in which the pH of ten paired samples (draining and aspirated) of mucus was determined within 1 min. after *in vivo* determinations. A slow drop occurred in the pH of *in vitro* samples during the first 20 min. following collection, averaging 0.16 for draining samples

and 0.19 for aspirated samples. The *t*-test showed no significant differences between aspirated and draining samples. Earlier workers found that a film is formed about an electrode in contact with moist tissue and that a difference in electrical potential may exist. Perhaps this was a contributing factor to the observed differences between *in vivo* and *in vitro* pH values of this experiment.

Further studies of the cyclic variations in the physical and chemical properties of bovine mucus are in progress and may enhance our knowledge of the factors affecting breeding efficiency where artificial insemination is practiced under field conditions.

**P75 The Interrelationship of Age and Season on Bull Fertility.** T. M. LUDWICK, D. S. RUDRAIAH, J. ROSENBERGER AND F. ELY, Ohio Agricultural Experiment Station.

Investigations were made on data from the two artificial breeding associations of Ohio and include approximately 70,000 1st services from the Central Association and 120,000 1st and 2nd services from the Northern Association. The data cover a period of 2.5 yr. for Central and 5 yr. for Northern. Records were summarized by age groups of bulls, seasons and breeds. Only bulls which had been used for breeding more than 1,000 cows/yr. were included in the study.

Variation in conception (measured by 60 to 90-d. non-returns) as influenced by season or age of bull is not highly significant. Breed differences are not influenced greatly by age variations.

Some significant differences between breeds may exist as influenced by seasonal variations.

EXTENSION SECTION

**E1 Suggested Revisions in the D.H.I.A. Herd Record Book.** J. F. KENDRICK, Bureau of Dairy Industry, USDA.

A discussion of possible revisions of the D.H.I.A. forms that they may more adequately serve the needs of the D.H.I.A. programs operating in the various states is presented.

**E2 Comparison of D.H.I.A. Computing Tables.** C. R. GEARHART, Pennsylvania State College.

The object of this study is to make possible the use of simplified computing tables to save time for D.H.I.A. supervisors and to reduce the number of mistakes made in those associations which do not have calculators.

2251 monthly records were calculated on 109 cows. These were distributed as follows: (a) Three consecutive years of a RH herd averaging over 400 lb. fat. (b) Three consecutive years of a RG herd averaging over 400 lb. fat. (c) Four

consecutive years of a P&GrG herd averaging less than 350 lb. fat. (d) Three consecutive years of a RJ herd averaging over 400 lb. fat. (e) A few lifetime records on cows having from three to six lactations.

Individual records were calculated for each cow each month. In addition to the regular D.H.I.A. calculations, three additional calculations were made of these same records by using three different modified computing tables. All monthly records were then placed on I.B.M. cards and comparisons of the various types of tables were made by the machine.

The results of this study show: (a) The use of simplified computing tables will save a supervisor much pencil work. (b) Multiplication mistakes will be reduced. (c) Part of the addition will be simplified. (d) Work will be easier for supervisor, thus there will tend to be fewer changes of supervisors. (e) Computing tables will not help associations with calculators.

**E3 Progress Report on Use of I.B.M. Machines in Processing D.H.I.A. Records.** H. C. GILMORE, Pennsylvania State College.

The object of this study is to determine whether I.B.M. machines can be used to advantage in processing D.H.I.A. records. Some of the factors involved are saving time to the supervisor, accuracy of records and having the information in a more usable form. Temporary forms have been drawn up and plans have been developed to study the use of these machines in one full association and a few herds in different sections of the state for a period of 1 year on a trial basis. This will be in addition to the regular D.H.I.A. work, so that a comparison of the two systems and their relative merits can be determined.

Identification appears to be one of the big problems at the present time. Ear tag numbers present a problem as well as the length of some registered names because the number of columns on the cards is limited. If some of the records could be shortened it would simplify the use of punched cards because of the lack of space on the cards.

Along with this procedure, a study is being made of new methods of sampling in the field and it would seem that more use could be made of D.H.I.A. records from an educational viewpoint if the information were recorded on punched cards.

**E4 Use of I.B.M. Equipment for More Efficient Processing of BDI 718 Reports.** R. ALBRECHTSEN, Cornell University.

With the renewed expansion of D.H.I.A. has come the problem of handling the increased volume of data efficiently. This applies particularly to BDI 718 lactation reports. These reports are the key information to evaluating the artificial insemination program's effect on herd improvement, sire proving and herd analysis. The usual methods for handling this data require a great deal of labor which cannot be provided as the BDI 718 reports increase. Recourse to modern methods for handling data on I.B.M. equipment seems to be a feasible solution.

The processing of data such as is reported on BDI 718 cards has little precedence in the experience of I.B.M. fieldmen. A system of transferring data to I.B.M. cards with subsequent sortings, machine calculations of mature equivalents and final tabulation of summarized results call for a complicated series of I.B.M. processes. However, once the system is mastered, its versatility and efficiency becomes apparent. Regular personnel is trained in these new methods. The possibilities of I.B.M. processing of BDI 718 records are not yet fully apparent.

**E5 Centering Date Versus Calendar Month for Computing Dairy Cow Production Records.** R. MORRISON AND R. E. ERB, Washington State College.

The present method of calculating D.H.I.A. records is on a centering date basis. The involved procedure for calculating credit due a cow is confusing. Many errors in calculating centering dates have been found in D.H.I.A. record books. These errors, the extra time required and the fact that dairymen know when the tester is coming make this system undesirable. Calculating records on a calendar month basis would correct these errors. However, the accuracy of the measure of production on a calendar month basis as compared to the centering date basis is unknown.

To study this problem, the Holstein-Friesian Association has made available 24 lactation records, each 365 d. 4 ×, and each milking being weighed and tested. Ten cows in the college herd were milked 305 d. 3 ×, with each milking being weighed and tested. Also nine cows in the college herd were milked 305 d. 2 ×, with each milking being weighed and tested. Eight periods were selected in each month and production for both calendar method and centering date were computed. This production was compared to the actual production. A statistical analysis of these records was presented.

**E6 Extension Education on Milking Machine Operation.** I. E. PARKIN, Pennsylvania State College.

Pennsylvania dairy farmers have been sold milking machines without receiving the fundamental instructions required to operate them efficiently and to keep them clean. An extension program launched in 1943 on managed milking has branched out to include proper machine operation, installation and care of milking machines and the cleaning of the vacuum line. This program has been accomplished by demonstrations on managed milking, county-wide milking machine clinics and demonstrations of cleaning vacuum lines. These meetings have been requested by county agents, plant field men, sanitarians, dairy farmers and milking machine dealers. The cooperation of milk plant personnel, milking machine dealers, dairy cooperatives and farmers has been extremely gratifying. Apparently farmers are interested in the program because attendance has been more than satisfying. The subject matter presented included installation and care of the milking machine, washing and sanitizing milking machines, cleaning vacuum lines, managed milking, milk secretion, mastitis prevention and herd management. The

aims of this program are better herd management and better quality milk.

**E7 Development of a Successful Integrated Dairy Program.** E. C. SCHEIDENHELM, Rutgers University.

New Jersey's agriculture extension service has five major commodity groups. They are dairy, poultry, fruits, vegetables, and ornamental horticulture and home grounds. Contributions from other subject matter specialists to the dairy project results in a complete integrated dairy extension program. The subject matter specialists whose programs are included in the dairy program in New Jersey are agricultural engineering, farm crops, farm forestry, farm management, marketing, soils, soil conservation and human nutrition.

The steps followed in the development of the program were: (a) Conference of all specialists to discuss how their programs could be integrated with the dairy project. This meeting resulted in developing a "long-time dairy extension program." (b) Two or more conferences during each year to plan a series of integrated dairy institute meetings for the winter months. These are all-day meetings. (c) Additional meetings as requested by agents where coordinated teaching of two or more specialists is needed.

The dairy specialists carry on most of the work with reference to their sub-projects themselves. This also is true for the specialists who contribute to the integrated dairy program.

**E8 The Michigan Program of Brucellosis Control in Cattle.** R. E. HORWOOD, Michigan State College.

Part I of this paper reviews the progress of brucellosis control program in Michigan since 1930 and the accomplishments of the state brucellosis committee which include: (a) making available three general plans of testing on a herd or area basis; (b) enforcing the exhibition law for livestock; (c) returning copies of officially reported vaccinations to livestock owner; (d) reduced the time of returning results of tests to owner; (e) made possible the use of local veterinarians in area work; (f) prompt retests on a herd and area basis; (g) an extra bang's test at several state breed association sales; (h) secured the cooperation of government agencies and farmers associations; and (i) developed an educational program that has been carried out by the Extension Service to each county in the state and that resulted in all counties requesting an area test.

Part II reports on the use of Brucella M vaccine in Michigan since 1947 and states that: (a)

M vaccine in infected herds appears promising. In general it seems to stop the spread of infection effectively. (b) It does not produce long-lasting blood reactions in non-exposed animals. (c) A very small number of reactor animals show a significant decrease in blood reaction, but it is not advised for reactor cattle. (d) In accredited herds that desire to vaccinate only M vaccine may be used. (e) For adult vaccination, advise only M vaccine. (f) No evidence has been observed that M vaccine produces infection.

**E9 4-H Show Programs as Developed in Mississippi.** L. A. HIGGINS, Mississippi State College.

This paper discusses the limitations of the 1, 2, 3 system of placing cattle in 4-H shows and reviews the development, since 1940, of a group method of judging and placing entries of 4-H cattle. Briefly, the system developed is as follows:

The groupings were set up as nearly as was practical on the American Jersey Cattle Club's system of official herd classification. This was done to educate Mississippi farm youth on the principles of herd classification. Group terms were different, though perhaps as significant as are the official terms. They are: Superior, Very Desirable, Desirable, Medium, Fair and Undesirable. These various groupings carry the same score card rating as the corresponding rating in official classifications. The greatest difference is in the fact that under-producing ages are classified in this show system.

The "Superior" rating carries a purple ribbon. A female must have dropped her second calf and score 90 or more to qualify. "Very Desirable" ribbon award is blue. "Desirable" color is red and "Medium" is white. Neither money nor ribbon awards are given on animals which rate under medium in district and state shows. Judges are asked to follow actual score ratings as closely as possible, without actually scoring the animal point by point, and to place the top two to five animals of the "Very Desirable" group in 1, 2, 3 order, depending on the number permitted to show in the respective open show lots, also for championship competition. Each animal in a respective group receives the same amount of premium money. Junior owned bulls generally are permitted to show in the open-class shows only.

**E10 Training 4-H Dairy Project Leaders.** E. T. ITSCHNER, M. J. REGAN AND W. H. CLONINGER, University of Missouri.

This paper emphasizes the value of the demonstration method of teaching in 4-H club work and

describes the development of a type of leader training meeting at which project leaders are trained to perform method demonstrations which these leaders in turn present at 4-H club meetings. Leader training meetings are held on farms where facilities for group work are good and where there is sufficient livestock of various ages to permit leaders to practice after seeing the demonstrations. Demonstrations given at leader training meetings include casting, dehorning, tattooing, drenching, fitting, fast milking, cleaning and care of utensils, removing extra teats, trimming feet, estimating weight, keeping milk production records, preparing registration and transfer forms, and treatments for ringworm, lice and warbles. Other subjects discussed include mastitis, calf feeding and calf quarters. Since this method of leader training has been used, 4-H club membership in dairy projects has increased from 672 to 2605.

**E11 Analysis of Production Records of the Daughters of Sires Used in the New York Artificial Insemination Program.** RAYMOND ALBRECHTSEN, Cornell University.

The D.H.I.A. records made by progeny of sires used in artificial insemination are providing unexcelled data to measure various phases of dairy production within a state. Primarily, these records serve to measure the influence of carefully selected sires on the D.H.I.A. segment of the dairy industry. Since this D.H.I.A. segment is regarded as a basic dairy demonstration, the situations observed can be used as teaching materials to encourage adoption of improved dairy practices.

The records used in this study are those reported to the Dairy Record Office at Cornell on the standard report card, BDI 718. These data were transferred to I.B.M. cards and were sorted, summarized and tabulated to give the following studies: (a) A study by levels of production of the mates of proved and analyzed young sires shows the possibilities for herd improvement on cows that average up to 420 lb. of fat. (b) A study by levels of production of daughters of sires used shows the variability of a cow population in support of good sires. Many high-producing dams do not have satisfactory daughters. (c) A study of regional differences in response to the use of the same sires shows production apparently is better in certain areas of the state. (d) A study of differences between herds in the effect of the use of sires in artificial insemination reveals that previous breeding programs affect the response to the AB sires. (e) Study of reproof of natural service proved sires and their performance in relation to proved sire performance in general shows that reproof in artificial insemina-

tion will establish more firmly a bull's genetic value. (f) Study of analyzed sires proved in artificial insemination in relation to proved sires in general provides a check on a method of selecting young sires.

As further data accumulate, it becomes important to re-check all studies to ascertain changes that may affect the conclusions drawn from these data. These AB daughters will provide an unparalleled opportunity to check the affect of proved sires, analyzed sires, environmental influences and the genetic qualities of the mates of the bulls as well as the bulls themselves.

**E12 A Different Slant on Sire Selection.** W. E. WASHBON, West Virginia University.

Sire selection methods in common use today hold no promise for consistently selecting bulls that offer better than six out of ten chances for improving production at a profitable level. Artificial breeding cooperatives and individual breeders as well have great need for a method of selecting young sires that will reduce their chances of getting a really poor bull and greatly increase the chances for getting an outstandingly good one. The results received by dairymen who have selected 25,000 D.H.I.A. proved bulls should indicate how to select uniformly herd-improving bulls.

A study of the results received by 1,500 Holstein breeders who selected sons of D.H.I.A. proved bulls reveals: (a) Ten or more comparisons are needed for sire selection purposes. (b) The greater the proof increase, the better the results. (c) The higher the level of production in the sire's proof, the better the results. Outstanding results are found when proof is above a 475 lb. fat level. (d) Sons of minus proved bulls offer less than a 50% chance for herd improvement regardless of the number of comparisons, the amount of decrease in production or the butterfat production level of the daughters.

The results received by 916 Holstein breeders who selected grandsons of 33 famous sires indicate: (a) Sires with uniformly outstanding proved sons have uniformly outstanding proved grandsons. (b) Those sires having 65% or more of sons plus proved, whose sons' daughters averaged at least 430 lb. of fat, an increase of at least 20 lb. over their dams, seemed to offer outstanding possibilities in sire selection.

The possibility of analyzing sire pedigrees for actual proof of transmitting ability, not only as immediate descendants of proved bulls but as descendants of outstanding bull families as well, offers real opportunity. The combination supplements the assurances of one method with the assurances of the other.



## FORTY-FOURTH ANNUAL MEETING OF THE AMERICAN DAIRY SCIENCE ASSOCIATION

P. R. ELLSWORTH, *Secretary-Treasurer*

The American Dairy Science Association assembled in the Main Ballroom of the Coffman Memorial Union, Minneapolis Campus, University of Minnesota, Minneapolis, Minnesota on June 21st, at 9:30 a.m. J. B. Fitch, local chairman, introduced Dean T. C. Blegen, who gave the welcoming address as official representative of President J. L. Morrill, University of Minnesota.

Association President W. E. Petersen was introduced next and gave the following address:

### THE PRESIDENT'S MESSAGE

The American Dairy Science Association has for its objective the promotion of the entire dairy industry through research, teaching and extension with the firm conviction that by sound promotion of this great segment of American agriculture, the best interests of humanity are served. A sound agriculture that produces efficiently an abundance of food of a great variety is the most important single requisite for a high living standard. Without a diet that is adequate in promoting the best well being and of satisfying the palate demand, a people will not be happy, and if the cost of such a diet is too great there will be little left to acquire the other essentials for high standards of living. Everyone, therefore, whether urban or rural dweller, should have an enormous interest in agricultural promotion. Rightly, agricultural research should be supported by general taxes because all benefit from its contribution in providing more abundant food more efficiently produced.

In this connection, only those farmers who adopt new technological advances early will benefit in greater profit. As such technological advances that increase efficiency are universally adopted, the results reflect in a lower price to the consumer because of the highly competitive nature of agriculture.

