Manufacture of Cottage cheese with a starter stimulant and hydrochloric acid. D. D. Vincent and T. J. Clayton, Kansas State University, Manhattan.

Preparations from milk cultures of Pseudomonas fluorescens, previously found to stimulate lactic starters, were evaluated in Cottage cheese manufacture. Coagulating properties of the stimulant frequently caused setting at too low acidities. To increase acidiity, HCl was added to cold milk as a 5% solution to adjust the pH to near 5.8 prior to processing. General procedures were those for the short-set method, using 5% starter. Six trials, each including one experimental and one control lot, were conducted on a pilot scale.

Differences in coagulating activity of the stimulatory agent caused some variations in results. Experimental cheese required a shorter manufacturing time than controls (avg 6.3 hr vs. 7.9 hr). Cutting acidities were reached earlier, and cooking and draining periods were shorter. In flavor preference of six judges, 19 judgments favored the controls, six the experimental lots, and 11 indicated no difference. In texture, 16 judgments favored the controls, five the experimental lots, and 15 indicated no difference. Data were obtained on moisture, curd firmness, cream retention, and yield. Further investigation is expected to lead to improved control of experimental cheese.

Heat inactivation of a Streptococcus lactis bacteriophage. D. F. Anderson and W. E. Snyder, Colorado State University, Fort Collins.

Utilizing plaque counts, it was found that lactic phage exhibited considerable survival after heating at 65°C for 90 min in sterile skim milk at pH 6.4. Four concentrations of hydrogen peroxide, alone and in combination with lactic acid or disodium EDTA, were tested for their effect on phage inactivation at 65°C. The rate of phage inactivation in skim milk containing peroxide (at all four concentrations) was increased slightly over inactivation in the control. Lowering the pH of the medium from 6.4 to 5.5 with lactic acid or EDTA increased the rate of inactivation approximately the same as peroxide. Peroxide in combination with lactic acid caused no further increase in the rate of inactivation over peroxide or lactic acid separately. Peroxide (0.10 or 0.14%) in combination with 0.01 M EDTA and a heat treatment of 65°C for 30 min decreased the number of surviving phage by a factor of 1,000, as compared to the control receiving the same heat treatment.

It appears that EDTA and hydrogen peroxide are complimentary in increasing the rate of phage inactivation by heat. The effect is apparently not one of greater peroxide stability at a low pH, because the inactivation rate does not increase when the pH is lowered with lactic acid.


The thermal resistance of Pseudomonas fragi was measured by determining $z$ values and the time required to reduce the original cell population by 99.99%. The experimental variables were the concentration of milk fat in the medium in which the cells were propagated and the concentration of milk fat in the medium in which the cells were heated. The three media used contained milk fat concentrations of 0, 10, and 20%.

When the cells were heated in the medium containing 20% milk fat, the $z$ values ranged from 20 to 22, whereas the $z$ values ranged from 11 to 14 when the cells were heated in the medium containing 0 and 10% milk fat. The concentration of milk fat in the medium in which the cells had been propagated did not seem to influence the magnitude of the resultant $z$ values. The cells grown in the medium containing 20% milk fat always required less time to reduce the original cell population by 99.99% at 48 and 50°C than did the cells grown in the medium containing 0% milk fat. The concentration of milk fat in the medium in which the cells were heated did not seem to influence the time required to obtain a given level of destruction.

Effect of nutrient intake upon the per cent fat, solids-not-fat, protein, and acid degree value of milk. E. F. Smith and J. C. Boyd, Montana State College, Bozeman.

Milk samples from cows on different levels of nutrient intakes, i.e., all-roughage vs. roughage plus grain were analyzed each month of lactation for fat, solids-not-fat, protein, acid degree value, and change in acid degree value due to mechanical abuse. Preliminary analysis of some 300 observations indicates possibly a significant difference in protein, acid degree value, and resistance of fat to mechanical abuse, with cattle on grain having a higher protein, a lower ADV, and a milk fat more resistant to mechanical abuse.

