**Historical review of Florida's contribution to dairying.** R. B. Becker, Florida Agricultural Experiment Station, Gainesville.

Seminole Chief Cowkeeper supplied milk to William Bartram in 1791 from descendants of cattle brought by Columbus to the New World.

Florida's second contribution was air conditioning and artificial ice used by John Gorrie, M.D. for malaria and yellow fever patients.

Florida's contribution to the role of trace mineral elements in animal nutrition began with W. E. French, V.S., in 1901. He used iron sulfate to treat salt-sick cattle diagnosed anemic. Later, work included the role of copper, cobalt, and control of excess molybdenum.

Cooperating with the citrus industry, station workers pioneered experiments with citrus pulp and molasses for livestock feeds, and a method for processing pulp. The production in 1960 exceeded 320,000 tons of pulp and 33,000 tons of molasses.

Dr. H. N. Parker wrote the first college textbook for market milk—City Milk Supply, and in 1910 the Jacksonville milk ordinance. Florida helped develop procedures for deflourinating phosphates to provide safe livestock supplements.

Commercial use of urea in dairy rations came from joint work by Florida, Michigan, New York, and Wisconsin Experiment Stations during World War II.

**Simplified Nussel's-type equation for describing some of the heat transfer characteristics of fluid dairy products.** M. L. Peeples and Joe Eastham, Texas Technological College, Lubbock.

The data of Peeples (Forced Convection Heat Transfer Characteristics of Fluid Dairy Products, A Doctoral Dissertation, The Ohio State University, 1960) were used in this study. Three skim milks of from 8.8 to 20% SNF, and five products of from 3.8 to 40% fat were investigated.

Peeples' equation for describing the forced convection heat transfer characteristics of water was modified empirically to apply to dairy products. His equation is:

\[
\frac{Nu}{Pr^{0.4}} = 0.11 \ Re^{0.896} \]

where \( a \) is the factor derived empirically for modifying the water equation so that it will describe the thermal characteristics of each product:

The \( a \) values for the following products were:

<table>
<thead>
<tr>
<th>Product</th>
<th>( a ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skimmilk, 8.8%</td>
<td>0.964</td>
</tr>
<tr>
<td>Reconstituted skimmilk, 12.5% SNF</td>
<td>0.943</td>
</tr>
<tr>
<td>Reconstituted skimmilk, 20% SNF</td>
<td>0.899</td>
</tr>
<tr>
<td>Fortified milk, 10% fat and 12% SNF</td>
<td>0.988</td>
</tr>
<tr>
<td>Regular milk, 3.8% fat and 8.7% SNF</td>
<td>0.961</td>
</tr>
<tr>
<td>Milk, 10% fat and 7.5% SNF</td>
<td>0.977</td>
</tr>
<tr>
<td>Cream, 25% fat and 6.7% SNF</td>
<td>0.996</td>
</tr>
<tr>
<td>Cream, 40% fat and 5.6% SNF</td>
<td>0.997</td>
</tr>
</tbody>
</table>

These values correspond closely, in most cases, with the ratios of pseudo-viscosity to absolute viscosity as determined by Betscher (Friction Characteristics of Fluid Milk Products, A Doctoral Dissertation, The Ohio State University, 1960).

**Uptake of Strontium\(^{88}\) and Calcium\(^{44}\) by Streptococcus lactis.** B. J. Demoit and H. C. Holt, Tennessee Agricultural Experiment Station, Knoxville.

The growth media used consisted of 200 ml of filtered tomato juice and 5 g each of tryptose, tryptone, and yeast extract made up to one liter with distilled water. The pH was adjusted to 6.8-6.9. Ten milliliters of the sterilized media was inoculated with 1% of a pure \( S. \text{ lactis} \) culture and approximately 0.2 ml of a solution containing 0.01 \( \mu \text{c} \) Sr\(^{88}\) and 0.04 \( \mu \text{c} \) Ca\(^{44}\). After incubation at 36°C for 16 hr the samples were centrifuged for 30 min at 2,500 rpm in an international centrifuge. The standard plate count of the supernatant was less than 1% of the original mixed sample.

The Sr\(^{88}\) and Ca\(^{44}\) content of the supernatant and precipitates were determined by differential counting of the oxalate precipitates, using 8 mg of calcium carrier per oxalate sample. The \( \text{Sr}^{88} \) cells for nine samples was \[
\frac{\text{Ca}^{44}}{\text{Sr}^{88}} \]

\[
1.24 \pm 0.22 \]; a ratio very close to that was found in earlier work on Cheddar cheese curd.
The filtrate from samples passed through a Selas filter showed a slightly greater uptake of $\text{Sr}^{2+}$ than $\text{Ca}^{2+}$ in the harvested cell fraction. The $\text{Sr}^{2+}$ filtrate
\[
\frac{\text{Sr}^{2+}}{\text{Ca}^{2+}} = 0.96 \pm 0.08.
\]

Test for predicting the shelf-life of Cottage cheese. R. L. McDonald, J. J. Willingham, and M. L. Peoples, Texas Technological College, Lubbock.

Thirty samples of commercial Cottage cheese were stored at 40 and 50 F until they became unsalable, as determined by organoleptic evaluation. The samples were scored on an every-other-day basis and the flavor evaluations were placed into categories on a six-grade system. Several microbial and chemical tests were run to determine the degree to which each test could be correlated with the shelf-life of the cheese. Yeast and mold counts were made along with such chemical tests as moisture, fat, and salt contents. None of these tests could be correlated with shelf-life. A general relationship existed between the initial psychrophilic plate count and the shelf-life of the cheese.

Two reduction tests were performed on the samples at two-day intervals until decomposition was evident. One of these tests employed the use of resazurin, naceconol, and buffered water. TTC was used as the indicator in the other test. The sample size was 10 g.