The dairy enterprise is the largest of all farm enterprises in America. It is responsible for about a fifth of the total farm income and supplies about a fifth of the American food. This enterprise contributes enormously to an improved quality of the diet and therefore the general well being of the people. Milk and other dairy products hold pre-eminent positions among the nutrition specialists as the best foods for not only children but adults as well.

Dairy products serve well in satisfying the palate appeal as well as a source of good nutrition. Milk as such or any of the many products such as cream, whipped cream, ice cream and the numerous varieties of cheeses have enormous appetite appeal.

Dairying serves humanity not only in these particulars but plays a very important part in assuring a permanent, efficient agriculture. Much of our agricultural land is unsuited to tillage because of erosion hazards and should be kept in grass. Other land has been depleted in fertility because of over cropping and bad soil management practices needing rejuvenation calling again for growing of grass and legumes. Grasses and legumes that are needed in the preservation and improvement of soils cannot be consumed as such by human beings. Our digestive tracts are not constructed for such materials but are well suited to animal products produced for them.

The cow has been designed for this job of converting roughage into milk and meat. She is endowed with a structure—the rumen—that is specifically designed to handle bulky rough feeds. This, coupled with the fact that she has an extraordinarily highly efficient complex factory, the mammary gland, puts her in a class by herself in the economy of food production. No other animal has the potentialities to serve man as effectively or as efficiently as the dairy cow. We in the field of dairy science, whether research worker, teacher or extension worker, have every reason to feel proud of our field of endeavor as it serves humanity so well.

Let us now in all humility take stock of our accomplishments and then of some problems as we face the future. We cannot, of course, claim credit for all the advances that have been made in the dairy industry, but I am certain that a fair share of the improvements made can be credited to the people who have carried on research, teaching and extension work in dairying. During the last 50 years the average production per cow has doubled. The quality of dairy products have been greatly improved, new products have been developed and perhaps most significantly the receptivity of both dairy farmers and dairy manufacturers for information has been enormously improved. At the time this organization was formed, it was difficult to get an audience, while now the demands for new information cannot be filled.

The factors that have contributed to the improved situation with relation to the dairy enterprise are legion and cannot be dealt with in the limited time available. Better to give the remainder of the time to our problems as they face us.

The dairy industry cannot progress any faster or further than the quality of the men in this organization will permit. Our first and most important problem therefore, is that of obtaining the right kind of men and giving them the proper training. This problem has always been with us. Interestingly enough, the very first meeting of this Association in 1906 stressed this point by having inserted in the published proceedings the following: "Emphasis was placed on the demand for more and better trained men in dairy work and raising the standard of dairy instruction." With the enormous technological development in dairying and allied fields since that time, the problem of training men is greatly increased as is the need for better trained people.

Every segment of the dairy industry is very much concerned with research and teaching in its larger sense; as a matter of fact its progress is pretty much dependent on these two. This Association began as the National Association of Dairy Instructors and Investigators and since was changed to the American Dairy Science Association. While recognition of teaching has been dropped from its title, it is still of the highest importance for the furthering of the industry whether on the undergraduate or graduate level. Let us never under-rate good teaching. Our technological knowledge is of little avail without its spread to those that shall use it and our research workers must also be produced by the teacher.

This Association has always been aware of the teacher and has had committees from time to time for studying the problems incident to the worker in the classroom. With all that, the good teacher or trainer of men does not receive the recognition he merits. We have recognition and awards for those who excel in research, but we have never found a way to recognize the good teacher upon whom we are so dependent. It would be an added stimulus to good teaching if we could find some way to give recognition to the good teacher. One way, of course, that is not under the control of this Association, is giving him a salary more nearly commensurate with his contribution.

The qualifications of a good teacher in dairy husbandry are no different from those of teachers in other fields. He must be well informed and keep up with all new developments in the field. He must be enthusiastic about the subject and have the capacity to radiate that enthusiasm to his students. He must have a good perspective of the

whole and have a sound philosophy—not disregarding the old because it is old; likewise not to adhere to the old because of tradition. The new, likewise, must not be accepted with blind enthusiasm because it is new nor rejected simply because it is new. A healthy critical view must be taken by the teacher which will reflect quickly on the student. These are but a few of the qualifications of a good teacher.

The extension worker is a teacher and what has just been said applies to him equally well. The extension worker is a very important wheel in the complex educational machinery. It is he who is largely responsible for new information and practices getting into the hands of the ultimate user. The idea once entertained by some that the dairy extension worker should be a practical man with a pleasing personality, a gladhand man who had a few recipes that could be forcibly given with a good selection of funny stories is no longer tolerable. He, of course, must have personality and must know enough about the practical side to gain confidence, but to do the proper job, he must in addition be above all else well-informed on all aspects of dairying and its inter-relationship with other agricultural enterprises. This holds equally well for extension in production and manufacturing.

There is nothing that will depreciate the confidence in the extension worker more than an ignorance on his part of the technological knowledge on the subject. The farmer of today is not satisfied with a recipe. He wants to know the facts—he wants evidence and he is entitled to it. There is a marked change in the extension workers clients as contrasted to a generation ago. The dairy farmer is a much better informed individual. Here the agricultural press has contributed enormously and also furnished evidence of the evolution in the level of education. Note the technical nature of our agricultural press of today as contrasted to that of a generation ago.

For the extension worker to keep up on the new technological developments in the dairy field is no easy task. Too often administrators consider that he works only when he is out in the field and neither time nor facilities are given him for the continuous education that he must carry on to be the most effective. Our JOURNAL OF DAIRY SCIENCE is the most important source of new information for the extension worker as well as others. The original papers, if studied, will give a fairly comprehensive picture of developments in America. The review or abstract section, as it has been improved by our capable editor, is a splendid source of other pertinent dairy material. In addition, frequent conferences between the extension workers and the resident staffs are of mutual benefits to both.

Now we come to the research worker—the one who is responsible for the new technological developments that so often upset the mental equilibrium of dairy folks and seemingly keep them in a constant stage of uncertainty, for no sooner has one worked out what appears a sound plan than out comes a bomb-shell, a new discovery that disrupts everything. Partly because of this disturbance he creates in what might otherwise be calm water, and partly because of the inertia of tradition worshippers, some people have suggested that a moratorium be declared on research work. They use as an argument that our technological knowledge is much in excess of that used in general practice and that we need a rest from new knowledge so practice can catch up with knowledge.

There are several faults with this line of reasoning. One is that practice never catches up with knowledge. If it did, we would have reached perfection and that is too much to expect even from dairy folk. A second and more important point is that the greater the backlog of knowledge is, the more rapid will be the adoption in practice. Rather than too great a backlog of technological knowledge, we have entirely too little for the most rapid improvement in the practice. Due to curtailment of research during the war and concomitant cessation of training of research personnel, both the quantity and the quality of dairy research has suffered setbacks that will require still some time before recovery is made.

There are several reasons why a large backlog of scientific information is needed. One is the sheer pressure that is created by the mass of the information. This seems to be a physical phenomenon similar to hydrostatic pressure in which the velocity and extent of the spread of the technological knowledge is directly proportional to the head pressure. Another and very important fact is that a few of the most progressive adopt new technological knowledge as rapidly as it is advanced. The impact of these progressive individuals, although often few in number, upon the whole is beyond the realm of accurate evaluation. It is our duty to see that a constant and ever increasing flow of new information will reach them.

The selection and training of the research worker is one of the great and difficult responsibilities that befall many of us. Selection of the right kind of person is the first and by no means the least of these responsibilities. Only relatively few have the inherent potentialities to become good research workers. The desirable research worker must have an abundant amount of enthusiasm, an infinite capacity to work, the patience to wait, sometimes for long, for results; he must have imagination, the ability to question, the power to generalize and the capacity to apply.

Knowing the often meager material reward for services rendered, our candidate for training in research needs to be possessed of a such a temperament that he will be animated by the professional spirit which is one of service.

When we are lucky enough to discover such an individual, the second major responsibility begins—that of training. The type of training needed today is vastly different from that which was satisfactory a generation back. There was a time when all that one needed was the ability to apply a certain test pattern or formula. It was work of a nature to get the answer to practical problems as quickly and cheaply as possible. Typical of that type of investigation is the double reversal feeding experiments in which the relative merits of different feeds were determined. This type of investigation is not passé as much useful information is still to be obtained from its judicious application, but the work that will yield information of the greatest value to the dairy industry, in all areas, is fundamental research. The discovery that one feed is superior to another in milk production is of value, but of much greater value is to know in all details as to why it is better. Likewise, it is well to know that one procedure produces a better quality of milk powder, but it is infinitely more valuable to know why this is so. By knowing all of the fundamentals operative in a given area, a clearer picture of that area is possible which not only helps solve any new problems that may arise but is essential for suggesting new and better ways or methods.

To carry on modern dairy research requires special training. In an area with as many ramifications and as complex as that represented by this group training in many different disciplines are needed. No one can any longer prepare himself for the entire area of dairy science so he must specialize to a certain degree. Therefore, detail patterns will vary for individuals. There are some broad generalizations, however, that can be laid down. None of the physical or biological sciences is alien to dairy science. Botany, zoology, bacteriology, physics, chemistry, nutrition, physiology, anatomy, genetics and others have a direct bearing upon various areas in dairy science. It is not possible for anyone to obtain complete mastery of all of these specialties, but sufficient training in each of them so as to have a general grasp of their import is essential. This should be followed by mastery of one or more of them that are to be used directly in research work.

The general knowledge should be obtained in the undergraduate level. One of the major handicaps we encounter in the training of research workers is that candidates do not make up their minds to pursue graduate work, for the most part, until late in their undergraduate life or after hav-

ing completed a course in Agriculture. These people are not as well prepared for graduate work as would be those who could use their entire undergraduate time for preparation for graduate work. The ideal time to begin training for research work is at matriculation in college. If selection could be made at that time, an undergraduate course can be outlined that would not fit the student for a job at the end of the four year course because he would have very little, if any, of practical courses; but he would be fitted to really begin graduate work.

What should such an undergraduate course consist of? Stress would be placed upon mathematics, chemistry, biology, physics and of course a goodly portion should be given over to cultural courses. At the end of the four years, he should be culturally developed and have a foundation upon which to build his graduate education. Up to this point, it is unessential to have any special training in dairy technology. This can far easier be made up in graduate work than can deficiencies in fundamental work such as chemistry, mathematics, etc. Every effort should be made to ascertain as early as possible those who have the qualifications and the inclination to pursue graduate work that the undergraduate program may be better suited for graduate work.

In graduate training for research, an absolute requirement is thorough training in dairy science not only in the area of specialization but a comprehensive knowledge and understanding of the area outside of the field of specialization should be had that a sound perspective of the whole may be formed. But that is not enough. Modern dairy research that will most benefit the industry, demands research workers that have intensive fundamental training in one or more additional basic sciences. For dairy production physiology, biochemistry, nutrition, genetics and others not only are essential in their contribution to dairy research, but dairy research also offers great possibilities of making valuable fundamental contributions to these areas of learning. In dairy manufacturing, dairy bacteriology, dairy engineering or dairy economics, the need for fundamental training in chemistry, bacteriology, physics, engineering and economics are equally essential. Because of the enormous breadth of dairy research, no one can hope to master completely all of the basic knowledge essential to all dairy research, and therefore must make a careful choice of the area to which special attention must be given.

If the foregoing analysis of the needs in training research men are acceptable, it becomes obvious that for many research problems no one individual can acquire sufficient knowledge that by himself he can carry on the most effective work. This

means that more and more of dairy research must be carried on cooperatively between different specialty departments. Singularly, enough such cooperative projects are the more numerous and more satisfactory where the dairy science research partner has had training in the area of learning represented by the other cooperator. As one would expect, misunderstanding and disagreements arise mostly in cooperative projects when no such training has been had.

It will take time before we in dairy science will have a sufficient number of properly trained men to supply the need. We have quite a number of excellently trained dairy scientists, but we need more. For those who are skeptical about their existence look over the character of the papers listed in our programs for this and other meetings of this association. For an industry that holds the importance in the total economy and welfare of the country that is represented by this Association, we need many more men of the quality and training represented by our best research people.

Before leaving the question of research in dairy husbandry, let comment be made about giving opportunity to those who are well trained to make the most use of their abilities. Recognition must be made of the problems of the administrators with our project system which must be carried on and the lack of adequate funds to initiate and carry on special projects. As a result of this situation, the young research worker too often is made to fit in on projects where he has no opportunity to exercise his ability. Often his time is assigned to work for which he has no liking or special training—all of which is frustrating. To stimulate the most rapid development of the individual, it is essential that as much freedom of action be given as possible. The ideal situation for the right kind of a man is to furnish him a laboratory, with the necessary equipment and finances, and let him do whatever he wants.

Chairman Fitch then introduced Ancel Keys, Director of Laboratory of Physiological Hygiene, University of Minnesota who spoke on the subject of Cholesterol and the Problem of Ageing.

The following is an abstract of this talk:

Progress in preserving life and health in youth accentuates the medical problems of later life. In the United States the outstanding necessity of research on the ageing process is made clear by inspection of the vital statistics. Disease of the cardiovascular system is far and away the greatest killer now that so much has been accomplished in controlling tuberculosis and the diseases of childhood. And the largest part of cardiovascular deaths is related to the ageing process—high blood pressure, hardening of the arteries, coronary occlusion, "strokes."

We cannot hope to prevent ageing but perhaps we may attempt to delay or control it so the heart and blood vessels do not give way before their time or while the rest of the mind and body is relatively young.

The central feature of ageing in the cardiovascular system seems to be arteriosclerosis, or hardening of the arteries, which begins with an accumulation of fatty materials within the blood vessel walls and ends with a vascular tube either so reduced in bore that it cannot carry enough blood or so brittle that it bursts. Finally, the artery is full of a deposit of insoluble calcium salts but this seems to be a secondary consequence of the primary accumulation of lipoids in the wall. In a very real sense, then, one of the major problems of ageing is why, and how, this lipid deposit comes about.

The lipid deposit itself is peculiar in that it is made up of a large percentage of cholesterol, a lipid compound which is very peculiar to animals and is chemically related to other important substances, including some of the hormones. If cholesterol is not the "cause" of arteriosclerosis, it is at least importantly involved. In some animals administration of cholesterol can produce arteriosclerosis. Certain diseases, like diabetes and myxedema (thyroid deficiency), are notable in that the patients often have much cholesterol in the blood and tend to early and severe arteriosclerosis.

Recent arguments suggest that cholesterol obtained in the diet may promote arteriosclerosis. Dietary cholesterol comes from eggs, dairy products and meats—foods we generally consider to be very good nutritionally. Can it be that, as we improve the diet in general, we automatically increase the hazard of arteriosclerosis? The main arguments are: 1) Feeding large amounts of cholesterol to chickens and rabbits produces high blood cholesterol and arteriosclerosis. But these species ordinarily never have cholesterol in the diet and are scarcely comparable to carnivorous animals which are much more resistant to cholesterol feeding. 2) As our diet has improved to include more cholesterol-containing foods, the mortality from cardiovascular disease has increased. But this may be largely a result of an older population and better methods of diagnosis and recording. 3) It is claimed that the incidence of arteriosclerosis in different countries is inversely related to the cholesterol (and fat) content of the diet. But the data for this conclusion are as yet totally inadequate and are mainly only impressions from visitors to the Far East. 4) A low cholesterol diet reduces the blood cholesterol. But, though this is true with extremely low-fat diets, it is not proved with any lesser degree of restriction and

as to whether cholesterol or total fat, or both, are important is not known.

Recent work at the Laboratory of Physiological Hygiene has shown that the blood cholesterol increases with age from adolescence to the middle fifties; thereafter the values tend to decline. This suggests that, before the deposition of cholesterol in the arteries, there is a change in the metabolism of cholesterol independent of diet. Among men of the same age, the fatter men tend to have higher blood cholesterol concentrations. This suggests what we already know from vital statistics, that is overeating is a serious nutritional fault. Finally, a study of the habitual diets of 500 men who were also investigated with regard to blood cholesterol, showed no relation at all between dietary cholesterol and the amount of this substance in the blood. Special experiments with meals containing very large amounts of cholesterol confirmed this conclusion that, within wide limits, the amount of cholesterol in the diet and that in the blood are unrelated.