Comparison between milk composition of semimonthly composites and the mean compo-
Inaccuracies in the Babcock method for fat and the differences resulting between technicians make the gravimetric estimation of solids-not-fat in composite samples unsatisfactory:

(a) gravimetric total solids are subject to error even when determined in duplicate;
(b) the per cent fat, as determined by the Babcock method, declines in the composite sample, resulting in under-estimating the per cent fat and over-estimating the per cent solids-not-fat.

If the present inaccuracies in determining the per cent fat in composite milk samples are tolerable with respect to the degree of accuracy for the system of paying for producer milk, then several alternatives for determining milk composition are suggested:

(a) Tables developed from within per cent fat intervals for per cent solids-not-fat;
(b) A single per cent protein determination at random during a 2-wk interval will yield an estimate of the true value of per cent protein for the period about as well as a single per cent fat determination for fat, using a composite sample;
(c) it is recommended that a density rather than gravimetric method be used if per cent solids-not-fat is to be estimated on composite milk samples;
(d) or, it is suggested that per cent protein determination be run on one random sample each 2-wk interval, in conjunction with two density measurements and two tests for fat.


Colorado milk production cost was studied by analysis of reports obtained from 160 milk producers in seven Colorado milk market areas.

Individual milk producers and their management abilities were the key to a successful milk-producing operation. Management decisions regarding feeding, labor, cow selection, herd size adjustment, and investment in equipment and facilities each had a bearing on over-all efficiency.

High feeding level, to 178% of Morrison's standard, was associated with low cost by regression analysis. Labor cost was influenced to a great extent by operation size, with labor cost per hundredweight of milk for 16 cow herds almost three times that for 108 cow herds. Investment in facilities and equipment was important, because maximum return depended on a high degree of facility utilization. Total cost of producing milk decreased with increasing herd size to 69 cows, and remained essentially the same for herds over 70 cows. Variation in cost for different market areas was primarily attributable to differences in feed price.

Only 45% of the producers studied operated at a profit. There was a marked difference between individuals in their return for operator management, regardless of size or location, emphasizing the importance of operator management.

Estrogenic excretion by the cow during the first cycle after breeding. E. P. Smith and D. Vadehra, Montana State College, Bozeman.

Urinary estrogenic excretion values for cows obtained on the day of breeding, tenth and 19th days after breeding, were determined on 25 cows. While there were considerable individual differences, the main difference noticed between groups was a definite tendency for those cows that did not conceive to reveal a much higher level of urinary estrogenic excretion than did the cows that had conceived. The average total amount of estrogenic substances measured were 2,906, 2,680, and 2,941 mg on the day of breeding and on the tenth and 19th day after breeding, respectively. The cows that did not conceive excreted an average of 4,075, 4,778, and 3,825 mg of estrogenic compounds on comparable days.

Effect of estrogenic substances on milk yield during the first lactation. E. P. Smith, Montana State College, Bozeman.

Ten of the 21 heifers on this experiment have completed their first lactation and data were available for a preliminary analysis. The average amount of milk produced by Group I (control) heifers was 10,038 lb. The average amount of milk produced by the heifers of Group II (6 mg implants) and Group III (12 mg implants) was 10,707 and 9,972 lb, respectively. The differences between groups are small and are not significant. Growth measurements taken at monthly intervals up to 20 months of age would indicate that the estrogen treatment is detrimental upon growth. Average height of withers of the heifers of Groups I, II, and III was 131.2, 130.7, and 127.2 cm, respectively. These differences were significant (P < 0.05). A similar picture is shown with body weights at 20 months of age. Average weight of the heifers in Groups I, II, and III was 1,108, 1,080, and 1,066 lb, respectively.

Effects of ovariecction on parturition in cattle. K. R. Johnson, University of Idaho, Moscow.

Bilateral ovariectomy was performed on 12 dairy animals at 55-143 days of pregnancy. The animals were carried to term with exogenous progesterone. When the progesterone was withdrawn at 274-278 days, parturition occurred in two to six days. Eleven of the animals
had great difficulty in calving. The pelvis, cervix, vagina, and vulva were only four-fifths dilated. Labor was very weak and sporadic. A great deal of assistance was needed to deliver the calves. It appears that estrogen may be deficient in these animals at parturition.