The resazurin test was more reliable for predicting shelf-life than was the TTC test in all samples. A reduction time of approximately 12 hr by the resazurin method on samples stored at 40 F indicated that the remaining shelf-life was only two days. Shelf-life increased two days for every 6-hr increase in reduction time. The tests performed on samples stored at 50 F were less reliable for use in predicting the keeping quality of the cheese.

Effect of preservatives on shelf life of Cottage cheese. R. Y. Cannon, Alabama Agricultural Experiment Station, Auburn.

The addition of sorbic acid, potassium sorbate, and sodium benzoate to creamed Cottage cheese at the level of 0.1% by weight resulted in significantly higher (P < .05) flavor scores after 3 and 4 wk of storage at 45 F when compared with an untreated control and Cottage cheese containing 0.1% sodium propionate. During the first 2 wk of storage, no differences in flavor score were noted and all samples were commercially acceptable. After 3 wk of storage, the samples with sorbic acid, potassium sorbate, and sodium benzoate added were commercially acceptable, but after 4 wk of storage all of the samples had deteriorated beyond the point of commercial acceptability.

No differences in standard plate counts or psychrophilic counts among the cheese samples were found.


A method was developed for extracting polypeptides from Cottage cheese. Twelve ounces of cheese were thoroughly mixed in a blender and a 5.0-g aliquot was added to 15.0 ml of distilled water in a 100-ml beaker. The pH was increased to 9.0 with 0.20 N NaOH. This mixture was dispersed in a 40.0-ml tissue grinder and transferred back into the beaker. The pH was adjusted to 4.5 with 0.20 N HCl. The contents were centrifuged at 3,000 rpm and filtered through Whatman No. 1 paper. The precipitate and filter were washed with dilute (pH 4.5) HCl. The filtrate which contains the soluble peptide nitrogen was finally diluted to 50.0 ml. Per cent recovery of di- and tripeptides ranged from 85.0 to 105.0%.

Total cheese nitrogen and total soluble peptide nitrogen were determined by a slight modification of the official micro-Kjeldahl procedure. The soluble nitrogen, extracted from Cottage cheese that varied in flavor quality from excellent to poor, contained 2 to 6% of the total nitrogen. Also, three to six polypeptides were separated from these solutions by paper chromatography.

Quality study of retail market cream. W. W. Overcast and J. D. Skean, Agricultural Experiment Station, University of Tennessee, Knoxville.

Fifty samples of market cream were purchased at retail outlets for microbial and keeping-quality evaluation. Samples were stored at 37 to 39 F and examined on the 1st, 4th, 7th, and 14th days. Total plate counts, psychrophilic plate counts, coliform counts, and yeast and mold counts were made at each examination. In addition, each sample was evaluated for flavor. On the day of purchase, 66% of the samples had a total plate count below 60,000 per gram. On the fourth day of storage only 32%, on the 7th day of storage 6%, and on the 14th day of storage none of the samples had counts below 60,000. A similar situation occurred with the psychrophiles; 56% on the first day, 22% on the fourth day, 4% on the seventh day, and none of the samples on the 14th day were below 60,000 per gram. Forty-eight per cent of the samples had a coliform count less than ten on the 1st day, 36% on the 4th day, 32% on the 7th day, and 34% on the 14th day. Approximately 70% of the samples had a yeast and mold count below ten per gram throughout the 14-day period. Ten per cent of the samples were considered spoiled from a flavor standpoint on the day of purchase and this increased to 96% by the 14th day.
Within-cow variability of milk constituents in samples taken at daily intervals. C. J. Wilcox and W. A. Krienke, University of Florida, Gainesville.

Data from 2,052 milk samples, taken from randomly selected Jersey, Guernsey, and Holstein cows during six consecutive days, were analyzed to obtain estimates of day-to-day variability. Repeatability estimates for fat content ranged from 0.46 to 0.62 for the three breeds studied. Estimates were considerably higher for other constituents and properties and for milk yield, with 18 estimates ranging from 0.75 to 0.95. Based on the coefficients of variation, pH was the least variable, followed by per cent SNF, per cent protein, per cent titratable acidity, per cent chloride, milk yield, and per cent fat. In most investigations involving these variables, little could be gained by taking samples more frequently than once a week. If particularly sensitive estimates are required, reductions in variances of means based on two samples, rather than a single sample, would be about 7 to 13% for per cent SNF, 19 to 27% for per cent fat, 8 to 20% for pH, 7 to 9% for per cent titratable acidity, 5 to 10% for per cent protein, 7 to 8% for per cent chloride, and 2 to 3% for milk yield. Although some advantage would be gained by a third sample for per cent fat, little would be gained with the remaining variables.

Milk solids-not-fat determined by evaporation and by computation from specific gravity. R. W. Henningson, Clemson College, Clemson, South Carolina.

Milk solids-not-fat were determined for 195 samples of milk, using the Mojonnier method (minus Babcock milk fat) and the Watson pattern lactometer (at 102 F) in conjunction with Whittier's equation. The averages were 8.67 (range, 6.33-9.65) and 8.64 (range, 6.36-9.97) % for the calculated and evaporation methods, respectively. Differences by the two methods for the same sample ranged from zero to 1.60% SNF.

An analysis of covariance yielded a correlation coefficient of 0.754 (r^2 = 0.569). The coefficient of nondetermination (-r^2) was calculated as 0.431. These results indicate that about 57% of the variation was due to differences between samples and about 43% due to lack of linear association between the two methods.

A ratio of 1.69 between the mean squares calculated for the two methods, significant at the 1% level, indicates a reduced range and lack of sensitivity for the calculated method, assuming that evaporation yields true results.

Chloride content of fortified skim milk. W. A. Krienke, Florida Agricultural Experiment Station, Gainesville.