While these findings make us feel more at ease while eating our bacon and eggs and drinking milk at breakfast, the problem of cholesterol and arteriosclerosis is still present in all its mystery. We have merely made it clear that the body itself regulates its own content of cholesterol. We have still to discover how this is achieved and what there is in getting older and fatter that has such disastrous consequences. The Laboratory of Physiological Hygiene will continue to study these questions as a part of its long-range study on cardiovascular degeneration.

At a general session of the Association held on the Minneapolis Campus, June 22 at 4:15 p.m., W. W. Spink, Professor of Medicine at the University of Minnesota delivered an address on "Brucellosis in Man."

## HUMAN BRUCELLOSIS

### (Abstract)

Brucellosis may be caused by any one species of *Brucella*, namely, *Br. abortus*, *Br. melitensis* and *Br. suis*. The natural reservoir of this disease resides in domestic animals, particularly in cattle, hogs, and goats. The disease is very rarely transmitted from human to human. Man acquires the disease either through direct or indirect contact with infected animals.

A recent study in collaboration with the Laboratories of the Minnesota State Department of Health has revealed epidemiologic data of fundamental importance. This information is based upon 268 bacteriologic proved cases of human brucellosis. The data emphasize that brucellosis is primarily a disease of males, particularly of



farmers and packing plant workers. Children under 12 years of age are relatively resistant to this disease. This also applies to young cattle, young goats and young hogs. In the acquisition of human brucellosis in Minnesota, contact with infected material is much more important than acquiring the disease through drinking raw milk. The data indicate that for every case acquired through the ingestion of milk, there are four cases caused by direct contact. With the exception of fresh cottage cheese and fresh goat's cheese, it is doubtful that milk products play a very significant role in spreading human brucellosis. In a period of 12 years in the University Clinics, not a single instance has been seen where the disease was contracted through the ingestion of cheese, butter, or ice cream.

The nature of the acute illness in man may be likened to influenza, except that there are no respiratory symptoms. The outstanding manifestations of the disease are weakness, easy fatigability, generalized body aches and pains, headache, backache, nervousness, inability to sleep and emotional instability. The majority of cases do not endure beyond 3 months. Occasionally chronic disease may ensue with localization of the *Brucella* in certain tissues, including the bones, particularly the spine; the central nervous system, including the meninges; and on the valves of the heart. In this part of the country at least, brucellosis is rarely the cause of death.

During the past 12 years at the University of Minnesota Hospitals and Laboratories, efforts have been made to treat patients with antibrucella agents. Vaccines or filtrates of *Brucella* are not used in the treatment of brucellosis in our Clinics. Early experimental work indicated that *in vitro* the sulfonamides were active against the

*Brucella*. Disappointing results were obtained in patients with the use of all the sulfonamides as they appeared. Penicillin is without effect in brucellosis. Some hope was held out when streptomycin became available, but this drug when used alone is not too effective. A number of patients have been successfully treated with a combination of streptomycin and sulfadiazine. Unfortunately the streptomycin in some instances resulted in toxic reactions, and there was a relapse rate of about 20 to 25 per cent. In more recent months aureomycin, a new antibiotic, has been used successfully in the treatment of both acute and chronic cases of brucellosis. This drug is given by mouth, and, therefore, it is not necessary to hospitalize the patients. Treatment is continued for 10 days to 2 weeks. It would appear that both in Minneapolis and in Mexico from 80 to 90 per cent of the patients have been successfully treated. Reference is made only to bacteriologic proved cases. It appears that aureomycin is effective in human brucellosis caused by all three species of *Brucella*. More recently, chloromycetin, or chloramphenicol, has been made available for therapy. Indications are that this drug, which can be given by mouth, also is effective in the treatment of brucellosis.

Brucellosis as a human disease can only be eliminated by eradicating the infection at its source, that is, in domestic animals. Vaccination of young calves with *Brucella* is one effective means of controlling the disease in animals. Another procedure is to eliminate positive reactors from herds. The eradication of brucellosis in domestic animals will only be accomplished by a cooperative effort on the part of farmers, livestock producers, dairymen, public health agents, veterinarians, and physicians.

## BUSINESS MEETING OF THE AMERICAN DAIRY SCIENCE ASSOCIATION

*Minneapolis, Minnesota, June 23, 1949*

President Petersen called the meeting to order at 3:00 p.m. in the auditorium of the Museum of Natural History. There were 175 present.

### REPORT OF THE EXTENSION SECTION

The opening session of the program of the Extension Section of the 44th annual meeting of the American Dairy Science Association was called to order by Chairman Heebink of West Virginia on Tuesday, June 21, 1949 at 1:30 p.m. in Room 320 of the Coffman Memorial Union. Following his opening remarks and announcements, the following nominating committee was appointed: R. G. Connally of Virginia, R. A. Cave of South Dakota, and W. T. Crandall of New York as

Chairman. This session was devoted to the presentation of five papers dealing with various phases of Dairy Herd Improvement Associations.

Vice-chairman Reaves opened the Wednesday morning, June 22 session at 9:15 a.m. Those papers on teaching methods were presented and discussed. The section then retired to the room where several state exhibits on methods were presented under the chairmanship of Boynton of New Hampshire. State exhibits were explained by representatives of that state.

A joint session of the Production and Extension sections, L. A. Moore, Chairman, was held Wednesday afternoon. A panel discussion on the job of Herd Improvement was held with



Taylor of Pennsylvania State College as leader. Following the panel discussion Co-chairman Heebink conducted a session devoted to committee reports.

The Breeds Relations Committee and Herd Health Committee reports are incorporated in the report of the Production Section.

The Dairy Breeding Committee, E. J. Perry of New Jersey, Chairman, made the following recommendations:

1. That the A.D.S.A. place more emphasis on the Breed Herd Test and D.H.I.A. testing programs to promote testing of entire herds. Further, that H.I.R. records from all breed associations and all D.H.I.A. records be reported promptly to the U. S. Bureau of Dairy Industry, so that less confusing and a more complete proof will be published on all bulls.

2. That all sire proofs: preliminary, complete, H.I.R., private, etc., be properly designated as to what they are at the source of the proof.

3. Recommend that a licensed Veterinarian who is not a full time employee of an artificial breeding organization may collect blood samples for blood typing of sires. This is to be done in the presence of the manager of the breeding organization and both sign as to having properly identified each bull. This recommendation is designed to make unnecessary the presence of a breed representative at such times.

4. That the problem of identifying registered cows after service because the registration papers were not available is not properly the responsibility of the technician nor the artificial breeding organization.

5. Once a registered cow has been identified by her registration papers and ear tag at time of first service, it is recommended that the ear tag alone shall be sufficient identification on additional services.

6. Recommend that the secretary of Purebred Dairy Cattle Association consult with State Extension dairymen whenever interpretations of P.D.C.A. rules arise in that Extension dairyman's state.

7. Recommend that the American Dairy Science Association establish a committee to formulate practical recommendations to be used as a guide in setting up a sound artificial breeding program based on genetics.

The Type Classification Committee with Tyler of West Virginia acting as Chairman made the following recommendations:

1. The literature on studies of type be reviewed.

2. An evaluation of type programs and studies be considered as a topic for a panel discussion before a joint session of Extension and Production

Sections at the 1950 annual meeting of the American Dairy Science Association.

3. All animals in college and experiment station herds be classified at least once a year. If feasible all animals over 6 months of age should be included. The purpose of this recommendation is to make available some needed data for research purposes.

4. Wherever individual classifications ratings are published the age of the animal at the time of the rating be given.

5. Cooperation of persons in charge of college and experiment station herds be given this committee for a proposed survey on the utilitarian aspects of certain type characters assumed to be defects.

6. Cooperation be extended to the committee of the Purebred Dairy Cattle Association that is charged with the consideration of type problems.

7. The name of this committee be changed to the Type Committee.

Thursday, A.M., June 23.

Chairman Heebink introduced the speakers presenting papers on 4-H club work. Following discussion of these papers, Chairman Heebink opened the business session of the Extension Section.

Six committee reports were read, amended and approved. The nominating committee brought in a slate of two candidates for Secretary of the Extension Section for 1949-50. Ramer D. Leighton of Minnesota was elected Secretary.

Chairman Heebink called the final session to order at 1:30 p.m. at which time two papers on artificial breeding results and sire selection were presented. The section was then adjourned to the business meeting of the Association.

Respectfully submitted—G. HEEBINK, *Chairman*; C. W. REEVES, *Vice-Chairman*; RAYMOND ALBRECHTSEN, *Secretary*.

Upon motion duly seconded, the report was accepted.

## REPORT OF THE PRODUCTION SECTION

The Production Section held eight sessions at which 70 papers were presented. Eight sessions were held with concurrent sessions held to provide for the large number of papers, as customary for the past 2 years. Two business meetings were held, and presided over by Chairman L. A. Moore.

In addition to the eight sessions at which papers were read, a session was held with the Extension Section at which a panel discussion on the job of Herd Improvement, lead by Joe Taylor was held. Other participants were E. E. Heizer on "Allowing for the Effect of Environment in Production", J. L. Lush on "Estimating

the Breeding Value of Young Bulls", G. A. Bowling on "Should a Bull be Linebred or Outbred?", V. A. Rice on "What about Indexes in the Selection of Bulls?", Milton Fohrman on "Results from Crossbreeding", and Frank Astroth on "Reasonable Production Increase to be Expected from Culling."

The reports for the following committees were presented and accepted by the Production and Extension Sections in joint session.

*Breeds Relations* presented by H. A. Herman, Chairman, D. L. Fourt, W. W. Yapp, Floyd J. Arnold, E. C. Scheidenhelm and Lynn Copeland.

Action recommended by the committee follows:

*Rule 3, page 7*—Change the following sentence "A supervisor is limited to 36 milkings per day" to read "The number of milkings supervised daily shall not exceed 48".

*Rule 12, page 18*—Change to read as follows: "The number of milkings supervised per day A—When the herd is enrolled in a Dairy Herd Improvement Association and the tests are used for both H.I.R. and D.H.I.A., the number of milkings shall not exceed 60 per day, B—In central testing laboratories where additional technicians are working the number of cows supervised by each supervisor shall be limited to 90 milkings, and C—When the tests are used solely for the H.I.R. report the number of milkings supervised shall not exceed 90 per day".

*Rule 15, page 18*—Change the following sentence "The retest shall include the entire herd, or, in case of herds requiring more than one day's supervision that portion of the herd tested with the qualifying animals during the regular test period" to read "The retest shall include the entire herd, or, in case of herds requiring more than one day's supervision, only those cows meeting retest requirements need to be included in the retest".

The committee recommends that the above revisions be made effective July 1, 1949.

*Dairy Cattle Health* presented by C. G. Bradt, W. E. Petersen, Chairman, W. D. Pounden, R. E. Horwood, Joe Nageotte and W. R. Walker.

*Dairy Cattle Breeding*—reported by Extension Section (Type Classification)

*Pasture Investigation Technique* presented by R. H. Lush, Chairman, J. B. Shepherd and W. B. Nevens.

*Special Report of Dairy Cattle Judging Coaches*—Fordyce Ely, Chairman.

*Dairy Cattle Judging*—S. M. Salisbury, Chairman, R. E. Johnson and D. L. Fourt, read by section Secretary.

It was voted that the two above committees and others that they may have represented be

dismissed, and that in their place a new committee to be called the National Intercollegiate Dairy Cattle Judging Contest Committee be appointed to carry on with these activities.

*Resolutions* by D. M. Seath, chairman; R. E. Hodgson and K. L. Turk.

*Other business*—Suggestions for improving the meetings included:

1. The use of mimeographed summaries and graphs available in the abstracts.

2. Less use of slides when mimeographed material is **feasible**.

3. Placing available mimeographed material at a central location for the convenience of those not attending the particular section in which the paper is given.

*Nominating Committee*. The report of this committee by G. W. Salisbury resulted in the subsequent election to the office of Secretary of N. N. Allen, University of Wisconsin.

There being no further business, the meeting adjourned.

Respectfully submitted—L. A. MOORE, *Chairman*; G. M. CAIRNS, *Vice-Chairman*; L. O. GILMORE, *Secretary*.

Upon motion duly seconded, the report was accepted.

#### REPORT OF THE MANUFACTURING SECTION

The program for the manufacturing section was carried out as scheduled and published in the May issue of the JOURNAL OF DAIRY SCIENCE. A total of 38 submitted papers and a symposium on milk proteins consisting of four invitational papers were presented. Three papers (M10, M21 and M22) were not given. The symposium on milk proteins was under the leadership of A. M. Swanson.

The business meetings of the section were held Tuesday, June 21 at 4:30 p.m. and Thursday, June 23 at 11:00 to 12:00 a.m., with Chairman E. M. Barker presiding. Reports from the Standing Committees on Butter, Dairy By-Products, Milk and Cream with six subcommittees on Products Judging, on Standardizing Methods for Conducting all Phases of Babcock Testing, and on Standardizing all Tests of Dairy Alkalis and Methods of Reporting Results, were read and accepted.

The following motions were passed:

1. That the scoring method for sediment in bottled milk and cream proposed by the committee be accepted as official by the section and presented to the general session for adoption.

2. That the work of the following committees be continued:

(a) Committee on Standardization of the

- Acidity Test of all Dairy Products.
- (b) Committee on Standardization of all phases of Babcock Testing.
- (c) Committee on Standardizing Dairy Alkali Tests.
- (d) Committee on Dairy By-Products.

3. That a committee be appointed to study methodology, classification and nomenclature of milk proteins.

The section elected the following officers to serve for the coming year: E. L. Jack, Secretary; J. H. Hetrick, Vice-chairman; and D. V. Josephson, Chairman.

Respectfully submitted—E. M. BARKER, *Chairman*; D. V. JOSEPHSON, *Vice-Chairman*; J. H. HETRICK, *Secretary*

Upon motion duly seconded, the report was accepted.

#### EDITOR'S REPORT

The twelve issues of Volume XXXI of the JOURNAL OF DAIRY SCIENCE printed during 1948 consisted of 924 pages of original articles, 8 pages of Association announcements, 20 pages of program for the annual meetings, 32 pages of proceedings of the annual meetings, 73 pages of abstracts of papers presented at the annual meetings, 46 pages of indices, 37 pages of membership list, 160 pages of abstracts and 3 pages of miscellaneous. This makes a total of 1,303 pages, exclusive of the advertising sections and blank pages.

The material printed included 102 manuscripts (54 in the production field and 48 in the products field) and 4 reviews (1 in the production field and 3 in the products field), 137 abstracts of papers presented at the annual meetings and 436 abstracts of literature appearing in the Abstract Section. Of the 130 papers submitted for publication during the year, 14 were rejected and 55 were on hand at the end of the year in various stages of processing for publication.

The assistance of all those who have aided in the review of papers is acknowledged with gratitude. Without the continued cooperation of the reviewers present standards could not be maintained. The cooperative manner in which authors have helped to maintain publication standards and to condense their material as much as possible also is appreciated.

In line with the recommendation of the Journal Management Committee, the Abstract Section has been expanded as of January 1, 1949, by the addition of a considerable group of new abstractors and by the appointment of section editors for the abstracts. As of April 1, 1949, 57 abstractors had agreed to abstract 99 journals and additions to this group will be made as the

opportunity arises. In the first five issues this year, 417 abstracts have been published. This expansion in coverage has been possible only because of the excellent cooperation which many members have given this project. The two-column format of the Abstract Section also was adopted with the January issue. The slightly narrowed margins and slightly smaller type have resulted in a considerable saving in paper and press costs without sacrificing readability of the of the abstracts. Any members who have access to significant journals which now are not being covered in the Abstract Section are invited to volunteer for abstracting such journals. The assistance of abstractors familiar with one or more of the foreign languages, especially Italian, French, German and Finnish, is especially needed at present.

Respectfully submitted—F. E. NELSON, *Editor*

Upon motion duly seconded, the report was accepted.

#### SECRETARY-TREASURER'S REPORT

The membership and circulation of the JOURNAL for the year 1948 showed a further rise in numbers totaling 3884 by the end of the year. This total is made up of 1747 members, 780 student affiliates and 1357 subscribers.