Estrogen in fetal cotyledons from five ovariec-
tomized Holstein cows were compared with values for term cotyledons of eight intact Hol-
stein cows. The concentration per 100 g of fetal cotyledons was 17.2 μg for the intact ani-
imals and 13.83 μg for the ovariecetomized cows (78% as high). Estrone was slightly higher in the ovariecetomized group (2.65 vs. 2.07 μg). However, estradiol-17β (3.59 vs. 6.02 μg) and estradiol-17α (5.66 vs. 9.52 μg) were lower for the ovariecetomized group. When exogenous progesterone was withdrawn more than six days before parturition (expected at 279 days), the placentae were retained in all cases and were very difficult to remove 48 to 60 hr later.

Effect of ovariecetomy on lactation. K. R. JOHNSON, University of Idaho, Moscow.

Bilateral ovariecetomy was performed on 12 dairy animals at 55-143 days of pregnancy. The animals were carried to term (270-288 days) with exogenous progesterone and were milked 30 to 526 days after parturition. A 2-yr-old Holstein × Jersey heifer produced 21,048 lb milk and 974 lb fat in 526 days, and was producing 35 lb of milk per day when sold. The ovariecetomized cows were more persistent than contemporary herd-mates in level and in total milk produced during a lactation.

Four 2-yr-old grade Holstein heifers averaged 12,872 lb milk and 460 lb fat in 305 days, compared to less than 10,000 lb milk and 330 lb fat for herd-mates. All four of the heifers were still producing over 40 lb of milk per day when sold. Two reasons for this difference could be the effect on the intact animals of gestation and hormones during the estrous cy-

cle. When the ovariecetomized animals were given single treatments of exogenous estrogen, the level of production declined for two or three milkings, then gradually returned to normal. There may be a place for ovariecetomized animals on dairy farms. After five or six weekly treatments with exogenous estrogen the cows remain excellent animals to detect estrus in other cows. For herds in which de-
tecting animals in estrus is difficult, these cows could be of great benefit.

Changes in progesterone levels in cow ovar-

Forty-two corpora lutea from 31 cows and heifers were collected by laparotomy at various stages of the estrous cycle and analyzed for progesterone content. Corpora lutea were col-
lected on the day of estrus and Days 1-9, 14-16, and 20 post-estrus. A small amount of prog-
esterone was found in regressing C.L.'s from three cows during estrus or one day after, whereas no progesterone was found at two days post-estrus. From three to nine days post-
estrus the mean progesterone level rose from 16 to 158 μg per corpus luteum. The maximum mean progesterone level of 570 μg was found at Day 14, with a sharp decline after Days 15 to 20. The mean concentration of progesterone was 19 μg/g at Day 3 and reached a peak of 38 μg/g at Day 5. A decline in progesterone concentration between Days 6-9 to 25 μg/g was concomitant with a rapid increase in C.L. size. A maximum mean concentration of 73 μg/g was reached on Day 14, whereas mean C.L. size changed very little. There was con-
siderable variation between animals in prog-
esterone content of the corpora lutea, part of which appeared to be related to body weight and age of the animal.

Endometrial biopsy for studying histological changes of endometrium of cattle. K. R. JOHN-
son, University of Idaho, Moscow.

Seventeen cows were sampled over periods ranging from 29 to 70 days at rates of one to three times weekly, to cover all stages of the estrous cycle. Microscopic examination of the biopsies showed that the uterine surface epithelium was composed of pseudostratified col-
umnar cells which varied in height at the dif-
ferent stages of the estrous cycle or by the treatment employed. The number of glands present, the size of the glandular lumen, and the height of the glandular epithelium also varied according to the stage of the estrous cycle or the type of treatment used. The endo-
metria of ovariecetomized cows treated with estrogen were very similar in histological ap-
pearance to those taken from animals at estrus, whereas those treated with progesterone were similar to normal animals 15 days postestrus. Extreme care taken in the cleaning and san-
tizing of the biopsy instrument prevented uter-
ine infections from being induced in the bi-
opied animals. The difficulty in getting a simi-
lar plane of section of the tissue was overcome by careful placing of the tissue at time of em-
bedding. This study indicates that endometrial biopsies can be successfully taken from bovines and that the biopsied tissue is suitable for his-
tological study.