Two lots of milk representing several cows each were selected on the basis of low and high chloride content. They were separated and a portion of the skim milk of each concentrated. Composition of the original skim milks were: high chloride, solids 9.04%, protein 3.12%, and chloride 0.18%; low chloride, solids 9.89, protein 3.45, and chloride 0.132%.

After increasing the solids content of each by 2.0%, using respective condensed skim milks, the chloride values for the fortified skim milks were: low chloride 0.15% and high chloride 0.22%. Two of five judges criticized the high chloride skim milk and its fortified product as salty, the latter objectionable.

It is suggested that the chloride content of fortified skim milk not exceed 0.18% (Sharp-Struble Method).

Physiological characteristics of some staphylococci isolated from aseptically drawn cows' milk. K. L. Smith, University of Florida, Gainesville.

Hemolytic staphylococci were isolated from 450 aseptically drawn quarter milk samples. Approximately 45% of the samples contained staphylococci which were hemolytic on bovine blood agar plates. None of the isolates produced indole, hydrolyzed starch, or consistently utilized ammonium phosphate as the sole source of nitrogen. All of the hemolytic organisms liberated ammonia from arginine, reduced nitrate, and were catalase-positive. Urease was produced by about one-third of the isolates. Two-thirds of the staphylococci liquefied gelatin and about 60% of them were coagulase-positive. Mannitol was fermented by 82% of the organisms and 91% grew in broth containing 10% sodium chloride. Yellow pigmented colonies were produced on gelatin plates by 58% of the isolates. The average leukocyte count per milliliter of milk was 990,000 for the milk samples containing hemolytic coagulase-positive staphylococci, as compared to 670,000 for the samples containing hemolytic coagulase-negative organisms.

Some nutritional characteristics of Pseudomonas fluorescens. C. Vanderzant and T. J. Ousley, Texas Agricultural Experiment Station, College Station.

All seven test cultures of P. fluorescens showed growth in a basal medium (0.02% MgSO_4, 0.1% KH_2PO_4, and 0.5% glucose) with NH_4H_2PO_4, NaNH_HPO_4, or (NH_4)_2 H_2PO_4 as the sole source of nitrogen. NH_4Cl, NH_4NO_3, and (NH_4)_2 SO_4 supported growth of the majority of the cultures. Complex organic nitrogen substrates were readily utilized by all test cultures. Aspartic acid, isoleucine, isocitric, lysine, proline, serine, or tyrosine could serve as the sole source of nitrogen and carbon for all test cultures. With NH_4H_2PO_4 as a source of N, glucose, mannose, maltose, trehalose, starch glycero1, citric, malic, pyruvic, caprylic, or capric acid supported growth of all cultures.
1-Nonanol, 1-decanol, and 1-hendecanol were satisfactory carbon sources.

Consumer preferences for ice cream with different amounts of vanilla flavor. E. J. Finnegan and J. J. Sheuring, University of Georgia, Athens.

To determine the reaction of consumers to varying vanilla flavor levels in ice cream, a household panel was conducted during April, 1961. Five ice creams which had vanilla flavor (50-50 Mexican-Bourbon extract) of 2.0, 2.5, 3.0, 3.5, and 4.0 oz. were tested. The ice creams were dispensed as they would have been in supermarkets. Panel members were asked to return questionnaires indicating a preference for paired samples.

Resulting preferences, excluding no-preference responses, were analyzed statistically, using the method of rank analysis of incomplete block designs. Unequal repetitions on pairs indicated that the consumers had no preference for the five vanilla levels studied.

Combined effects of agitation and temperature treatments on the lipolytic activity in milk. P. E. Johnson and R. L. von Gunten, Oklahoma Agricultural Experiment Station, Stillwater.

Samples of milk were collected from Holstein cows and subjected to various combinations of agitation and temperature treatments. The warm milk samples were agitated with a centrifugal milk pump, from 0 to 40 sec, immediately after they were drawn. The samples were then divided into four portions. The first two portions were cooled immediately to 32 F and 42 F, respectively; the third and fourth portions were cooled to 32 F and 42 F, respectively, after a delay of 30 min. All samples were stored at the respective temperatures for 48 hr.

Fat acid degree values were obtained at the end of the storage period. The least change in the fat acid degree value occurred in the unagitated samples stored at 32 F after cooling was delayed. The greatest change in the fat acid degree value occurred in the samples agitated for 40 sec and cooled immediately to 32 F. Storage at 42 F was more effective in retarding lipolytic activity than storage at 32 F, and delayed cooling was more effective in retarding lipolytic activity than immediate cooling. A combination of delayed cooling and storage at 42 F was very effective in retarding lipolytic activity in agitated samples.

Performance of dairy cows fed sart sorghum silage cut in vegetative and dough stages of maturity. G. E. Hawkins, L. A. Smith, H. W. Grimes, and J. A. Little, Alabama Agricultural Experiment Station, Auburn. Effects of stage of maturity on composition, digestibility, and D.M. intakes of sart sorghum silage and on F.C.M. production of cows fed this forage were evaluated.

Two crops were cut at (a) vegetative, and (b) dough stages of maturity. On D.M. basis, the silages averaged (a) 9.7%, and (b) 6.9% C.P.; and (a) 8.3%, and (b) 10.2% lignin. Mean digestibility of D.M. was (a) 54.7%, and (b) 51.1%. Apparent digestible protein was (a) 2.6%, and (b) 0.5%.