The following is a summary of our gains and losses in members for 1948:

Membership December 31, 1947 . . . . .	1663
Gains: New Members 1948 . . . . .	177
Former student affiliates . . . . .	18
Total gain . . . . .	195
Losses: Members resigned . . . . .	12
Members delinquent . . . . .	92
Members deceased . . . . .	7
Total loss . . . . .	111
Net Membership gain . . . . .	84
Membership Total, December 31, 1948 . . . . .	1747

In order to supplement the membership drive which was conducted last year and to increase the membership of the association for 1949, your secretary will be glad to write a personal letter from this office to any prospective members whose names may be sent to him. It is hoped that this may result in a larger membership in 1949 and aid in the membership efforts of our present members.

Another phase of membership which needs further attention by all members and especially by those who are at universities in the country, is the encouragement of student affiliates to assume full membership in the association upon graduation. Here is a source of members which has never been fully realized and never fully drawn upon by the association.

Plans are under way to contact all dairy school graduates with literature regarding the associa-

tion and the advantages of membership therein, but if such a program is to be successful, all persons who are in contact with such graduates must make every effort to get the story of the American Dairy Science Association across. Close cooperation between dairy department heads and the secretary should assure success.

The biggest worry of the Association is the ever increasing cost of JOURNAL publication. It might be well to mention that unless some method is devised for defraying or lowering the cost of publication, the association can expect to operate in the red for this year the same as it did for the year just past. Some of the ways in which this cost can be overcome is through increased membership, an increase in the number of subscribers, and an increase in advertising carried.

Advertising which appeared in the JOURNAL during 1948 occupied 199 pages and was worth \$7,840.64 to the association as compared with 198 pages and \$7,225.92 for 1947. Your secretary feels that the low advertising rates which we are charging should induce more companies to place advertising in the JOURNAL and that we should engage in an active program of solicitation for the year 1950. Any ground work which the members can give along this line will be greatly appreciated and will do much to assist with the financial problems of the Association.

It might be of interest to the members to know that we have 506 foreign subscribers to the JOURNAL. The big three in the foreign field are Australia, England and Holland with 56, 73 and 52 respectively. Altogether our JOURNAL is being sent to 45 foreign countries, so you can see that interest in dairy science is world wide.

Sale of back copies during the past year totaled 570. This was 220 below 1947, and followed an anticipated trend downward inasmuch as most of the members and subscribers who missed out on issues during the war have purchased the back copies they desired. There are some issues which are out of print at present which undoubtedly should be reprinted at the earliest possible moment of suitable cost. To date the association has made no move in this direction feeling that it would be wiser to wait until printing costs come down a bit.

The student branches of the American Dairy Science Association are showing continued and increasing activity and are fast becoming a factor in the world of dairy science. Since our meeting last year, the Executive Committee has granted certificates to the following schools: Rutgers University, New Jersey, a new certificate; University of Massachusetts, Ohio State University and the University of Georgia, renewal certi-

icates. While we are on the subject of student branches, an apology is in order for Clemson College. The name of Clemson was omitted last year from the list of those schools which had student branches through an oversight. Clemson, under the able leadership of J. P. LaMaster and B. E. Goodale, is definitely to be numbered amongst the living.

The big four in student activity in the American Dairy Science Association are Ohio with 143 students, Oklahoma with 68, Iowa with 66 and Wisconsin with 51. Ohio leads the field with more than twice as many members as its nearest rival. Apparently W. L. Slatter and S. M. Salisbury must have the secret of successful chapters well in hand. Last year's total student affiliate membership was 780. So far this year the total has increased to 846, with new membership coming in frequently.

As per predictions made by the late R. B. Stoltz at our Athens, Georgia meeting, your Association operated at a \$3,083.37 loss during the past year. This loss was entirely unavoidable due to the already high and ever increasing costs of printing the JOURNAL. The executive board has set up a budget of \$39,500.00 for 1950 which is considerably higher than the 1949 budget, and reflects this increased cost of operation. Our net worth as of December 31, 1948, was \$36,036.84. A complete report of the Certified Public Accountant was sent to each member of the Executive Board in March. One bright spot in the financial picture for the year was the maturing of three \$1,000 bonds which your secretary reinvested by purchasing four \$1,000 Series F bonds which are now in the Association's Safe Deposit Box. The interest from the three bonds totaled \$790.00 which enabled us to purchase an additional bond and place the extra \$40.00 in our bank account.

I wish to take this opportunity to express my sincere and grateful thanks to all those members of the Association, who through their willingness to help and the encouragement which they have offered, have made the job of acting Secretary-Treasurer both instructive and enjoyable.

Respectfully submitted—P. R. ELLSWORTH,  
*Acting Secretary-Treasurer.*

Upon motion duly seconded, the report was approved.

#### AUDITING COMMITTEE REPORT

The president then requested the report of the Auditing Committee which was read by H. S. Willard.

May 11, 1949

To the Directors and Members of the

American Dairy Science Association  
Gentlemen:

On May 6, 1949, Mr. Walter C. Burnham, a certified public accountant, met with the Auditing Committee of the American Dairy Science Association. At that time, Mr. Burnham's report of his audit of the American Dairy Science Association business for 1948 was considered.

Mr. Burnham has made a thorough examination of the records. He has checked the bank statements and examined all the U. S. Government Bonds. Mr. Burnham had check-tested the inventory of Journals and Twenty-Year Index to assure accuracy of the physical inventory.

The Auditing Committee is satisfied that the financial statement for the year 1948 is correct. We recommend that it be accepted by the Board of Directors and the members of the American Dairy Science Association.

Respectfully submitted—W. J. BRAKEL, *Chairman*; R. N. KENNEDY; H. S. WILLARD.

Upon motion duly seconded, the report of the Auditing Committee was accepted and ordered filed.

#### REPORT OF THE JOURNAL MANAGEMENT COMMITTEE

During the past year as authorized by the Journal Management Committee and the Executive Board of the American Dairy Science Association, the following action has been taken.

1. The abstract section of the editorial work has been reorganized and section editors in the various subject matter fields appointed.
2. The abstract section of the Journal is now printed in two-column pages and in slightly smaller type thus saving considerable space.
3. Two exchanges with foreign journals have been arranged and others are being contemplated.

In furtherance of a program of continued progress the Journal Management Committee recommends:

1. In continuation of the policy of rotating the associate editors the Journal Management Committee recommends that Associate Editors H. A. Ruehe and E. P. Reineke be retired and W. V. Price and H. A. Herman be appointed as replacements.
2. In view of the possible desirability of expanding the exchange arrangement with foreign journals for abstracting purposes the Journal Management Committee recommends that the Executive Board authorize the provision of sufficient exchange copies as needed for this purpose.
3. The Journal Management Committee recommends that the Proceedings of the Annual Meeting and the Abstracts of Papers presented

at the Annual Meeting be printed in two column pages in the same form as is now used for the abstract section.

4. In consideration of the high printing costs and little prospect of relief from these high costs in sight, the Journal Management Committee recommends that the Executive Board consider retrenchment or action on certain proposals to increase the revenue of the Association.

The Journal Management Committee wishes to express the commendation of the Association membership to the Editor and Editorial Staff in acknowledgement of the excellence of their work.

Respectfully submitted—T. S. SUTTON; P. R. ELLIKER; G. H. WISE.

Upon motion, duly seconded, the report was approved.

#### REPORT OF NATIONAL RESEARCH COUNCIL

The activities of the Division of Biology and Agriculture of the National Research Council are varied and numerous. Several are of particular interest to the American Dairy Science Association. At present this Division has committees studying the problems involved in the public health aspects of Brucellosis in animal nutrition and in milk production, distribution and quality.

Since the organization of the American Institute of Biological Sciences, about two years ago, under the sponsorship of the National Research Council, there has been some merging of the programs followed by the Institute and the Division of Biology and Agriculture. This is inevitable since it was designed in the organization of the Institute that all member Societies of the Division would become members of the Institute.

As of January 1, 1949, the Institute had fifteen members and two societies as affiliates. Already during this year several other societies have become members of the Institute, thus adding to its strength and usefulness.

The American Dairy Science Association as yet has not joined the Institute. An invitation was issued by the Institute to our Association to have a representative at its board meeting on May 4, 1949, so President Petersen requested your reporter to attend. Much of the report made at this meeting was again reported and discussed at the meeting of the Division of Biology and Agriculture which was held the next day.

Items that should interest our membership were: (a) A report of the Committee on Advisory Services to Armed Forces, (b) A report of the Committee on Handbook of Biological Data, and (c) A report of the Publications Committee.

The Committee on Advisory Services to the Armed Forces has been asked by General Hershey, Director of Selective Service, to serve as his advisory panel in the field of the biological sciences. This is the first time that biology, as such, has been officially recognized in connection with manpower problems in the U. S. A plan has been proposed for organized cooperation between the Armed Services and biology in placing scientific personnel where it can serve most usefully. Under it, all worthy young scholars will be deferred. The tests for deferment are (a) interest in a scientific field and (b) an intelligence level at least equal to that required for officer training. If this latter test produced too many deferments, then the intelligence standards would be raised. These intelligence standards would be applied and the weeding out done within each college or university.

A proposal was also made to put all scientists in a common pool—probably with a common science uniform, so that they could be transferred from one service to another with no difficulty and placed where they could do the most good.

The plan as finally worked out has been accepted by the Selective Service Administration and forwarded to the President of the United States for his approval and action, probably through a Presidential Directive.

The idea for a Handbook of Biology really started when the Air Force asked for a Handbook on Medical Science. Due to the efforts of the American Institute of Biological Sciences, the scope of the Handbook was enlarged and the Institute given the responsibility of its compilation. The Air Force has underwritten the start of the book through an appropriation of \$15,000 but the ultimate cost is expected to be about a quarter of a million dollars. The Handbook will contain authentic, accepted and frequently used constants, data, normal values, tolerances, and standards applying to the quantitative aspects of biology in its broad and basic sense, including many fields of applied biology. The committee in charge of this compilation solicits the cooperation of all interested societies and their members in gathering the material that each would most like to see in a handbook.

The Publications Committee has been studying the economies that might occur through cooperative publication of magazines of member societies. In canvassing the membership of the Division of Biology and Agriculture it was found that twenty of the Societies had a lively interest in this venture, eighteen were somewhat interested and twelve were not interested. Further efforts will be made to serve those interested Societies by getting cost of publishing their magazines uni-

formly as to size, kind of paper, by standard printing or by the off-set method, etc.

During the past year Dr. R. E. Cleland, Department of Botany, Indiana University, replaced Dr. J. S. Nicholas as Chairman of the Division of Biology and Agriculture. Dr. Cleland also was Chairman of the Board of Governors of the American Institute of Biological Sciences during the past year, but was replaced at the last meeting by Dr. E. G. Butler, Department of Biology, Princeton University.

Respectfully submitted—C. Y. CANNON

Upon motion duly seconded, the report was approved.

#### NECROLOGY COMMITTEE REPORT

Robert Bear Stoltz, Professor and Chairman of the Department of Dairy Technology, Ohio State University, Columbus, passed away on October 2, 1948. He was born on March 6, 1890, at Bradford, Ohio. He graduated from Ohio State University in 1912 and joined the staff of that University soon after graduation. He taught Dairy Husbandry and was promoted to full professor in 1923. In 1929 he was made Chairman of a newly formed Department of Dairy Technology, a position he held until his death. Professor Stoltz took an active part in the organization of several commercial dairy associations. The Ohio Swiss Cheese Association and the Columbus Milk Distributors Association are but two highly successful groups that he organized and served for many years. He also served as secretary of the National Cheese Association for several years and was an honorary member of the Board of Trustees of the Ohio Dairy Products Association. His outstanding service to the American Dairy Science Association is well known to all members. Aside from serving as Secretary of this Association for over 12 years he also was our president in 1934. His tireless efforts in promoting the affairs of the Association have made this Association a large, aggressive and financially sound organization. It is fortunate that this association recognized his many contributions before his untimely death by presenting him with the Association Award in 1947. Professor Stoltz was very active in Masonry work and attained the 33rd degree in that organization. Before his death he was elected to the post of Deputy General Grand Master of the General Grand Council, R. & S.M. of the United States. He is survived by his wife, Mrs. Marie Cassel Stoltz, one son and three daughters. His untimely death is a great loss to this Association but the fruits of his labors will long be felt in the progress of the American Dairy Science Association.

Samuel Irvin Bechdel, Professor of Dairy Husbandry, the Pennsylvania State College, State



College, was born at Howard, Pennsylvania, July 9, 1886. He received his B.S. degree from the Pennsylvania State College in 1911, an M.S. degree from the same institution in 1916 and a Ph.D degree from the University of Minnesota in 1925. During his 32 years of service to the Pennsylvania State College Dr. Bechdel distinguished himself as a teacher and scientist. His most outstanding contributions in the field of Dairy Research were his studies on vitamin requirements of dairy cattle and silage and pasture investigations. His experimental work with vitamin B synthesis in ruminants attracted world wide attention. Dr. Bechdel was very active in church work, serving as Deacon, Elder and as teacher of the Men's Bible Class of the Faith Reformed Church for some 20 years. He retired in January, 1946, due to ill health and passed away on September 13, 1948. He is survived by his wife and four children.

Christian Larsen was born in Odense, Denmark on August 4, 1874. After coming to this country he received a B. S. degree in Agriculture at Iowa State College in 1902 and an M.S. degree from that institution in 1904. He served on the instructional staffs at Massachusetts State College, Iowa State College and Utah State College and in 1907 went to South Dakota State College as Professor of Dairy Husbandry and Director of Extension. In 1921 he became Director of Dairy Marketing for the Illinois Agricultural Association. He was appointed Dean of Agriculture at the South Dakota College in 1923, a position he held until his retirement in 1940. Dean Larsen was one of the pioneers in the field of dairy science and made many early contributions in both dairy manufacturing and production. Production heredity, physiology of milk secretion, effects of water and alkali on nutrition and the chemistry of butter were but a few of his major interests. He was the author of several early books on dairying subjects among which were *Principles and Practices of Buttermaking*, published in 1905, and *Dairy Technology*, published in 1914. He held memberships in many Agricultural and Scientific societies, as well as fraternal and civic groups. He was a member of the American Dairy Science Association from 1920 until his death and was honored with a life membership in this Association in 1943. Dean Larsen passed away on August 23, 1948.

Thomas E. Elder was born in Virginia in October 1882 and died of a heart attack at Cedar Grove, N. J., September 8, 1948. He was graduated from Cornell University in 1911 where he specialized in Animal Husbandry under the late Professor H. H. Wing. Shortly after completing his college course, he joined the staff of the Mount Hermon School for Boys at Mount Her-

mon, Mass. and became Dean of the school in 1926. He served as a director of the Holstein-Friesian Association of America from 1921 to 1941, a period of 20 years. He was a member of the True Type Committee of the Holstein-Friesian Association, the committee that developed the true type models and paintings for the Holstein breed, and served as an official inspector from the beginning of the type classification program in 1929 until the day of his death. He had gone from his home in Alton, N. H. to inspect and classify the Overbrook Dairy herd at Cedar Grove, N. J. and there his death occurred. His wife, Grace Holton Elder, and two sons survive him.

Thomas B. Buchanan, manager of Borden's Hamilton Milk Co., Columbus, O. for over 28 years, died September 18, 1948. A native of Cincinnati, Mr. Buchanan spent his boyhood in that city, but moved to begin his career in the dairy industry in Columbus, O. as a route salesman for the Pure Milk Co. Mr. Buchanan later became a member of the Moores and Ross organization and was appointed manager of the Hamilton Milk Co. which they acquired in 1920. After the Borden Company acquired this company in 1929, Mr. Buchanan remained as manager of the expanded Borden's Hamilton Milk Co. and held this position until his death. Mr. Buchanan joined the American Dairy Science Association in 1932. At the time of his death he was treasurer of the Columbus Milk Distributors Association, treasurer of the Ohio Dairy Products Association, and a member of the Columbus Lions Club. He is survived by his wife, three daughters and two grandchildren.

It was reported to the Association that Mr. Charles Staff of Pleasant Ridge, Mich. passed away on July 10, 1948. Mr. Staff was formerly associated with the Larro Research Farms at Detroit, Mich. and at the time of his death was with General Mills at Pleasant Ridge, Mich. He has been a member of the Association since 1942. The committee was unable to obtain further information regarding Mr. Staff.