A total of 90 alfalfa, orchard grass, and al-
falfa–orchard grass mixture samples, whose digestibilities were known, were subjected to an in vitro rumen technique. Some of the for-
ages had been harvested as hay, some as silage, and some were dried pasture clippings. The digestibilities of dry matter, cellulose, organic
matter, and energy were determined by the in vitro technique and were compared to in vivo digestion values.

Forty-seven orchard grass samples cut at one-day intervals showed a significant correlation of in vivo digestible dry matter (a) to in vitro D.D.M. of 0.805 (P < 0.01), (b) to in vitro cellulose digested of 0.966 (P < 0.01), (e) to in vitro digestible energy of 0.87 (P < 0.01), and (d) to the per cent cellulose in feed of −0.95 (P < 0.01).

Five orchard grass–alfalfa mixture samples at 100, 75, 50, 25, and 0% of alfalfa showed a significant correlation between in vivo digestible dry matter to (a) in vitro D.D.M. of 0.963 (P < 0.01), (b) to in vitro cellulose digested of 0.993 (P < 0.01), (e) to in vitro digestible energy of 0.884 (P < 0.05), and (d) to the per cent cellulose in feed of −0.974 (P < 0.01).

Also, significant correlations were obtained between in vitro D.D.M. and (a) per cent cellulose in feed of −0.999 (P < 0.01) and (b) to TDN of 0.884 (P < 0.05).


The Holstein herd at Montana State College is being used in this experiment.

Each sire’s daughter is fed on all-roughage ration of alfalfa hay from ten months of age to freshening. The hay is fed ad libitum, not to exceed 10% weighback.

At freshening, each sire daughter group is randomly divided into two equal groups. Group I will continue to receive only alfalfa hay through their lactations, Group II will receive alfalfa hay plus a grain supplement through their lactation periods.

Results to date are as follows:

<table>
<thead>
<tr>
<th>Feed-Hay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sire</td>
</tr>
<tr>
<td>Rag Apple</td>
</tr>
<tr>
<td>B-3194</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feed-Hay-Grain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sire</td>
</tr>
<tr>
<td>Rag Apple</td>
</tr>
<tr>
<td>B-3194</td>
</tr>
</tbody>
</table>

An observation of considerable interest concerns the daughters of B-3194. On the all-hay rations, their production level was 2,039 lb of F.C.M. less than the daughters of the Rag Apple bull; whereas, on the hay-grain ration there was only 965 lb of F.C.M. difference. Also, the dry matter intake of the heifers receiving only hay indicates that there is a very close relationship between dry matter intake and F.C.M. production, when considering the complete lactation. The criterion seems to be appetite, as those heifers consuming the most dry matter produce the most. There appears to be little difference between high- and low-producing animals in efficiency of F.C.M. production.


Experiments were conducted to investigate the effects of high levels of rapeseed oil meal (RSOM) on serum protein-bound iodine (PBI) levels in milking cows and to determine the acceptability to cows on pasture of concentrates containing RSOM. Neither RSOM nor linseed oil meal (LOM) at 20% of the dry matter intake affected serum PBI over an 11-wk period. Milk production of cows fed RSOM was not significantly different from that of cows fed the same level of LOM. There was no significant difference in the amount of feed rejected by 12 cows fed concentrate containing 10% RSOM and that rejected by 12 cows fed concentrate containing 10% LOM. Neither concentrate mixture was completely consumed even at low levels of feeding. There was evidence of sorting out of the protein supplements. Cows fed RSOM in this experiment produced as well as did those fed LOM.

Color observations on rumen epithelium of dairy and beef cattle. Gyorgy Vidacs, Ralph Smith, Raymond Hinders, and Gerald M. Ward, Colorado State University, Fort Collins.

In the course of our investigations of the condition of rumen epithelium on different diets, we became interested in the wide range of color of rumen epithelium. Description of color changes occurring in the rumen have been based on subjective grading, which causes difficulty in comparing the results of different research groups.