Thirty cows producing an average of 33.3 lb F.C.M. daily were used. Rations consisted of silages (a) or (b) plus Johnsongrass hay. A control group was fed Johnsengrass hay ad lib. All cows received 1 lb of concentrates daily per pound F.C.M. Among forage rations concentrations containing three levels of protein were fed. Intakes of silage D.M. per 100 lb body weight were: (a) 0.62 lb, and (b) 0.58 lb daily. Mean daily F.C.M. in pounds by rations was: (a) 31.2; and control 32.1, and L.S.D., P = 0.05 was 1.5. Production of F.C.M. in pounds associated with concentrate protein levels was: (1) 16.0% C.P., 30.3; (2) 18.0% C.P., 31.4; and (3) 18.0% C.P. + C.S.M., 32.7. The L.S.D., P = 0.05 was 1.5 lb.


Corn and Sart and Hegari sorghums yielded 18.7, 21.0, and 17.3 T/A, respectively, and were ensiled for later feeding trials. Silages were fed to lactating or growing Jerseys in Latin-square reversal trials. In one, silages were fed ad libitum—corn supplemented with 18 or 22% C.P. concentrate and Sart supplemented with 18 or 27% (increased by urea). Cows consumed 67.7 lb as-fed and 14.0 lb D.M. daily from corn silage compared to 5.45 lb as-fed and 11.6 lb D.M. from Sart. Cows produced 24.4 lb F.C.M. on corn compared with 21.5 lb on Sart. More FCM (1.8 lb) was produced when corn was supplemented with 22%. Twelve 600-lb heifers also ate significantly more corn than Sart silage (47.4, 38.8 lb) and made greater gains (1.48 and 0.86 lb). No protein effect was evident. In another trial, corn, Sart, and Hegari were supplemented with 18, 27, and 27% C.P. concentrate, respectively (increased by CSM to basal). Cows consumed 67.7 lb as-fed and 14.0 lb D.M. daily from corn silage compared to 5.45 lb as-fed and 11.6 lb D.M. from Sart. Cows produced 24.4 lb F.C.M. on corn compared with 21.5 lb on Sart. More FCM (1.8 lb) was produced when corn was supplemented with 22%. Twelve 600-lb heifers also ate significantly more corn than Sart silage and Hegari compared favorably with corn.

Value of feed additives in storing and feeding grass silage. Lee R. Sisk and M. E. McCulloch, Georgia Experiment Station, Experiment.

The influence of type and rate of use of feed additives in storing and feeding direct-cut grass silage was studied in 27 silos of silage between 1956 and 1960. The additives studied were citrus pulp, ground snap corn,
molasses, and distillers grains. The forages used were oats, wheat, millet, Sudan grass, and alfalfa. Seven silages served as controls without additive, eight silages received 100 lb of additive per ton, and 12 silages received 200 lb per ton. All materials were weighed into and out of the silos and the silages were fed free-choice to producing dairy cows. The mean loss of dry matter in the silos was 21% for the control, 16% for 100 lb additive, and 13% with the 200 lb additive. The respective dry matter intake per 1,000 lb body weight and average daily 4% milk productions were: control, 20.5 and 29.7; 100 lb additive, 23.7 and 33.6; 200 lb additive, 25.4 and 33.9. The use of 100 lb of additive reduced dry matter losses by 5%, increased dry matter intake by 3.2 lb per day, and increased milk production by 3.9 lb per day. The relative effectiveness varied with crops. When the combined effects of 100 lb of additive are considered, on the average, the break-even point for 100 lb of additive would be at a cost per ton of additive of $32, when milk sells for $3.00/100; $53 when milk sells for $5.00/100; and $70 when milk sells for $6.66/100.

**Ad libitum consumption of ground corn or corn silage by lactating dairy cows on pasture.** J. T. HUBER, R. W. ENGEL, AND G. C. GRAF, Virginia Agricultural Experiment Station, Blacksburg.

Two groups of lactating Holstein cows (five and six per group) on permanent-bluegrass pasture were allowed all the corn silage (31.1% dry matter) or ground, shelled corn they would eat for 2 hr before each milking, for 40 days. Rations for the groups were switched for a similar period. Consumption data are presented for the four ten-day subperiods. Milk production and composition are based on the last 30 days of each period.

Daily dry matter intakes of corn silage for the consecutive subperiods were 8.5, 12.2, 15.3, and 16.1 lb; whereas, those for ground corn were 18.7, 22.6, 22.4, and 22.7 lb. Daily milk yields were higher for cows on ground corn (38.9 lb) than corn silage (35.8 lb), whereas no difference in FCM was observed. Fat content of milk was significantly higher for cows consuming silage (3.58% vs. 3.05%), whereas SNF were significantly higher for cows on corn (8.66 vs. 8.44%). Milk protein followed a trend similar to SNF. In a subsequent digestibility trial with eight of the cows, it was estimated that 20.1% of the corn kernels in the silage and 15.4% of the ground corn passed into and out of the feces.

**Palatability and digestibility of corn and grass silages fed alone and in combination to young dairy heifers.** J. T. HUBER, G. C. GRAF, AND R. W. ENGEL, Virginia Agricultural Experiment Station, Blacksburg.

Two groups of five-month-old Holstein heifers (four per group) were allowed free-choice consumption of either corn silage (30% dry matter) or orchardgrass silage (29% dry matter) as the sole source of nutrients for 28 days. Rations for the groups were switched for a similar period. During a third period both groups were offered both silages, simultaneously. Silages were fed twice daily, so as to produce small refusal. During the last ten days of each period animals were dosed twice daily with 10 g Cr₂O₃ and grab samples of feces were collected at 8 AM and 5 PM during the last seven days.

Dry matter intakes per 100 lb body weight for animals consuming corn silage, grass silage, and corn and grass silages were 1.76, 2.06, and 2.49 lb, respectively. On the combined ration more grass silage (1.42 lb) than corn silage (1.07 lb) was consumed. Daily gains on the respective rations averaged 0.64, 0.38, and 1.34 lb. Estimated per cent TDN and pounds of TDN consumed per day for the corn, grass, and combined rations were: 58.5, 3.39; 48.5, 3.22; and 52.2, 4.67, respectively.