Respectfully submitted—J. P. LAMASTER; D. V. JOSEPHSON; D. M. SEATH, *Chairman*.

Upon motion duly seconded, the report was accepted.

#### RESOLUTIONS COMMITTEE REPORT

WHEREAS: The University of Minnesota through its administrative staffs and faculty has made available to the American Dairy Science Association in this its 44th Annual Meeting all needed physical facilities for the meeting, and

WHEREAS: Every possible personal courtesy has been given to members of the Association for their enjoyment and entertainment,

Therefore, be it **RESOLVED**: That the American Dairy Science Association take this opportunity officially to extend its thanks and appreciation and hereby request the President of this Association to convey by letter this appreciation to President J. L. Morrill and to Dean Clyde H. Bailey, and Professor J. B. Fitch.

WHEREAS: Many commercial and civic organizations have contributed greatly to the success and enjoyment of this 44th annual meeting,

Therefore, be it **RESOLVED**: That the American Dairy Science Association express to these organizations its sincere appreciation.

WHEREAS: The Borden Company has again offered its awards for outstanding research in dairy manufacturing and production,

Therefore, be it **RESOLVED**: That the American Dairy Science Association express to the Borden Company its sincere appreciation of this evidence of its continued interest in dairy research.

WHEREAS: The American Feed Manufacturers Association has seen fit to offer an award for outstanding research in the field of dairy cattle nutrition,

Therefore, be it **RESOLVED**: That the American Dairy Science Association express to the American Feed Manufacturers Association its sincere appreciation for their interest in and encouragement of research in dairy cattle nutrition.

WHEREAS: The Purebred Dairy Cattle Association has continued in its cooperation with the American Dairy Science Association in establishing uniform rules for the testing of dairy cattle,

for the regulation of artificial breeding and other matters promoting uniformity and,

WHEREAS: The Purebred Dairy Cattle Association has established a Dairy Cattle Breeding Research Council for the purpose of encouraging and supporting research in this field, in cooperation with the various experiment stations,

Therefore, be it **RESOLVED**: That the American Dairy Science Association commend the Purebred Dairy Cattle Association for its efforts.

WHEREAS: The officers of the various sections of the Association are changed annually and are often unfamiliar with organizational procedure, considerable confusion and misunderstanding exists.

Therefore, be it **RESOLVED**: That the Executive Board instruct the Secretary of the Association to prepare a report outlining the setup of the Association and the procedures to be followed in handling committee reports, recommendations and resolutions by the various sections in order that the business of the association at the annual meeting can be handled in an orderly manner.

Respectfully submitted—A. A. SPIELMAN, *Chairman*; F. J. ARNOLD; F. C. FOUNTAINE; H. B. HENDERSON; A. J. MORRIS.

#### REGISTRATION COMMITTEE REPORT

S. T. Coulter, University of Minnesota, made the following report for the Registration Committee. Upon motion duly seconded, it was accepted.

C. Y. Cannon moved and A. W. Rudnick seconded that all actions of the Executive Board during the past year be approved.

Alabama	2	Maryland	32	Oklahoma	10
Arizona	2	Maine	3	Oregon	3
Arkansas	5	Massachusetts	15	Pennsylvania	37
California	16	Michigan	32	South Carolina	5
Colorado	2	Minnesota	198	South Dakota	14
Connecticut	6	Mississippi	3	Tennessee	8
Delaware	2	Missouri	26	Texas	6
Washington, D. C.	23	Montana	6	Utah	6
Florida	5	Nebraska	16	Vermont	10
Georgia	1	New Hampshire	4	Virginia	10
Illinois	93	New Jersey	14	Washington	12
Indiana	29	New Mexico	3	West Virginia	8
Iowa	68	New York	70	Wisconsin	111
Kansas	14	North Carolina	19	Wyoming	4
Kentucky	44	North Dakota	6		
Louisiana	5	Ohio	84		
<i>U. S. Territories</i>		<i>Foreign Countries</i>			
Hawaii	3	Australia	6	India	4
Puerto Rico	4	Belgium	1	New Zealand	1
		Canada	2	Scotland	1
				Turkey	1
				Men Present	780
				Women Present	262
				Children Present	73
				Total registration	1115

MEETING OF THE EXECUTIVE BOARD  
AMERICAN DAIRY SCIENCE  
ASSOCIATION

P. R. ELLSWORTH, *Secretary-Treasurer*

The Executive Board transacted the following business:

Approved the minutes of the past annual meeting.

Approved the Editor's report.

Approved the Secretary's report.

Approved the Journal Management Committee report.

Approved the Auditing Committee report.

Approved the Budget for 1950, amounting to \$39,500.

Received the report of the representative of the National Research Council.

Re-employed the editor for the ensuing year.

Employed the present acting Secretary-Treasurer as Secretary-Treasurer for the ensuing year.

Voted unanimously to make H. B. Ellenberger an honorary member of the Association.

Elected J. K. Loosli as a member of the Journal Management Committee to serve for the three ensuing years.

Accepted Cornell University's invitation to hold the 45th Annual Meeting of the Association there in 1950.

Voted to make O. C. Cunningham a life member of the Association.

Voted to recommend that the Association no longer furnish free reprints of articles to authors.

Voted to recommend to the Association that:

Domestic subscription rates be raised from \$6.00 to \$10.00 per year.

Foreign subscription rates be raised from \$6.50 to \$10.50 per year.

Membership dues be raised from \$5.00 to \$6.00 per year.

Student Affiliates dues remain at \$3.00 per year.

The Associate Subscriber classification be discontinued and that all present associate subscribers be invited to become members or subscribers as the appropriate case may be, with no \$5.00 affiliation fee being charged those who become members.

Voted to have printed abstracts of all papers presented at the annual meeting available at the registration table. Cost of these reprints to be included in the registration fee. The journal will print all abstracts in the June issue.

Renewed student branch certificates for the University of Massachusetts, University of Georgia and Ohio State University and issued a new certificate to Rutgers University, New Jersey.

Went on record as being in favor of the establishment of some sort of an award for Extension personnel should a suitable donor be found.

Empowered Journal Management Committee to make final decisions, if needed, relative to new or questionable advertising.

Approved the Resolutions Committee report as corrected.

Recommended to the Association that the Secretary be authorized to accept applications for membership in the American Dairy Science Association from citizens of foreign countries who have received advanced technical training in dairy science in the United States or Canada. This training would normally be expected to represent the equivalent of a Master's degree or Doctor's degree in our colleges, or work of at least one year's duration towards such degrees.

Recommended to the Association that student affiliate memberships of foreign citizens in United States or Canadian colleges may be converted to full memberships by the usual method of conversion now used for United States student affiliates.

Recommended that a new class of foreign members be established as follows: Upon the nomination of two or more members and approval by the Executive Board, distinguished foreign dairy scientists may be elected to membership with all the privileges of domestic members except that they have no voting privileges. The number of members elected normally would be restricted so that such election would be considered a distinct honor.

Recommended that the Association print the lectures of Dr. W. W. Spink on "Brucellosis in Man" and by Dr. Ancel Keys on "Cholesterol and the Problem of Aging" in the JOURNAL OF DAIRY SCIENCE as part of the proceedings of the annual meeting.

The Nominating Committee consisting of Warren Gifford, P. H. Tracy, E. G. Hood, Otto Hill and C. G. Bradt nominated the following candidates in April: Vice-president, R. B. Becker and S. J. Brownell; directors, C. W. Turner, J. P. LaMaster, F. J. Arnold and E. J. Perry.

Results of the election were announced on June 1 as follows: Vice-president, R. B. Becker of Florida; directors, C. W. Turner of Missouri, and F. J. Arnold of Iowa.

Upon motion duly seconded the report was approved.

## THE AMERICAN DAIRY SCIENCE ASSOCIATION AWARDS

*Minneapolis, Minnesota, June 23, 1949*

W. E. Petersen, of the University of Minnesota, acted as toastmaster at the annual awards banquet on June 23 at Coffman Memorial Union, Minneapolis, Minnesota. He installed the officers-elect as follows: G. M. Trout, of Michigan, was installed as President; R. B. Becker, of Florida, as Vice-President; C. W. Turner, of Missouri, and F. J. Arnold, of Iowa, as Directors.

Mr. Trout, you are about to take over the responsibilities of President of the American Dairy Science Association. As President it will be your duty to be chairman of the Executive Board and submit to the Board for approval the nominations of members to fill vacancies that may occur among the elected officers of the Association. As President you shall appoint, without the approval of the Executive Board, the standing non-elective committees of the Association. With these obligations, privileges and responsibilities I now charge you with the honor of being President of the American Dairy Science Association with all the privileges, responsibilities and obligations pertaining thereto.

Mr. Becker, you are about to take over the responsibilities of Vice-President of the American Dairy Science Association. As Vice-President, it will be your duty to preside over the Executive Board in the absence of the President and assume other duties of the Executive Board. At the expiration of President Trout's term, you will automatically become President of this Association. I now charge you with these duties.

Mr. Turner and Mr. Arnold, you were elected to the Executive Board of the American Dairy Science Association. It is the duty of the Board members to pass on all applications for the establishment of divisions, sections, and student branches of the Association. You will have full control of the budget and general business of the Association and have title to all property and funds of the Association. You will be members of the Board that has all the rights and power vested in the by-laws of the Association. With these privileges, responsibilities, and obligations you are now considered as members of the Executive Board of the American Dairy Science Association to serve a term of three years.

PRESENTATION OF ASSOCIATION  
AWARD

The toastmaster then introduced J. A. Nelson, chairman of the Association Honors Committee, who made the following citation:

Howard Bowman Ellenberger was born at Dallas, Iowa and educated in the public schools

of Iowa. He entered Iowa State College and was granted the Bachelor of Science degree by that institution in 1905. He earned the Master of Science degree from Cornell University in 1915 and continued with his advanced studies and investigations at Cornell to earn the degree of



HOWARD BOWMAN ELLENBERGER

Doctor of Philosophy in 1917. He married Priscilla Flatt, who has been a very conscientious and ardent co-worker in his professional life.

Before completing his undergraduate work, Howard Ellenberger gained practical experience by working as herdsman in Illinois and in Minnesota before graduating from Iowa State College. After graduation, he gained further practical experience as foreman and superintendent of farms in Illinois, Missouri and Iowa. His quest for further knowledge and his ambition led him to Cornell University in 1914 as instructor and graduate student. During the time he was instructing and doing graduate work at Cornell, he served as specialist in dairy manufacturing during the summer vacations for the Vermont Department of Agriculture. He performed his duties so well that he was offered and accepted the position as Associate Professor of Animal and Dairy Husbandry at the University of Vermont after

completing the work for the doctorate in 1917. His efficiency, sincerity and foresight brought about rapid advancement and in 1918 he was made head of the Department of Animal and Dairy Husbandry, a position which he held until his retirement in 1948.

Doctor Ellenberger has had a wide field of interest. He was author and co-author of a number of dairy bulletins and scientific papers on dairy production, dairy cattle management, dairy feeds, breeding and dairy products manufacturing and regulatory work. His interest and influence in the dairy industry went far beyond the borders of his home state of Vermont. He visited other institutions to study their methods and to exchange ideas with other workers. He always was helpful in assisting others with their problems.

His prominence and his good judgement were recognized by others in the dairy industry. He was honored by being selected as chairman of the New England Governors' Dairy Advisory Board to organize and administer the Boston market milk area from 1931 to 1933. This duty he performed with distinction.

To achieve closer coordination of the Vermont dairy industry, he organized the Vermont Dairy Plant Operators and Managers Association of which he was executive secretary from 1921 to 1941. He is now honorary secretary of this association. Professor Ellenberger has always been a diligent and sincere worker in the American Dairy Science Association. He served as chairman of the Eastern Division in 1926, chairman of the Production Section in 1930 and was president of the National Association in 1931 and director in 1940-42. His interest in scientific research and advancement was not limited to the dairy field. He has been a member of the American Society of Animal Production in which he served as North Atlantic vice-president and as chairman of the North Atlantic Section.

For these outstanding achievements in the dairy field and in other related fields and for the long and honorable service in the advancement of the dairy industry, it is with great pleasure that the American Dairy Science Association selects Howard Bowman Ellenberger as "Dairyman of the Year". In token of our high esteem of his professional accomplishments, we present to him this distinguished service award.

#### PRESENTATION OF BORDEN AWARDS

I. A. Gould, member of the Borden Award Committee for manufacturing, was then introduced and made the following statements:

The man chosen for the 1949 American Dairy Science Association Borden Award in Dairy Manufacturing has for more than a quarter of a

century been contributing to our knowledge in this field of endeavor. Over this span of years he has conducted a wide variety of research, both fundamental and applied, which has revealed unusual creative ability and a broad knowledge in dairy technology and in the allied science fields. His contributions have been based on sound scientific techniques and procedures which have yielded results of much value to the dairy industry.



FRANCIS JANNEY DOAN

This man has been author or co-author of more than eighty publications, the major part of which pertain to original research. His research and publications have been principally in the fields of market milk and concentrated milk products. He was a pioneer in studying homogenization and has conducted research of this process, as applied to milk and cream, for more than 22 years. In these studies he demonstrated the effect of homogenization and of fat clumping on the heat and alcohol stability of milk proteins and obtained information on the fundamental factors responsible for the heat "curdling" or "feathering" of cream. Also, his research revealed that the lipase enzyme in milk was inactivated at relatively low temperatures, so that this enzyme was not a factor of spoilage in pasteurized homogenized milk. In later studies dealing with the stability of emul-

sion of fat in homogenized milk, he obtained results which served as the basis for establishing new standards for the commercial bottled product.

Another important phase of his research has dealt with soft curd milk. By utilizing an improved *in vitro* technique for determining the digestibility of milk and for judging its suitability for infant feeding, he demonstrated the treatments and processes which yielded milk with superior digestible characteristics. His work tended to cast considerable doubt on the reliability of "curd-tension" values in indicating the digestibility of milk. Also, in this series of studies, he demonstrated the effect of mastitis on the curd properties and on the general chemical characteristics of milk.

The freezing of milk, cream and condensed milk also has received considerable attention from this research worker. Particularly noteworthy are his studies during the recent war years on the freezing of fluid and condensed milk to ascertain the most desirable procedure to preserve the normal milk flavor and to prevent undesirable protein effects which normally occur in milk as the result of freezing.

During recent years he became interested in improving the nutritional value of evaporated milk and conducted fundamental research on the ascorbic acid content of this product. His work revealed that fortification of evaporated milk with ascorbic acid is feasible and under proper conditions ascorbic acid may be retained in this product for a considerable period of time.

This research worker also has been instrumental in developing and applying techniques for the analysis of milk and milk products. Among his contributions in this connection may be listed the colorimetric picric acid method for measuring lactose in milk, a modified Babcock test for determining the fat content of chocolate milk, a rapid drying method for determining the solids content of milk products by use of forced heated air, studies of methods of measuring the phosphatase activity in milk, and the application of a modified direct microscopic method for the bacterial analysis of milk.

In addition to his many personal contributions to dairy science, this year's nominee has long been known as an outstanding teacher and counselor of research men. He has directed the graduate program for many men who now hold responsible positions in industry and in college work and has done much to stimulate their thinking along research lines.

This year's nominee was born on September 20, 1896, in Philadelphia, Pennsylvania. He received both his undergraduate and graduate training at the Pennsylvania State College. Following the completion of his undergraduate work he spent

3 years as chemist with the Nestles Food Co. and 1 year as laboratory director for the Wadlington Condensed Milk Co. He was instructor in dairying at the University of Maryland from 1922 to 1925. He accepted a position on the staff of the Pennsylvania State College and has remained on the staff of that institution since that time.

Principally because of his varied and valuable research in the fields of fluid and condensed milk during the past 27 years, but also because of his stimulating leadership and his training of men in Dairy Technology and his general contributions to the dairy industry the American Dairy Science Association Borden Award Committee for the Dairy Manufacturing Section has selected Francis Janney Doan, Professor of Dairy Manufacturing, the Pennsylvania State College, for the 1949 Award.

Mr. W. A. Wentworth of the Borden Company Foundation then presented Dr. Doan with a gold medal and a check for \$1,000.00.