Diffuse-reflection measurements were made on rumen samples of 135 slaughtered dairy cattle and 110 beef cattle, using a Photovolt Model 610 reflectometer. It was possible to exclude the subjectivity of observer and express differences numerically under standard conditions (100 = the reflectance of magnesium oxide, according to U. S. Bureau of Standard Letter Circular 547, 1939). Two samples (one from the lateral aspect, the other from the center of the ventral sac) from each animal were tested, placing the search unit of the instrument directly on the sample without using filters. The readings ranged between 4-7 for the darkest, and 32-38 for the lightest. The color of normal rumen pillars gave readings of 27-30. Sensitivity can be increased using intermediate standards. Instrumental determination of the color of rumen epithelium provides a quick and reliable method.
Effect of different preincubation temperatures of rumen liquid upon the gas and VFA production in artificial rumen techniques. Gyula Nagy, Gyorgy Vidacs, and Gerald M. Ward, Colorado State University, Fort Collins.

In studies of in vitro rumen fermentation, rumen fluid has been collected in vacuum bottles and processed as promptly as possible. However, during the interval between collection and the beginning of fermentation, temperature changes can occur which may alter microbial metabolism.

To study the influence of the holding temperature of rumen fluid, samples which arrived at the laboratory at 34°C were cooled to 5, 15, or 25°C and held at that temperature for 10 min. The fluid was then added to flasks of the artificial rumen and fermented 18 hr with an alfalfa hay substrate. Total gas production and VFA production were not significantly different between samples.

Rumen fluid samples stored at 5°C for 2 wk showed a marked reduction in gas and VFA production and an increased percentage of acetate. Frozen samples showed a decrease of about 70% in gas and VFA production, although the ratio of acids was not altered significantly. Large samples (500 ml) showed less deviation from controls than small samples (25 ml).

Diatomaceous earth in livestock rations. E. G. Moody, Arizona State University, Tempe.

The introduction of diatomaceous earth as a stored grain preservative justified testing effects of its presence in livestock feed, in view of its adsorptive properties and reports of beneficial effects from additions of certain inert materials to livestock feeds. Finely ground diatomaceous earth was added to the extent of 5% of the dairy concentrate, 5% of the chicken feed, and 2½% of the swine ration. Results expressed as average values obtained from animals on the treated and control rations, respectively, were: dairy cows: in a 15-wk double-reversal trial using 12 cows, each animal produced 44.7 and 45.9 lb milk testing 4.04 and 3.97% fat and gained in body weight 0.13 and 0.11 lb daily; chickens: two replicates involving 100 Vantress cross unsexed chicks gained 1.78 and 1.76 kg in 77 days, with feed conversions of 3.02 and 2.98; swine: three replicates involving 22 animals gained 1.64 and 1.54 lb daily. None of these differences was statistically significant. No effect of treatment was noted in thriftiness or in the swine and poultry intestinal Ascaris population. The data would suggest that at these levels of intake diatomaceous earth was inert, with neither harmful nor beneficial effects.

PRICE SCHEDULE FOR REPRINTS OF PAPERS THAT APPEAR IN THE JOURNAL OF DAIRY SCIENCE

H. F. Judkins, Secretary-Treasurer
32 Ridgeway Circle, White Plains, New York

The Executive Board, at the time of the Annual Meeting of the American Dairy Science Association at the University of Wisconsin, increased the price of reprints 25%, effective July 1, 1961. The new reprint schedule follows:

<table>
<thead>
<tr>
<th>Number of pages</th>
<th>Cost in dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of reprints</td>
<td>2</td>
</tr>
<tr>
<td>50</td>
<td>17.50</td>
</tr>
<tr>
<td>100</td>
<td>20.00</td>
</tr>
<tr>
<td>200</td>
<td>22.50</td>
</tr>
<tr>
<td>300</td>
<td>28.00</td>
</tr>
<tr>
<td>400</td>
<td>33.75</td>
</tr>
<tr>
<td>500</td>
<td>37.50</td>
</tr>
<tr>
<td>600</td>
<td>41.25</td>
</tr>
<tr>
<td>700</td>
<td>45.00</td>
</tr>
<tr>
<td>800</td>
<td>48.75</td>
</tr>
<tr>
<td>900</td>
<td>52.50</td>
</tr>
<tr>
<td>1,000</td>
<td>57.25</td>
</tr>
</tbody>
</table>