At ten months of age the same heifers were fed only corn silage for 28 days. Intakes averaged 2.31 lb per 100 lb body weight whereas gains averaged 1.2 lb per day.

**Palatability for dairy animals of volatile fatty acids usually found in grass silage.** L. L. RUSOFF AND P. F. RANDEL, Department of Dairy Science, Louisiana Agricultural Experiment Station, Baton Rouge.

The literature reports that lactic and acetic acids are typically present in good-quality silage, whereas butyric, propionic, and higher fatty acids are typical of poor-quality silage. Palatability studies with these acids when added to dry hay singly, or in combinations usually found in good silages and poor silages, were conducted with dairy steers. Results on consumption of hay indicated butyric acid or combinations of acids containing butyric acid were slightly more palatable of the acids tested. The observation that poor-quality silage owes its unpalatability to its high butyric acid content is not supported in this study.

**Dry lot feeding vs. supplemental pasture for lactating cows.** W. R. MURLEY, North Carolina Agricultural Experiment Station, Raleigh, and J. R. EDWARDS, Mountain Research Station, Waynesville.

Twenty Jerseys and Guernsey cows were randomly assigned after a 14-day standardization period, to two treatments: pasture plus supplemental silage; and silage and hay fed in dry lot for a 105-day comparison period. All cows received a 16% concentrate at the ratio of 1:4 for 4% milk. Corn silage was fed to both groups at the beginning of the trial, after which oat silage was fed. Alfalfa...
hay was fed at the rate of 0.5 lb per 100 lb body weight and silage was fed ad libitum. Pastures during the period were better than usual because of adequate rainfall. The ten cows in the pasture group were rotated with 20 other herd cows in 13 different pasture paddocks during the experimental period, in an attempt to provide the best pasture available. These were mountain pastures varying from native bluegrass to Ladino-fescue, Ladino-orchard, and alfalfa pastures. The cows on pasture produced 31.83 lb per day of 4% milk as compared to 25.17 lb for the dry-lot fed cows. This was a decline of 4.14 and 8.76 lb from the average produced during the standardization period for the two groups, respectively. After adjusting for initial production, the differences were highly significant (P < 0.01). The dry-lot fed cows ate a daily average of 3.66 lb hay and 70.54 lb silage. Those cows on pasture consumed 14.96 lb silage daily.

**Comparison of irrigated Coastal Bermuda, Ladino clover, and a Coastal-Ladino mixture for summer grazing.** C. B. Browning, W. D. Craft, and W. C. Cowsert, Mississippi State University, State College.

Eighteen lactating cows in a three-treatment switchback design grazing trial with 28-day periods were used to compare the relative quality of the three treatments. The trial began May 27, 1961. Four paddocks of each clover treatment and three paddocks of the grass were used. The paddocks were two acres in size. The cows were rotated among the paddocks to insure ample forage at all times and were removed only for milking. Extra cows were used as needed according to the put-and-take system, to utilize extra forage. A 15.5% crude protein grain mixture was fed according to the milk produced during a standardization period. This quantity was decreased 1% each week.

Average daily 4% FCM production for the cows grazing Ladino clover was 44.5, for the mixture 42.7, and for Coastal Bermuda 37.3 lb. The mean persistency values on a 28-day basis were 107.8% for Ladino, 90.9% for the mixture, and 81.5% for Coastal Bermuda. The change in body weight was variable among animals and averaged +0.10 lb daily for the cows grazing Ladino, +1.05 for the mixture, and +0.62 for the Coastal Bermuda.

**Effect of the physical state of hay on rate of passage through the digestive tract of dairy heifers.** Glen D. O'Dell, W. A. King, and S. L. Moore, South Carolina Agricultural Experiment Station, Clemson.

Digestion trials at this station have shown a slight reduction in digestibility of dry matter and TDN content of Coastal Bermuda hay after grinding and a larger reduction after pelleting. A study was initiated to determine the rate of passage of a marked hay (dyed brilliant green) in the different compartments of the digestive tract of dairy heifers. Baled, ground, and pelleted hays were studied, 1/4-inch grind and 1/4-inch pellets used from same cutting. Unmarked hays were fed 14 days as the only ration and on the 15th day 4% of the daily dry matter intake was marked hay, with the heifers slaughtered 24 hr after feeding.

From marked hay recovered 95% of the baled, 86% of the ground, and 59% of the pelleted hays were calculated to be in the reticulo-rumen, which indicates that both baled and ground hay remained in the rumen for a considerably longer time. Dry matter content of the reticulo-rumen (baled hay at 100%) was 112% for ground hay and 45% for pelleted hay. These were mountain pastures varying from native bluegrass to Ladino-fescue, Ladino-orchard, and Coastal-Ladino mixture, and 81.5% for the Coastal Bermuda.

In vitro digestibility of certain plant fractions using the nylon bag technique. E. J. Stone, A. J. Guidry, and J. B. Frye, Jr., Louisiana Agricultural Experiment Station, Baton Rouge.

A 2 × 2 × 2 × 4 factorial experiment replicated six times was used to determine the relative digestibilities of dry matter, cellulose, and total available carbohydrates in vitro. Four rumen fistulated cows, two maintained on bloat-producing clover pasture and two on dry lot with alfalfa hay as the sole roughage, were the experimental host animals for nylon bags. One animal of each pair was given 1 lb of a control pelleted ration through the rumen fistula; the other animal was given 1 lb of the same control ration containing a bloat inhibitor, PETSI. Into each animal were placed four bags of freshly plucked clover and four bags of ground alfalfa hay. At periods of 1, 2, 4, and 24 hr samples of clover and alfalfa were removed from each cow for their respective analyses.