#### BORDEN AWARD IN DAIRY PRODUCTION

G. M. Cairns, chairman of the Borden Award Committee for Production then was introduced and made the following statement:

The recipient of the Borden Award in Production for 1949, is George Herman Wise of the North Carolina State College, Raleigh, N. C. Dr. Wise was born and reared in South Carolina. He received his B.S. degree from Clemson Agricultural College in 1930, and his M.S. and Ph.D. degrees from the University of Minnesota in 1932 and 1936, respectively.

Dr. Wise has held the following positions since graduation from Clemson: Assistant, University of Minnesota 1934-36; Associate Dairy Husbandman, Clemson Agricultural College 1936-1944; Associate Professor of Dairy Husbandry at Kansas State College 1944-1947; Associate Professor of Dairy Husbandry and Research Assistant at Iowa State College 1947-1949 and since April 1949 Professor of Animal Industry at North Carolina State College, in charge of the nutrition section.

During his student days he was characterized by the thoroughness of his preparation in both study and research work. Since completing his graduate study he has continued to exhibit those same qualities in his research activities. An important contribution made by Dr. Wise was his series of comprehensive studies upon the physiology of gastric digestion in the calf. These include the various factors affecting the passage of liquids into the rumen of the calf and the changes in milk products that took place when milk was sham-fed. His more recent studies include the effect of the prepartum diet of the cow on the vitamin A and tocopherol content of colos-



trum and milk in the early post-colostrum period and upon the vitamin A storage in the new born calf. He received the American Feed Manufacturers' Association Award in 1948 for his series of publications on the latter work.

Dr. Wise has published more than 25 papers in the nutrition and physiology fields. He has been active in the Association, having served as Chairman of the Production Section in 1948 and is an Associate Editor of the *JOURNAL OF DAIRY SCIENCE*.



GEORGE HERMAN WISE

On behalf of the Committee on the Borden Award for Dairy Production, it is a pleasure to present Dr. George H. Wise to receive the Award.

Mr. W. A. Wentworth of the Borden Foundation then presented Dr. Wise with a gold medal and a check for \$1,000.

#### AMERICAN FEED MANUFACTURERS' AWARD

R. B. Becker, acting chairman of the Award Committee for the American Feed Manufacturers' Association, then was introduced and made the following statement:

Professor J. G. Archibald, chairman of the American Dairy Science Association committee to determine the recipient for the Award by the

American Feed Manufacturers Association regrets his inability to be present because of a conflicting engagement in the East, so it becomes my pleasure to represent Chairman Archibald on this occasion.

Seven persons were nominated for consideration this year. Your committee also canvassed the literature in the field of dairy cattle nutrition published during the two-year period 1947-48, as required by the rules. Over 50 papers were found eligible, all of which were evaluated carefully. The first draft reduced them to 23, and



THOMAS S. SUTTON

the decision narrowed finally to a group of six outstanding papers by one author and his co-workers.

These six papers have appeared in the *JOURNAL OF DAIRY SCIENCE*, one in 1947 and five in 1948. They dealt with comparisons of colostrum with normal milk as sources of vitamins and amino acids in the nutrition of dairy calves. The important and economic desirability of feeding as much colostrum as possible to young calves was established definitely by their investigations. The value of these findings to the dairy industry through healthier and more vigorous calves is obvious.

The worker who merited the award this year is widely known to nearly every member of this Association. He is an Ohioan by birth, scholastic

training and professional position. His career has been one of rapid promotion, from instructor in 1929 to head of Agricultural Biochemistry in 1948. He has been active in our Association, and served as editor of the JOURNAL OF DAIRY SCIENCE over the period 1938 to 1946.

By now, all of you must have recognized his identity. The committee is happy to present as candidate to the representative of the American Feed Manufacturers' Association for the 1949

Award, Dr. Thomas S. Sutton, of Ohio State University, Columbus, Ohio.

Dr. Record, it gives me great pleasure to serve in place of Chairman Archibald in presenting Dr. Thomas S. Sutton to you, as candidate for the 1949 Award.

P. R. Record, vice-chairman of the Nutritional Council of the American Feed Manufacturers' Association, then presented Dr. Sutton with a check for \$1,000.

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#### NOTICE

Those wishing a copy of the material presented on the panel discussion on "The Job of Dairy Herd Improvement" that was held by the Production and Extension Sections at the recent meeting of the American Dairy Science Association may obtain this material in mimeographed

form by writing to the Editorial Department, Hoard's Dairyman, Fort Atkinson, Wisconsin. Tape recordings were made of the discussions and the resulting material has been edited by the members of the panel and mimeographed through the courtesy of Hoard's Dairyman.

# JOURNAL OF DAIRY SCIENCE

## ABSTRACTS OF LITERATURE

Prepared in cooperation with the  
International Association of Ice Cream Manufacturers  
and the Milk Industry Foundation

### BOOK REVIEW

577. **Condensed milk and milk powder.** 7th ed. O. F. HUNZIKER. 583 pp. Published by the author, La Grange, Ill. 1949.

This new edition follows the pattern of the preceding edition, with the incorporation of an appreciable amount of new material. The cuts of equipment have been brought up-to-date in many instances and some of the newer methods of processing which have been used in European countries are described and illustrated. The chapter on "Definitions, Standards and Import Tariffs" has been expanded to incorporate recent material. The increased number of pages is due, in part, to less crowding on the pages and more readable type. The appearance of the new edition after only 3 years is evidence of the desire of the author to keep this standard textbook abreast of the new developments in the field.

F. E. Nelson

### ANIMAL DISEASES

W. D. POUNDEN, SECTION EDITOR

578. **Effect of infused streptomycin in the mammary gland.** C. R. SMITH, W. E. PETERSEN AND R. W. BROWN, Univ. of Minnesota, Minneapolis. Proc. Soc. Exptl. Biol. Med., **68**, 1: 216. May, 1948.

Five grade Holstein-Friesian cows and one grade Togenberg goat were employed. All animals were lactating normally and free of disease during the experiment. The cup-plate method of assay, as adapted to measurement of antibiotics in milk, was used for determining the concentration of streptomycin in the milk samples. Milk samples for assay purposes were obtained by milking out the quarter completely. Streptomycin could be detected in milk samples as long as 48 hr. after the infusion of 100,000 to 500,000 units/quarter and concentration did not fall below 20 units/ml. in any of the samples after a 24-hr. interval. Concentration was found to vary with dose, interval between infusion and sampl-

ing, and milk production. At no time was it possible to detect streptomycin in the blood. However, in both the cow and goat, significant amounts were found in urine samples as long as 27 hr. following infusion. The pH, chlorides, cell count and clinical inspection showed that streptomycin was relatively non-toxic when infused into the normal bovine mammary gland.

R. P. Reece

579. **Comparison of New Jersey and Palestine strains of bovine leptospira.** H. BERNKOFF AND R. B. LITTLE. Rockefeller Inst. Med. Research, Princeton, N. J. Proc. Soc. Exptl. Biol. Med., **69**, 3: 503-506. Dec., 1948.

A study was made of strains of leptospira recovered from an outbreak of leptospirosis among cattle in New Jersey and a strain isolated from an outbreak of the disease in Palestine. In agglutination and lysis tests on sera from recovered cattle as well as sera from immunized rabbits, all the New Jersey strains reacted alike, while the Palestine strain belonged to another serological group.

R. P. Reece

580. **Brucellosis: Contralor sanitario de los alimentos.** (Brucellosis: Sanitary Control of Foods.) E. PIERANGELI. Rev. asoc. argentina dietol., **5**, 50: 281-284. Oct., Nov., Dec., 1947.

Direct and indirect transmission of the disease is discussed. The author states that contraction of the disease from the bites of infected mosquitoes has been demonstrated experimentally in *Macacus simiensis*, using infected *Stegomia fasciata* and *Culex pipiens*.

According to Dr. Molinelli and coworkers' report on a large slaughterhouse in Buenos Aires, sacrificing some 4,800 cows, 3,000 sheep and 2,500 hogs, serum agglutination tests were positive in 6.67 and 4.48% of the hogs and cows, respectively, with no positive tests in the sheep. Of the 2,000 employees, 7 of the 18 medical veterinarians had the disease (of the infected, 1 worked with cows and the rest with hogs, one of the latter succumbing); 14 (6 of whom worked with cows

and the rest with hogs and other animals) of the 52 assistant veterinary inspectors had the disease. In the rest of the employees, 53, or 3.02%, had brucellosis. In the city of Buenos Aires, 19.44% of the raw and 2.77% of the pasteurized milk contained *Brucella abortus*, according to the Lab. of Bacteriology, Dept. of Agr.

Survival periods for the organism are discussed. Recommendations for the control of milk and milk products were made, including an official control of pasteurization, which has not been adequate, as shown by the presence of brucella in pasteurized milk. Compulsory testing of herds for Bang's disease was not mentioned.

L. S. Olsen

#### 581. Effect of gonadal hormones on experimental infection of rats with *Brucella abortus*.

L. H. PUGH. N. J. Agr. Expt. Sta., New Brunswick. Proc. Soc. Exptl. Biol. Med., **68**, 3: 591-592. July-Aug., 1948.

One-half of 15 immature intact male rats and 22 immature intact female rats were injected subcutaneously with 2.5 mg. of testosterone propionate 6 hr. before infection. All of the rats were infected with 3,800 million *Brucella abortus* organisms via the intraperitoneal route. After 5 d. the mortality rate of the non-injected animals was 100%; injected males, 87.5%; and injected females, 63.6%. It was concluded that testosterone propionate significantly increased the resistance of rats to experimental *B. abortus* infection.

R. P. Reece

### CHEESE

A. C. DAHLBERG, SECTION EDITOR

#### 582. Expansion Seen for Cottage Cheese.

Anonymous. Milk Plant Monthly, **38**, 5: 30-31, 43. May, 1949.

In the past 10 yr. the national per capita consumption of cottage cheese has risen from 0.33 lb. to 2 lb. With this increased consumption there appeared a nomenclature for the types of cottage cheese so confusing that attempts were made to classify the varied forms. The following six categories were proposed: (a) medium sized curd lightly creamed, (b) medium and large curds heavily creamed, (c) small curd heavily creamed, (d) small curds heavily creamed with free cream showing on the bottom of the container, (e) small curds floating in added cream, and (f) very fine curds creamed to approach the texture of cream cheese. Although these varied types have added confusion to our nomenclature they have aided in increasing consumption of the product due to varied local and

regional tastes.

J. A. Meiser, Jr.

Also see abs. no. 614, 615.

### CONDENSED AND DRIED MILKS; BY-PRODUCTS

F. J. DOAN, SECTION EDITOR

#### 583. Dehydrated Animal Products. 2. Dried Milk.

J. A. PEARCE, Natl. Research Lab., Ottawa, Can. Food in Canada, **8**, 4: 14-18. Aug., 1948.

Methods of manufacturing dried milks are described and current research being conducted by the National Research Lab. is reviewed. The effect of such factors upon quality as promptness of cooling the powder, exposure to light, storage temperature, gas storage and compressing the powder into blocks is dealt with.

O. R. Irvine

#### 584. Dehydrated Animal Products. 3. Milk Products.

J. A. PEARCE, Natl. Research Lab., Ottawa, Can. Food in Canada, **8**, 10: 14-17, Oct., 1948.

A brief description is given of a dried milkshake mix having the following composition: fat, 14%; protein, 31%; carbohydrate, 46%; ash, 6.9%; and moisture, 2.5%. This was made entirely from milk products. Attempts to combine egg products in the mix resulted in unsatisfactory flavors when stored. Results in terms of cake volume and foaming volume are given where the German products "Milei G" and "Milei W", made from milk, were compared to fresh eggs, sugar-egg powder and plain egg powder. In both respects the German egg substitutes were much inferior. Investigations were made on methods of drying whey and on the baking properties of whey powder. The results indicate the possibilities of using this product in baked goods, although strong odors and flavors are a problem. These were somewhat reduced by neutralizing the whey prior to condensing and drying.

O. R. Irvine

#### 585. Process of Making Whey Food Products.

R. E. MEADE AND J. M. STRINGHAM (assignors to Western Condensing Co.). U. S. Patent 2,465,905. 6 claims. March 29, 1949. Official Gaz. U. S. Pat. Office, **620**, 5: 1524. 1949.

A firm plastic mass or gel, suitable for animal or poultry feeding, is made by fermenting pasteurized whey with propionic and lactic acid type organisms, blending with partially delactosed whey, heating to at least 160° F. and concentrating to form a final product containing from 40 to 60% solids.

R. Whitaker

**586. Method of Making Novel Products from Whey.** R. E. MEADE AND P. D. CLARY, JR. (assignors to Western Condensing Co.). U. S. Patent 2,465,906. 5 claims. Mar. 29, 1949. Official Gaz. U. S. Pat. Office, **620**, 5: 1524. 1949.

The browning and staling of dried whey is prevented by passing the liquid whey prior to drying through resinous decationizing and deacidifying agents to reduce the ash content and such protein decomposition products as peptides and amino acids.  
R. Whitaker

**587. Method of Making Lactea Food Products.** R. E. MEADE AND P. D. CLARY, JR. (assignors to Western Condensing Co.). U. S. Patent 2,465,907. 5 claims. March 29, 1949. Official Gaz. U. S. Pat. Office, **620**, 5: 1524. 1949.

A powdered infant food made from cow's milk and having the average composition of breast milk when diluted, is made by drying heat treated cream with the liquid whey powder described in Abstract 586 (Pat. 2,465,906).  
R. Whitaker

**588. Preparation of Dried Protein Products.** E. W. HOPKINS (assigned to Armour and Co.). U. S. Patent 2,465,875. 5 claims. Mar. 29, 1949. Official Gaz. U. S. Pat. Office, **620**, 5: 1517. 1949.

Acidic proteinaceous materials such as fermented milk, whey, eggs and the like are neutralized to pH 5.65 to 6.5 with a non-volatile alkali, such as  $\text{NaHCO}_3$ , then to pH 7.0 to 8.5 with a volatile alkali, such as  $\text{NH}_3$ , and then dried. The pH of the reconstituted product is close to the neutral point.  
R. Whitaker

**589. Method of sealing empty cans.** P. T. LEMMEL (assignor to the Borden Co.). U. S. Patent 2,471,332. 2 claims. May 24, 1949. U. S. Pat. Office, **622**, 4: 1212. 1949.

The vent hole in evaporated milk cans is plugged with a waxy material until ready for filling to keep the interior of the can clean and to prevent corrosion of the unplated vent hole edges.  
R. Whitaker

**590. Frozen Concentrated Milk.** C. D. COLVARD, Catawba Dairy, Inc., Hickory, N. C. AND W. M. ROBERTS, N. C. State College, Raleigh. Milk Dealer **38**, 7: 46, 100-106. Apr., 1949.

The following conclusions are drawn concerning the processing and storage of frozen milk: (a) Milk concentrated to a ratio of 3: 1 was successfully stored at  $-12^\circ$  for 20 wk. (b) The addition of 0.20% sodium citrate, 0.075% sodium hexametaphosphate or chocolate syrup prolonged the

period of storage at  $0^\circ$  F. (c) Storage of frozen concentrated milk at  $-12^\circ$  F. was more effective in preventing protein flocculation than at 0 or  $10^\circ$  F. (d) Samples stored at  $-12^\circ$  F. retained their flavor for a longer period of time than those stored at 0 and  $10^\circ$  F. (e) Although the addition of either 0.20% sodium citrate or 0.075% sodium hexametaphosphate retarded protein flocculation, these quantities were sufficient to produce a salty flavor. (f) Concentrated milk to which chocolate syrup had been added maintained flavor and protein stability for 11 wk. or for 8 wk. longer than the control when stored at  $0^\circ$  F. (g) Fat de-emulsification was not a serious defect in milk concentrated to a 3: 1 ratio and frozen statically. (h) A gravimetric method, which appears to be more satisfactory than the volumetric method, was developed for measuring protein stability.

C. J. Babcock

Also see abs. no. 577, 599.

## DAIRY BACTERIOLOGY

P. R. ELLIKER, SECTION EDITOR

**591. Isolation of Brucella from Apparently Healthy Individuals.** L. V. McVAY, F. GUTHRIE, I. D. MICHELMON AND D. H. SPRUNT, Univ. of Tennessee, Memphis. Proc. Soc. Exptl. Biol. Med., **69**, 3: 607-608. Dec., 1948.

Enlarged prostates and fibrosed fallopian tubes were cultured for brucella since they are known to multiply in macrophages and fibroblasts. Thirty-four prostates were cultured and from these cultures *Brucella abortus* were isolated in two instances and *Brucella melitensis* in one. Forty-three fallopian tubes were cultured and from one of these *B. melitensis* was isolated. In all four cases there was a history of country life, contact with cows and other farm animals, consumption of raw milk and a clinical record of illness compatible with brucellosis. Blood agglutinins for brucella were absent in all four cases; however, their skin gave strongly positive reactions with brucella antigen.  
R. P. Reece

**592. Electron Microscope Studies of Bacteriophage Active Against Streptococcus lactis.** C. E. PARMELEE, P. H. CARR AND F. E. NELSON. J. Bact., **57**, 4: 391-397. Apr., 1949.

Here are presented 16 excellent reproductions of electron micrographs of gold-shadowed specimens. Details of preparation are given. Normal cells of *Streptococcus lactis* are shown, with and without the presence of phage particles. The particles are sperm-shaped, 220  $m\mu$  long, with a head diameter of 70  $m\mu$ , and a tail 30  $m\mu$  wide and 150  $m\mu$  long. Two strains of phage

from New Zealand, four from England, one from Canada and two isolated at the Iowa Agr. Expt. Station are indistinguishable with respect to shape and size.

The bacterial cells in the presence of homologous phage tend to become elongated and to burst. Possible stages in the process of lysis are indicated.

D. P. Glick

**593. A Study of Boric Acid Media for the Separation of Escherichia and Aerobacter.** C. F. POE AND L. W. CHARKEY, Univ. of Colorado, Boulder. *J. Bact.*, **57**, 3: 386-387. Mar., 1949.

Boric acid in culture media showed greater inhibition toward strains of *Aerobacter* than toward strains of *Escherichia*. However, because of overlapping results secured from individual strains of each genus, boric acid media are not suitable as differential media for the two genera.

D. P. Glick

**594. The Fermentation of Alpha-methylglucoside.** DOROTHEA E. KLEMME AND C. F. POE. Univ. of Colorado, Boulder. *J. Bact.*, **57**, 3: 384-385. Mar., 1949.

Alpha-methylglucoside is fermented about equally by gas-producing strains of *Escherichia coli* and by strains of *Aerobacter aerogenes*. Gas-forming strains of *E. coli* produced more acetic, formic, lactic and succinic acids than did the non-gas-forming strains; e. g., the gas-forming strains produced 12 mg. of formic acid /g. of glucoside as compared with 1.6 mg. for the non-gas-formers.

D. P. Glick

**595. The Action of Phenol-Bile Media on the Genera Escherichia and Aerobacter.** C. F. POE AND RUBY J. O'KELLY, Univ. of Colorado, Boulder. *J. Bact.*, **57**, 3: 385-386. Mar., 1949.

Solid media containing bile and phenol did not serve to differentiate between *Escherichia* and *Aerobacter* species. However, these cultures were not inhibited by media containing as much as 11% bile and 0.1% phenol, whereas sporeforming lactose-positive aerobes were inhibited by 5% bile and 0.05% phenol. Several anaerobes grew well in media containing 15% bile and 0.2% phenol.

D. P. Glick

## DAIRY CHEMISTRY

H. H. SOMMER, SECTION EDITOR

**596. Oxidized Flavor in Milk and Cream.** T. L. FOSTER, Univ. of Manitoba, Winnipeg. *Milk Plant Monthly*, **38**, 5: 28-29, 37. May, 1949.

The relation of Cu contamination, ascorbic acid, dissolved oxygen, bacterial growth, homogenization and pasteurization temperature to oxidized flavor are discussed. A discussion of the value of certain antioxidants in retarding this off-flavor is also included.

J. A. Meiser, Jr.

**597. Method of Forming Protein Compositions.** J. R. CALHOUN AND T. M. BUZZO (assignors to The Borden Co.). U. S. Patent 2,469,546. 12 claims. May 10, 1949. Official Gaz. U. S. Pat. Office, **622**, 2: 463. 1949.

Casein, free from air bubbles, is prepared by applying about 25 in. of vacuum for 30 min. to a casein suspension in water, then adding caustic soda and gradually heating to 170° F. to dissolve the casein.

R. Whitaker

## DAIRY ENGINEERING

A. W. FARRELL, SECTION EDITOR

**598. Mechanical Can Washing.** C. B. SHOGREN, Klenszade Products, Inc., Beloit, Wis. *Milk Dealer* **38**, 7: 76-78. Apr., 1949.

A method is outlined for using acid to remove lime deposits from straightline can washers. The alternate use of acid and alkaline detergents is recommended for best can washing results. A few simple rules are given which should be observed in operating any type of straightline can washer.

C. J. Babcock

**599. Spray Drier Apparatus.** J. M. HALL (assignor to Drying and Concentrating Co.). U. S. Patent 2,469,553. 8 claims. May 10, 1949. Official Gaz. U. S. Pat. Office, **622**, 2: 464. 1949.

A cone shaped spray drier, suitable for dehydrating milk and other products, is so shaped and arranged that heated air fed in the top spirals downward to fan blades which reverse the air flow, causing it to flow upward in the center, where it is discharged and may be collected, reheated and again circulated. The liquid product is atomized by a centrifugal wheel and the dried product removed from the bottom of the cone. The air is heated in the upper portion of the chamber.

R. Whitaker

**600. Scraper for Freezing Apparatus.** C. ERICKSON AND E. SPELLMAN. U. S. Patent 2,470,691. 8 claims. May 17, 1949. Official Gaz. U. S. Pat. Office, **622**, 3: 900. 1949.

A scraper assembly for an ice cream freezer which provides for two easily detachable blades pivoted on a rotating member attached to a central shaft is described.

R. Whitaker



**601. The Use of Ultrasonic Energy in Agriculture.** L. E. CAMPBELL AND L. G. SCHOENLEBER, USDA, Beltsville, Md. *Agr. Eng.* **30**, 5: 239-41. May, 1949.

Ultrasonics refers to sound radiations above the normal audible limit and is differentiated from "supersonics" which denotes velocities greater than the speed of sound in air. Ultrasonics range in frequencies from 20,000 cycles to about 10,000 megacycles/sec. Ultrasonic waves are generated by siren-type generators, magnetostriction generators and the piezoelectric generator.

Preliminary investigations have been made to determine possible practical applications to agriculture. Some of these were concerned with stimulation of seeds and tubers, killing of the codling moth, bactericidal treatments, production of emulsions and suspensions and the homogenization of milk. The latter is among nine fields suggested for immediate investigation.

H. L. Mitten, Jr.

**602. Practical ammonia refrigeration.** C. H. MINSTER, Greenbrier Dairy Prod. Co., Beckley, W. Va. *Ice Cream Rev.*, **32**, 10: 46, 48, 52, 54. May, 1949.

The advantages and disadvantages of direct expansion, brine and sweet water refrigeration systems are discussed. It was calculated that a 7×7 in. compressor would be required to cool 1,000 gal. of milk from 85 to 38° F./hr. using direct expansion, whereas a 5×5 in. compressor could handle this same load if sweet water with an ice bank was used. A method is suggested for calculating the size of ice system necessary for use with sweet water. Hold-over ice bank systems may be purchased commercially, or the unit may be constructed. If they are to be constructed, certain points which should be observed if the system is to operate efficiently are discussed.

W. J. Caulfield

**603. Basic Principles of Piping (a Review of Fundamentals).** H. VETTER, Consulting Eng., Los Angeles, Calif. *Heating, Piping Air Conditioning*, **21**, 5: 87-90. May, 1949.

This article concerns refrigerant piping, which can be divided into liquid line between condenser and evaporator, low pressure vapor piping between evaporator and compressor, and the high pressure vapor piping between compressor and condenser.

Efficiency of a compressor is affected by pressure drop between evaporator and compressor and between the compressor and condenser. Vapor has its highest density at saturation and

should enter the compressor near saturation. Pressure drop represents power loss due to friction and friction causes superheat. The larger the pipe line to the compressor the less the friction and the higher the compressor efficiency.

Condenser types discussed are atmospheric, double pipe, horizontal shell and tube, vertical shell and tube, and evaporative. Evaporators are discussed briefly.

Low pressure vapor piping is the most important section in the system. Liquid refrigerant carried out of the evaporator in wet vapor is a definite loss. Low pressure vapor piping should slope back to the evaporator to return as much as possible of the liquid carried over during sudden load variations. If adequate vaporizing space has not been provided in the evaporator, a separator should be installed.

High pressure vapor lines carry superheated vapor and may, therefore, be level. When they run through low temperature air, they should slope toward the condenser. All vapor piping, high or low pressure, should be arranged to avoid traps where oil or liquid refrigerant can collect.

H. L. Mitten, Jr.

**604. Fuels and Firing. Part 2.** P. SWAIN, L. ROWLEY, J. McCABE AND B. SKROTZKI, McGraw Hill Pub. Co., N. Y. *Operating Engineer*, **2**, 5: 19-34. May, 1949.

This article describes firing equipment used with small and medium boilers. It is well illustrated to show the operation of such devices as atmospheric gas burners, low pressure gas burners, air and steam atomizers for oil, rotary cup gas-and-oil burners, overfeed stokers for coal, and many others.

Gas comes ready to burn if properly mixed with air. Yellow flames indicate "cracking" which means that the hydrogen portion of the gas is burned first and the carbon is freed. Increase of primary air will cause an increase in gas combustion with a shorter flame free from yellow color.

Oil burners must prepare the fuel for burning since a liquid burns only as a gas. The oil burner may vaporize the fuel oil or atomize it. Vaporizing burners are limited in the range of fuel they can handle. Atomizing burners break the oil into a fine mist by using steam or air under pressure, by forcing oil under pressure through a nozzle, or by use of centrifugal force. Oil burner design must be such that oil is fired in a fine mist and that yellow flames do not impinge on water-cooled surfaces.

Coal stokers, grates, spreaders and furnaces are discussed in detail.

H. L. Mitten, Jr.

**605. How to Service Package Boilers.** K. STEINER, C. Hoffberger Co., Baltimore, Md. Heating, Piping Air Conditioning, **21**, 5: 83-86. May, 1949.

Package boilers combine boiler, burner and mechanical draft system into a single piece of equipment. They are made for the automatic burning of gas or oil. They require a minimum of headroom and need only a smooth concrete slab for a foundation. Package boilers are rated according to their greatest possible output and have little or no reserve as do conventional boilers. Because of this they must be selected on the basis of a generously estimated load, pickup and radiation loss, and future expansion needs.

Since burners generally are connected at the factory, field installations require only connection of fuel lines, water make up lines, condensate feed lines, steam line, blow-down pipe and electrical lines. After the boiler is installed and ready to start, it should be checked and tested before being placed into service. Checks should include ignition and flames and stack temperature. Normal loads may run exit gases between 500 and 600°. Heavy loads may cause the temperature to be above 600°. Temperatures higher than normal for a given load condition indicate the flame is too long, or the tubes are sooted or the baffles between the passes are leaking. Procedure for adjustment of fire varies with the type of unit and burner. Other maintenance items to be observed are treatment of feed water, periodic internal inspection, cleaning of oil heaters and the checking of all safety controls.

H. L. Mitten, Jr.

**606. Know Feedwater-Treating Costs Before You Buy.** V. J. CALISE, Liquid Conditioning Corp., Linden, N. J. Power, **96**, 6: 100-4. June, 1949.

Items which make up the yearly cost of operating feedwater-conditioning equipment are initial investment for equipment and erection (usually amortized over a 5 to 15 yr. period), cost of chemicals required, cost of labor for operating the treatment plant, maintenance costs, and cost of fuel for unrecovered heat in waste blowoff or cooling water. After fuel cost, cost of chemicals is highest. Chemical cost can be reduced by application of chemical and mechanical skill.

The treating process and equipment selected must produce an effluent feedwater that will eliminate the common problems caused by the presence of dissolved mineral impurities, problems such as scale formation, corrosion of boiler drum and tubes, silica deposits, corrosion of condensate return lines, carry-over of solids into stream and

embrittlement of boiler drum and tubes.

The methods for treating raw make-up water are discussed. Zeolite and hot-process softening are reviewed. Chemical equations are given for the common reactions in water treating. Tables presented compare chemicals as related to effect on hardness, impurities after treatment, analysis of effluents and cost of chemicals.

H. L. Mitten, Jr.

**607. A Dynamometer for Determining Depth of Freezing in Foods.** H. TESSIER, Natl. Research Lab., Ottawa, Can. Can. J. Research, **27F**, 2: 47-48. Feb., 1949.

A hand operated dynamometer, designed to determine depth of freezing in frozen foods, such as meat, poultry and eggs, measures the force required to drive a pointed rod through a sample of the product. Readings are indicated on a pressure gauge and may vary from 0 to 160 lb.

O. R. Irvine

## DAIRY PLANT MANAGEMENT AND ECONOMICS

L. C. THOMSEN, SECTION EDITOR

**608. Balance Your Business As Well As Your Books.** F. MERISH. Milk Plant Monthly, **38**, 6: 50-53. June, 1949.

Although the balancing of books is an essential item to any plant owner, the results should not indicate a mathematical balance where debits equal credits but should indicate certain fundamental business ratios. These ratios are (a) current assets to current liabilities, (b) liabilities to net worth, (c) net worth to fixed assets, (d) net sales to net worth, (e) net profit to net worth, (f) fixed assets to current assets, (g) net profit to total assets, (h) net sales to receivables, (i) net profit, to sales and (j) cash and receivables to current liabilities. Since ratios are the best yardsticks for measuring managerial efficiency, their use will show whether one is maintaining the proper balance between the operating and financial elements in business.

J. A. Meiser, Jr.

**609. Are Your Depreciation Reserves in the Safety Zone?** A. C. KIECHLIN, Public Accountant. Ice Cream Rev., **32**, 10: 108, 110, 112, 114, 116. May, 1949.

Due to increased construction and equipment costs, depreciation reserves are apt to be inadequate to cover replacement costs when needed. Plants are urged to take immediate steps to correct inadequate depreciation reserves by setting up a special account under the name "Reserve

for increased cost of replacement". Such an account will cushion the increased replacement or construction costs when encountered.

In purchasing new equipment, depreciation rates should be set carefully and watched to determine whether any adjustments are necessary. Increased deductions on income tax returns may be allowable if they can be justified. A complete set of records on each unit or group of similar units of equipment should be kept as an intelligent means of setting up depreciation rates and in justifying changes in the rate of depreciation if necessary.

The straight line method of computing depreciation is recommended as the simplest to compute and the one preferred by the Treasury Department for income tax purposes. In this method, the estimated salvage value of the equipment is deducted from its original cost and the difference written off at a uniform rate each year during the estimated useful life of the equipment.

Increased charges for depreciation or construction necessitated under present economic conditions should be considered as a part of the production cost. This added cost, therefore, should be reflected in the selling price of the product so that all customers will pay their share of this expense. Too many plants are now absorbing this cost without knowing it because of inadequate depreciation reserves. W. J. Caulfield

**610. Delivery Cost Control.** A. E. FRIEDGEN, A. E. Friedgen, Inc., New York City. *Milk Dealer*, **38**, 7: 42-43. Apr., 1949.

Efficient maintenance and effective cost control can be attained only by the use of detailed cost reports for each individual truck. The average "cost per mile" for fleet is a poor yardstick of route-truck efficiency. A chart is presented which shows the operating cost per mile of 28 fleets varying in size from 11 to 131 trucks. The average cost ranges from about 14 cents for a fleet of 35 trucks to 3.9/mile for a fleet of 23 trucks. The 35 trucks averaged 27 miles/d., with an individual route mileage varying from 23 to 60 miles. The 23 trucks average 84 miles/d. with an individual route mileage varying from 12 to 130 miles. These mileage variations also mean a variation in the cost/mile for the individual trucks in the fleet. Therefore, the cost/mile for the entire fleet is practically useless as a means of securing lower cost and efficiency for individual trucks. C. J. Babcock

**611. Two Studies of Milk Distribution Costs and Profits in the New York Market.** L. SPEN-

GER, Cornell University. *Milk Dealer* **38**, 7: 50, 132-142. Apr., 1949.