Results indicate no differences in dry matter digestibility attributable to dietary roughages, whereas the addition of antibiotic had a significant effect (P < .05). For cellulose, significance was obtained for dry matter (P < .05) and dietary roughage × dietary antibiotic × substrate (P < .05). Regressions for this three-factor interaction will be presented.

1 Supplied by Eli Lilly.

Sesame meal vs. soybean oil meal as a source of protein in calf starters. J. K. Miller, W. J. Miller, and C. M. Clifton, Dairy Department, University of Georgia, Athens.

Thirty-six calves were fed one of four starters in a 15-wk growth study. Starter No. 1 contained SOM, 30; citrus pulp, 40; corn, 28;
and mineral, vitamin, and antibiotic supplements, 3.7. Sesame meal, which has been shown to increase zinc requirements in poultry, replaced the SOM in Starter No. 2 on an equal protein basis. No. 3 and 4 were the same as 1 and 2, respectively, except 100 ppm of zinc was added. The calves were given a limited amount of milk replacer and 0.5 lb of Coastal Bermuda hay per day. They were housed in painted wooden pens bedded with shavings. Weight gains and starter consumption were as follows for calves fed the four starters, respectively: 1.63, 4.27; 1.57, 4.14; 1.58, 4.21; and 1.53, 4.08 lb per calf per day. Blood zinc values were 2.3, 2.0, 2.7, and 2.3 ppm. There were no significant differences among the treatments. Thus, the sesame meal was as satisfactory as soybean oil meal.

Effect of roughages on the calf's stomach development. S. P. Marshall and R. B. Becker, Florida Agricultural Experiment Station, Gainesville.

Male calves were fed milk for 60 days, supplemental concentrate through 110 days, and alfalfa hay through 30 days. During the 31-to-110-day period, three Jerseys and one Holstein were fed corn silage, another comparable group received fresh pasture forage, and the third group was continued on alfalfa hay. Data indicate that type of roughage consumed did not influence significantly the mass of any stomach compartment tissue at 110 days of age. Average weights of fresh rumen, reticulum, omasum, and abomasum tissues of calves fed corn silage were 1,384, 183, 387, and 337 g; for animals receiving fresh pasture forage, 1,437, 197, 314, and 338 g; and for calves fed alfalfa hay, 1,242, 187, 425, and 398 g, respectively.

Average weight of ingesta in reticulo-rumen cavity was 13,717, 9,499, and 12,458 g, respectively, for calves receiving silage, pasture forage, and hay. Average weight of ingesta was less (P < 0.01) for calves fed forage and greater (P < 0.06) for those receiving silage, as compared with that of calves on hay. Differences in average amounts of ingesta in omasum or abomasum were not significant.

Rumen papillae development was most advanced in calves fed fresh forage.

Improving milking machine maintenance and use. J. D. George and T. C. Blalock, North Carolina State College, Raleigh.

The milking machine is the most used and quite often the least understood piece of equipment on the dairy farm. It is also the most neglected. Most dairy farmers do not know enough about a milking machine to realize that it needs regular service. A portable milking system, adapted to transporting in an automobile, has been assembled. Using this portable system, milking machine clinics are being conducted in all dairy counties in North Carolina. In a given locality, clinics are conducted for professional workers (agents, fieldmen, etc.), followed by farmer-attended meetings. Points demonstrated are: (1) how a milking system operates, (2) what can go wrong, (3) how to check for proper operation, and (4) proper use. Primary objectives are to: (a) make dairymen realize that milking machines will get out of order, (b) encourage use of services of commercial servicemen, if available and, (c) if service is not readily available, motivate dairymen to request that service be made available by the companies. The portable system and related equipment used will be displayed. Response and results after 1 yr's experience are given.

Selection for production in a Holstein herd. R. E. Walton, University of Kentucky, Lexington, and Jay L. Lush, Iowa State University, Ames.

A study of 1,747 records of 685 cows in the Iowa State University Holstein herd revealed that selection pressures exerted during the 29-yr period (1930-58) would theoretically result in an average annual increase in genetic merit amounting to 0.6% of the herd average. Most of the progress was contributed by the selection of dams of sires.

Applications of a maximum likelihood technique gave estimates of genetic progress that appeared to be unreasonably large. However, the use of age-correction factors derived from these same data gave moderate increases in both genetic and environmental trends that agreed reasonably well with the genetic gain expected from the selection practiced.

Overcorrection of first lactations and inclusion of low terminal lactations were shown to introduce strong negative biases in computed environmental trends. These biases tended to cancel when computing selection intensities, but accumulated and caused large errors in the trends estimated by the maximum likelihood method. Using different repeatability values (r = 0.3, 0.4, and 0.5) had only a slight effect upon the maximum likelihood estimates of trends.

Effect of stilbestrol on the development and reproductive performance of dairy cattle. L. J. Bush and H. W. Reuber, Oklahoma Agricultural Experiment Station, Stillwater.

Ten pairs of Holstein heifers were used to determine the effect of feeding stilbestrol on certain physical characteristics and reproductive performance. Stilbestrol was fed to one member of each pair at the rate of 5, 10, and 15 mg per day, respectively, from four to six months, six to 12 months, and 12 months of age until calving. During the experiment, measurements were taken of teat length, width and length of udder, height of tailhead, distance from front of udder to pinbone, and weight. The stilbestrol caused a definite, but
transitory, increase in teat length and a more prolonged effect on the height of tailhead. There was little difference in the weight gains of the two groups of heifers. The stilbestrol-fed heifers showed considerably more sexual aggressiveness, as evidenced by attempts to mount other animals; however, there was no difference between the groups with respect to breeding efficiency.