*An Economic Study of the Operations of Six Leading Milk Companies in the New York-New Jersey Metropolitan Area, 1941-48*, directed by the author is compared with *An Analysis of the Spread Between Farm and Consumer Milk Prices in New York City Under Present Practices, 1948*. The latter analysis was sponsored by the State Temporary Comm. of Agr. and directed by Dr. C. E. Young, Dean of the Graduate School of Purdue Univ. Findings of the two studies as to unit costs for various products are not directly comparable because of the difference in time and the marked changes in prices, wages and other cost factors between 1944 and 1948. The two reports are, however, in complete agreement that significant reductions in the spread between the prices paid by consumers and the prices received by farmers can be achieved only by reducing the cost of marketing services. C. J. Babcock

**612. Work Simplification in the Ice Cream Plant.** R. A. BAER, Bowman Dairy Co., Chicago, Ill. *Ice Cream Rev.*, **32**, 10: 122, 124, 126, 128. May, 1949.

Work simplification has for its objective the production of a better product at a lower cost. At the same time, such a program should increase the satisfaction of the workers in the jobs they are doing. It is designed to eliminate waste steps or operations which contribute nothing to the accomplishment of the job.

The five basic steps involved in work simplification are: (a) Select the job to be improved. (b) Prepare a flow process chart. This involves breaking the job down into its component parts and making an exact record of every detail of the job under study in the order in which each occurs. (c) Analyze and question each step in the operation to determine whether it contributes anything to the accomplishment of the job. Each non-essential operation should be eliminated. (d) Develop a better method. Once the non-essential operations have been eliminated, then a new sequence of operations must be developed so that each will contribute directly to the accomplishment of the job. (e) The final step is to apply the new method which has been developed. This involves the human element and necessitates securing the active cooperation and participation of those involved with the job.

The ideas of the employees throughout the organization are invaluable and should be obtained, otherwise a vast fund of ideas is being wasted. When employees are approached for suggestions and ideas and given suitable recogni-

tion for their contributions, their active participation in the program usually is assured.

Work simplification offers a means of gaining a competitive advantage by producing a better product at a lower cost. W. J. Caulfield

**613. Building Business With Sales Contests.** F. MERISH. *Milk Plant Monthly*, 38, 5: 34, 36-37. May, 1949.

Factors to be considered in planning and conducting a successful sales contest are purpose, scoring, quotas, awards and dramatization of the contest. These items, coupled with a well worked out plan for maintaining interest, will do much in fostering any contest. J. A. Meiser, Jr.

**614. Baseball Contest Spurs Cottage Cheese Sales.** T. KNIGHT. *Milk Plant Monthly*, 38, 6: 63-64. June, 1949.

Routemen are divided into 2 teams and each man assigned a ball. For each carton of cottage cheese sold, each player receives 5 points. When a total of 400 points is scored by a routeman, he receives credit for a home run and the contest is renewed. At the end of 6 wk. the winning team is given an evening of free entertainment. To obtain new customers, a bonus of \$2.00 for each new customer over 3 during a 1 mo. period is given. This plan may be used year-round but must be tied up with the current popular sport. J. A. Meiser, Jr.

**615. A Cottage Cheese Drive.** H. FLAGG. *Milk Plant Monthly*, 38, 5: 76. May, 1949.

For every pound of cottage cheese sold, one cent is placed in a kitty which is split at the end of the contest, 75% going to the top routeman and 25% going to the runner-up. Although the contest provides little cash gain to the participants, it does produce enthusiasm for increasing sales. J. A. Meiser, Jr.

## FEEDS AND FEEDING

W. A. KING, SECTION EDITOR

**616. The Nutritive Value of Nitrogenous Compounds for Ruminants. I. The Nutritive Value of Urea as a Protein Supplement.** C. J. WATSON, J. W. KENNEDY, W. M. DAVIDSON, C. H. ROBINSON AND G. W. MUIR, Dept. of Agr., Ottawa, Can. *Sci. Agr.*, 29, 4: 173-184. Apr., 1949.

The value of urea as a source of protein for ruminants was investigated by means of feeding and slaughter trials with 30 head of beef calves

and 60 lambs over a 40 to 50 wk. trial feeding period.

In the case of the calves, those on the low-protein basal ration made small live weight gains, showed practically no deposition of protein or ash, but did show some increase in fat. Those receiving urea made relatively good gains in live weight and body nutrients. Those receiving the casein (positive control) made appreciably better gains in live weight, body protein and ash than those receiving the urea. The gains in body fat were of similar order for both urea and casein.

The gains in total weight of carcasses, and gains in weight of protein, ash and water were greater for those receiving casein than for those receiving urea.

The section of the experiment dealing with sheep, while confirming the above results, did not allow drawing conclusions regarding urea, since the sheep failed to consume much of the ration in excess of their maintenance requirement.

O. R. Irvine

**617. The Nutritive Value of Nitrogenous Compounds for Ruminants. II. The Formation of Body Nitrogen from Urea Labeled with the Isotope N<sup>15</sup>.** C. J. WATSON, W. M. DAVIDSON AND J. W. KENNEDY, Dept. Agr., Ottawa, Can. *Sci. Agr.*, 29, 4: 185-188. Apr., 1949.

To determine whether urea was actually metabolized by ruminants, sheep on a low protein basal ration were given gelatine capsules containing urea. In the case of one group, the urea nitrogen was 30% N<sup>15</sup>. After 4 d. feeding and the administration of 10 to 12 g. of urea the animals were killed and the blood, liver and kidney proteins separated from the non-protein nitrogen by trichloroacetic acid. Nitrogen gas recovered from the protein was analyzed for its N<sup>15</sup> isotope concentration by the Washington Bur. of Standards mass spectrometer. Results indicated that those proteins contained N<sup>15</sup> in excess of normal abundance and it is concluded that nitrogen urea is utilized by ruminants in the formation of body proteins. O. R. Irvine

**618. The Nutritive Value of Nitrogenous Compounds for Ruminants. III. Synthesis of Urea Containing N<sup>15</sup>.** L. C. LEITCH AND W. M. DAVIDSON, Natl. Research Lab., Ottawa, Can. *Sci. Agr.*, 29, 4: 189-190. Apr., 1949.

A description is given of the methods and equipment used in synthesizing urea from diphenyl carbonate and ammonium nitrate. The ammonium nitrate contained 32 atom per cent excess N<sup>15</sup> when purchased. O. R. Irvine

## HERD MANAGEMENT

H. A. HERMAN, SECTION EDITOR

**619. Seeing is Believing at a Mechanical Milker Clinic.** P. R. ELLSWORTH, Ohio State Univ., Columbus. *Milk Plant Monthly*, **38**, 6: 80-82. June, 1949.

Producers bring in their own milking machines for inspection, cleaning and replacement of worn parts. The machines are placed on a "wash line" and each owner follows his milker watching the cleaning and adjusting operations as they take place. This clinic aids fieldmen in the fight for clean milk from clean utensils, provides a thorough cleaning since cleaners, brushes and plenty of hot water is available, enables dairy specialists not representing commercial organizations to contact producers, replaces faulty parts and enables producers to talk over mutual problems. J. A. Meiser, Jr.

**620. Machine Milking Plant.** E. G. REDIN AND K. E. OLANDER (assignors to Aktiebolaget Manus). U. S. Patent 2,469,519. 6 claims. May 10, 1949. *Official Gaz. U. S. Pat. Office*, **622**, 2: 456. 1949.

Several carriages, each carrying a manifold, 4 teat cups and connecting hoses, travel along a rail over the cows in a milking barn. A permanent vacuum line and a sanitary milk line adjacent to the rail, provide suction for the operation of the milking unit and a means of removing the milk to a collecting tank. Attachments are provided at each stall for connecting the milker to the suction and milk lines. R. Whitaker

**621. Mechanical Milking Apparatus.** C. G. HOWSE. U. S. Patent 2,470,169. 9 claims. May 17, 1949. *Official Gaz. U. S. Pat. Office*, **622**, 3: 767. 1949.

Two rubber hoses, one for supplying vacuum and one for conducting the milk, are attached to this milking machine teat cup. The cup is operated by the pulsations of the vacuum produced in a spring-loaded valve arrangement adjacent to the cup. R. Whitaker

**622. Refrigerated Milker Pail.** T. J. PFETCHER. U. S. Patent 2,470,520. 4 claims. May 17, 1949. *Official Gaz. U. S. Pat. Office*, **622**, 3: 855. 1949.

This milk pail, suitable for collecting the milk delivered by a milking machine or by hand, consists of a funnel shaped insert leading to a tube which conducts the warm milk to the bottom of the pail, where it spreads out in a thin layer between a flange attached to the tube and the

bottom of the pail. The tube and pail bottom are both refrigerated by a circulating cooling medium. R. Whitaker

**623. Means for Milking Domestic Farm Animals and for Temporarily Storing Milk and Cooling It.** G. R. DUNCAN. U. S. Patent 2,470,979. 11 claims. May 24, 1949. *Official Gaz. U. S. Pat. Office*, **622**, 4: 1119. 1949.

A movable container, traveling on rails between 2 rows of cows standing back to back, carries milk cans which receive the milk directly from the milking machines. The milk in the cans is cooled and stored at low temperature by means of a mechanical refrigeration unit built in the can holding container. R. Whitaker

## ICE CREAM

C. D. DAHLE, SECTION EDITOR

**624. Emulsifiers are Useful.** W. E. SNYDER, Univ. of Wisconsin, Madison. *Milk Plant Monthly*, **38**, 6: 30-33, 43-44. June, 1949.

Importance, need and action of emulsifying agents in the manufacture of high quality ice cream are discussed. Formulae illustrating common emulsifiers such as lecithin, mono-glycerides, di-glycerides, tri-glycerides, Span 60 (sorbitan mono-stearate) and Tween 60 (polyoxyalkylene derivative of Span 60) are included. Over-all effectiveness of an emulsifier depends on its ability to (a) disperse itself in the water phase of the mix, (b) be absorbed on the surface of the fat globule, (c) lower interfacial tension between the fat and water phase of the mix, (d) absorb water, thus providing hydrophilic properties to the fat globule, and (e) cling to the fat globules during the routine processes of freezing, hardening and aging of ice cream. J. A. Meiser, Jr.

**625. Confection Product.** E. M. KENNEDY. U. S. Patent 2,464,515. 3 claims. Mar. 15, 1949. *Official Gaz. U. S. Pat. Office*, **620**, 3: 884. 1949.

Two frozen confections are held on the tines of a forked stick. R. Whitaker

Also see abs. no. 600, 612.

## MILK AND CREAM

P. H. TRACY, SECTION EDITOR

**626. Helpful Ideas for Your Plant.** T. KNIGHT. *Milk Plant Monthly*, **38**, 5: 80-81. May, 1949.

Simple inexpensive accessories that save a plant money are stainless steel trays for homogenizer valves, stainless steel guards for glass thermometers, automatic soap dispensers for lubricating bot-

the conveyor lines, and float controlled reservoirs for controlling the alkalinity of can washers.

J. A. Meiser, Jr.

**627. Quick Frozen Homogenized Milk.** F. L. CROWLEY (assignor to Crowley's Milk Co.). U. S. Patent 2,470,020. 1 claim. May 10, 1949. Official Gaz. U. S. Pat. Office, **622**, 2: 582. 1949.

Milk is prepared for storage in the frozen state by treating it as follows: clarification, homogenization, deaeration by a vacuum treatment, concentration at 120° F. under vacuum, pasteurization for 30 min. 165 to 185° F., packaging and sealing under vacuum at pasteurization temperature, cooling to 60° F. and then quick freezing at about -20° F. R. Whitaker

Also see abs. no. 596, 602, 611.

## MILK SECRETION

V. R. SMITH, SECTION EDITOR

**628. Thiouracil and mammary gland growth.** J. J. TRENTIN, V. HURST AND C. W. TURNER, Univ. of Missouri, Columbia. Proc. Soc. Exptl. Biol. Med., **67**, 4: 461. Apr., 1948.

Twenty-one young male albino rats were castrated and divided into three groups. Group 1 served as a control and about 10 d. later the rats in groups 2 and 3 were injected daily for 2 d. with 10  $\gamma$  of diethylstilbestrol in oil. Group 3 had 0.1% thiouracil added to its ration. The mammary glands of group 1 showed small- to medium-sized duct systems with little or no alveolar development. Group 2 showed an increased state of mammary development with alveolar development in most animals. The glands of group 3 showed a striking advancement of mammary development over group 1 and a marked improvement over group 2. There was good duct extension with extensive alveolar development. Fifteen intact male albino mice were placed into three groups. Group 1 served as a control, group 2 was maintained for 6 wk. on a grain ration containing 1.23 mg. of dimethyl ether of diethylstilbestrol/kg., and group 3 was maintained for 6 wk. on the same level of estrogen with 0.2% thiouracil added to the feed after the

first week. The mammary glands of group 2 showed good duct extension as compared with the controls. No difference in the response to estrogen could be detected in the estrogen- and thiouracil-treated mice. R. P. Reece

**629. Secretion in cow's milk of intravenously injected radioactive phosphorus P<sup>32</sup>.** M. KLEIBER, A. H. SMITH, AND N. P. RALSTON. Univ. of California, Davis. Proc. Soc. Exptl. Biol. Med., **69**, 2: 354-356. Nov., 1948.

Two lactating Jersey cows were injected intravenously with radioactive phosphorus P<sup>32</sup>, one with 15 millicuries and the other with 30 millicuries. The cows were milked just before injection; 1, 2, 6 and 12 hr. after injection; and thereafter twice daily. Maximum P<sup>32</sup> concentration in milk reached a peak 3 to 8 hr. after injection; this amounted to 1.21 and 1.24% of the injected dose/l. of milk. The average daily secretion of P<sup>32</sup> in milk, as percentage of injected dose, for the first 6 d. after injection was 7.4, 4.9, 2.8, 2.1, 1.6 and 1.4%, respectively. In 7 d. the two cows secreted in their milk 20 and 23% of the injected P<sup>32</sup>, respectively. Casein with a radioactivity of 2 microcuries/g. was prepared from milk collected during 3 d. after injection of 40 millicuries of P<sup>32</sup> per cow. R. P. Reece.

## SANITATION AND CLEANING

K. G. WECKEL, SECTION EDITOR

**630. New Developments in Synthetic Detergents.** O. M. MORGAN, Allied Chem. & Dye Corp., Buffalo, N. Y. Milk Plant Monthly, **38**, 5: 52-54. May, 1949.

A very brief review of the classification and application of synthetic detergents.

J. A. Meiser, Jr.

**631. Dairy Plant Housekeeping.** I. E. PARKIN, Penn. State College, State College. Milk Plant Monthly, **38**, 5: 69-71. May, 1949.

A discussion of good housekeeping and responsibility for it.

J. A. Meiser, Jr.

Also see abs. no. 598, 619.

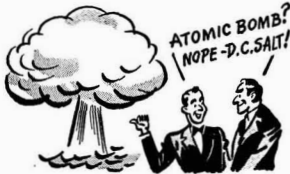


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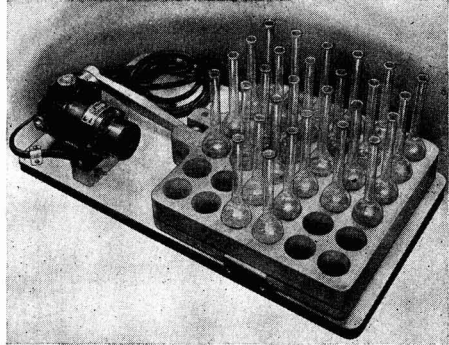
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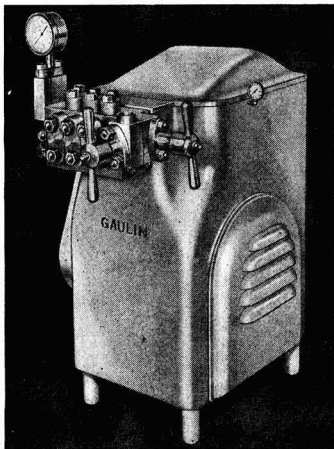
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