Twenty lactating Holstein cows were used in a similar experiment, to determine the effect of stilbestrol feeding on reproductive performance. Although the effects of the stilbestrol were available, several of the cows receiving stilbestrol required a large number of services over an extended period of time before conception occurred.

**Effects of injecting testosterone into pregnant cows on the reproductive organs of their heifer calves.** Victor Hurst, South Carolina Agricultural Experiment Station, Clemson.

Pregnant cows were injected with 1 mg of testosterone per kilogram of body weight per week for 24 wk, beginning at either the 25th or 49th day of pregnancy. To date, five bull and seven heifer calves have been born to injected cows. Each heifer calf, except one, has been born with an abnormal vulva, and each heifer calf has been born with an enlarged clitoris. One heifer, which died at 2 wk of age, had a vagina, uterus, uterine horns, oviducts, and ovaries, all of which appeared normal. The first heifer to reach 12 months of age was placed with a group of breeding heifers for observation purposes. She has shown normal estrus periods and cycles.

Cows injected with testosterone began to show nymphomaniac tendencies after 5 to 6 wk of injections. Their clitori became enlarged. This condition did not appear to affect either lactation or the length of the gestation period. Calving difficulties were not encountered.

**Seasonal variation in fertility of the female bovine.** H. C. Kellgren, T. E. Patrick, J. O. Shelwick, and J. D. Roussel, Dairy Department, Louisiana State University, Baton Rouge.

Seasonal variation in breeding efficiency of cattle was studied, using frozen semen collected and processed during the spring months. Three collections from each of five mature bulls (two Jerseys, two Holsteins, and one Guernsey) were stored in liquid nitrogen for four months before being released. The frozen semen was maintained under liquid nitrogen refrigeration during transit to the field, where it was then transferred to the technician’s liquid nitrogen unit. Five technicians located in various geographical areas in the State of Louisiana received an aliquot of semen monthly from each bull for a 12-month period.

Laboratory stress tests were conducted on 15 samples used in the fertility trial. The ampules were thawed at 5 °C and incubated at 38 °C for 5 hr. Simple correlation between the stress test and fertility and the 60- to 90-day nonreturns to first service by seasons will be presented.

**Effects of feeding low rates of phenothiazine and diethylstilbestrol to young dairy heifers.** O. T. Fosgate and K. S. Hedde, University of Georgia, Athens.

A preliminary trial with eight Holstein heifers on a 72-day feeding trial showed that the addition of 1.5 g of phenothiazine and 10 mg of DES daily to a simple 16% concentrate mixture was beneficial from the standpoint of rate of gain (lb/day) and increased heart girth (cm).

A 2 × 2 factorial experiment with 16 Holstein and eight Jersey heifers was conducted to test the following rations: basal ration, basal ration plus 1.5 g phenothiazine and 10 mg DES, basal ration plus 1.5 g phenothiazine, and basal ration plus 10 mg DES. In the two trials, the heifers were fed a maximum of 5 lb of grain daily and Coastal Bermuda hay, ad libitum. Rates of gain of Holsteins on the four rations were 1.49, 1.95, 1.42, and 1.78 lb/day, respectively, as compared to 1.23, 1.05, 1.29, and 1.52 for the Jerseys, respectively. Differences in rates of gain for both breeds were highly significant (P < .01). Differences in heart girth measurements were not significant. Reductions in fecal egg counts due to the feeding of phenothiazine were highly significant (P < .01).

**Comparison of methods for determining thyroid function in dairy cattle in Louisiana.** A. J. Guidry, R. D. Thompson, and E. J. Stone, Louisiana Agricultural Experiment Station, Baton Rouge.

Various techniques for determining thyroid function have been used in Louisiana since 1957. Protein-bound iodine (P.B.I.) was employed as a quantitative measure of the thyroid hormone in the blood. Thyroxine secretion rate was determined by the injection of $^{131}$I, with subsequent checking of the thyroid for uptake and release. Exogenous thyroxine was then injected in increasing dosages until the release of thyroxine was blocked. This gave a direct thyroxine secretion rate. Another procedure involved the periodic quantitative evaluation of $^{131}$I activity in whole blood after the injection of tagged thyroxine. This gave an estimated utilization rate which was used in conjunction with P.B.I. to compute the estimated thyroid secretion rate.

There were four experiments in which the above procedures were used. P.B.I. determinations were run on all animals in each experiment. Direct monitoring of the thyroid for uptake and release of $^{131}$I was used in the first two of the four experiments. While
mature dairy bulls were used, with the split-gases and methods of application on post-thawing, laboratory stress tests, and fertility of frozen bovine spermatozoa. J. D. ROUSSEL, T. E. PATRICK, H. C. KELLGREN, AND J. O. SHELVICK, Dairy Department, Louisiana State University, Baton Rouge.

In the first trial, the effects of N₂ and A gases and methods of application on post-thawing motility (PT) and laboratory stress tests based on per cent motility (ST) were tested. Two semen samples from each of five mature dairy bulls were used, with the split-ejaculate technique being employed. Duncan's multiple range test revealed that flushing ampules with N₂ (NF) and control (C) were significantly different (P = < 0.05) from other methods as tested by (PT and ST).

Split-ejaculates from four mature dairy bulls involving five freezings from each were employed in the second phase. The effects of NF were tested on prefreezing motility (PF), PT, ST, and fertility. Prefreezing means were essentially the same for the C and NF (P = > 0.05). A significant difference (P = < 0.01) between treatments was obtained for the PT, with mean values of 45.5 and 41.7% for the NF and C, respectively.

Semen samples subjected to the ST were thawed at 5 C and incubated at 38 C for 3- and 5-hr periods. The ST mean values for 3 hr were 31.2% for NF and 24.2% for C. Differences between treatments and among bulls were significant (P = < 0.01). Significant differences (P = < 0.05) between treatments and among bulls were observed at 5 hr. A slight but significant (P = < 0.05) increase in lactic acid production was observed at PT and 5 hr ST in semen treated with N₂.

Simple correlations and fertility data will be published as soon as information is available.

Relationship of motility of frozen bull semen incubated at 38 C, compared to frozen semen exposed to cold shock and then incubated at 38 C. B. C. PASS AND V. HURST, South Carolina Agricultural Experiment Station, Clemson.

A random sample of 20 plastic ampules of frozen semen was selected from each of 18 freezes. The ampules were divided into two groups of ten each. The semen was then thawed and given a rating of estimated per cent progressive motility of sperm cells based on microscopic examination. One group was then incubated at 38 C in a constant temperature water bath and motility estimates were made each hour until no further motility was observed. The second group was immersed in an alcohol-dry-ice bath at -77 C ± 1 for a period of 10 min. The ampules were then rethawed and a progressive motility rating was made. The samples subsequently were incubated at 38 C and motility estimates made each hour until no further motility was observed.

Correlation coefficient values (r) were calculated between groups of semen incubated at 38 C and groups of semen subjected to cold shock and then incubated at 38 C as follows: 1, sum of the motility values for the entire survival time of each group (r = 0.573); and 2, mean motility multiplied by hours survival time for each group (r = 0.898). The correlation value was also calculated comparing the progressive motility at the time of initial thawing and thawing following cold shock (r = 0.854).


Twelve Holstein bulls were reared to a state of sexual activity, collected routinely with an artificial vagina at weekly intervals until all were producing quality semen, then collected for an additional three months at weekly intervals, using either the artificial vagina or an electroejaculator. They were then divided into three equal experimental groups at an average age of 22 months. Group I served as a control and was collected weekly by artificial vagina. Groups II and III were collected weekly by electroejaculation. In addition, bulls in Group III were tranquilized before electroejaculation with a Diphenyl-methane derivative, which was given intramuscularly. The experimental period was extended for 40 wk. No significant differences were found between groups with respect to: volume of semen per ejaculate; pH; number of live spermatozoa per milliliter; and number of spermatozoa per milliliter. A significant difference (P < 0.05) was found with respect to satisfactory livability at 5 C.

Effects of electroejaculation and tranquilization on other than semen characteristics. M. E. WELLS, S. D. MUSGRAVE, W. N. PHILPOT, W. E. BROCK, AND E. W. JONES, Oklahoma Agricultural Experiment Station, Stillwater.

Twenty-five bulls were used in attempting to determine a combination of electroejaculator and tranquilizing technique that, when used routinely over an extended period, would be conducive to good semen production and minimum extraneous effects. Evidence of extraneous reactions and regularity of success in collections varied with different operational procedures, both within and between machines.
Physical distress was partially relieved by slowing the procedure, blending current alterations, and positioning the rectal electrodes in two horizontal planes.

Later, this was limited to one rectal probe ejaculator and one Diphenylmethane derivative, given intramuscularly at constant level throughout the final experimental phase, without evidence of highly undesirable effects. There was no significant difference in hematocrit, red cell count hemoglobin, or urobilinogen before or after tranquilization. Moisture content of rectal feces at the time of semen collection was 4.3% less (P < 0.01) for the tranquilized as compared with the nontranquilized bulls. Defecation ceased for at least 12 hr following tranquilization, whereas urination frequency increased approximately five times. Heart rate ranged from 13 to 40 beats per minute lower, respiration rate ranged from five to 15 counts per minute lower, and rectal temperature was lowered about 1 F in tranquilized as compared to nontranquilized animals.

Relationship between certain laboratory measures and fertility of bull semen. J. W. KELLY and V. HURST, South Carolina Agricultural Experiment Station, Clemson.

A random clip of ten plastic ampules of frozen semen was taken from each of 30 freezes. Semen was thawed and rated for estimated per cent progressive motility of sperm cells by microscopic examination. The semen was then incubated at 38 C and motility determinations made each hour until no further motility could be observed.

Correlation determinations for the relationship between semen fertility and different measures of sperm longevity and vigor were calculated on freezes grouped in three ways. The first group included 19 freezes for which 60- to 90-day N.R. were based on 70 or more first services. The second group included 30 freezes for which 60- to 90-day N.R. were based on 40 or more first services. The third group was the same as the second, except that four heterogeneous values were removed.

No important correlations were observed on unadjusted data in Groups 1 and 2. In Group 3, however, three highly significant correlations (P < .01) were observed for the following relationships with fertility: 1, sum of motility values for entire survival time, \( r = 0.536 \); 2, mean motility value for survival time, \( r = 0.579 \); and 3, hours survived multiplied by mean motility value, \( r = 0.582 \).

Methylene blue reduction test for frozen semen. S. B. HAYS and V. HURST, South Carolina Agricultural Experiment Station, Clemson.

Various techniques were tested to determine a procedure for predicting the frozen semen quality of ampules of semen frozen for use in the field. As a result, the following procedure appears to offer possibilities:

1. Prepare a methylene blue solution by dissolving 50 mg of methylene blue in 100 ml of sodium citrate buffer.
2. Place eight 1-cc ampules of thawed semen containing 12-15 million live sperm cells per ampule into a centrifuge tube and centrifuge for 4 min (3,200 rpm).
3. Pipette off all buffer down to 0.75 ml.
4. Add 0.25 ml of methylene blue solution and thoroughly mix.
5. Seal tube with 1/2-inch layer of mineral oil.
6. Place in water bath at 45 C.
7. Observe time required for sample to lose its blue color.

The blue color will be lost within 3 to 6 min in good-quality semen. Semen that retains the color for 9 min or over has very few motile sperm.

Under standard conditions the test was found to be largely dependent upon the concentration of spermatozoa and motility.