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A Test pf Calf Rations -- Methods of Controlling Contamination of Milk during Milking

A. L. Haecker  
*University of Nebraska-Lincoln*

C. W. Melick  
*University of Nebraska-Lincoln*

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A TEST OF CALF RATIONS.
By A. L. Haecker.

METHODS OF CONTROLLING CONTAMINATION OF MILK DURING MILKING.
By A. L. Haecker and C. W. Melick.

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A TEST OF CALF RATIONS.

BY A. L. HAECKER

INTRODUCTION.

Through the recent general use of hand separators by farmers and dairymen of the state, the interest in calf rearing has been greatly increased.

This industry is by no means a small one, as some twenty thousand hand separators are now being used throughout the state and each hand separator represents a farm where calves are reared on skim-milk. To use this valuable by-product to the best advantage is a problem worthy of much study and investigation.

Since the spring of 1899 the Department of Dairy Husbandry has been conducting experiments in calf rearing by using hand separator skim-milk and light rations of grain.

The first test was published in Bulletin No. 68 of this Station and dealt with a comparison of calves reared by hand with those sucking their dams. The hand-fed calves were reared on skim-milk, ground flaxseed being used to replace the lacking butter fat. This test resulted in a fine lot of calves reared at a very low cost, but it also brought out the fact that much more data were needed in the way of comparing rations to be used with skim-milk.

THE EXPERIMENT.

THE FOODSTUFFS THAT WERE COMPARED.

In the fall of 1901 an experiment was planned to test some rations rich in fat to replace the absent butter fat in skim-milk. Owing to complaints from feeders that flaxseed-meal was often difficult to obtain, it was thought advisable to use
the commercial oil-meal for one ration, this being a product easy to procure in almost any part of the country. The two other feeds were by-products of glucose factories, corn-germ oil-meal being one and corn-oil the other.

The corn-oil is pressed from the corn-germ and resembles a light oil in appearance but has a strong corn flavor. The corn-germ oil-meal is what is left after the oil has been pressed from the germ. This meal contains about ten per cent fat and resembles corn-meal but has a more uniform grain and a higher per cent of digestible nutrients.

MARKET PRICES OF FOODS USED IN THE EXPERIMENT.

The market prices of foodstuffs used in the experiment are here given and represent about the average for eastern Nebraska during the two years:

Whole milk, $1.00 per hundred.
Skim-milk, 15 cents per hundred.
Oil-meal, $25.00 per ton.
Alfalfa hay, $6.00 per ton.
Pasture for calves, ten cents per week.
Germ oil-meal, $27.50 per ton.
Corn-oil, 6½ cents per pound.
Shelled corn, 60 cents per hundred.
Oats, 90 cents per hundred.
Bran, $15.00 per ton.

THE THREE GROUPS.

For convenience the calves are arranged in three groups, each group including eight calves fed a certain ration. Nearly two years were required to complete the test owing to the necessity of securing a number of calves nearly the same age and the convenience in feeding one group at a time.

Each calf in all groups was weighed at birth and allowed to suck its dam for two or three days or until it was in a strong condition and the cow's milk fit for use. The calf was then taken from its mother and fed whole milk for ten days or two weeks, at which time it was gradually changed
A Test of Calf Rations.

to skim-milk. This changing required several days, by increasing the skim-milk and decreasing the whole milk gradually.

The rations of whole milk for the first two weeks were about five pounds to a feed, while the second two weeks, when the calf was on skim-milk, six or seven pounds were given. During the second period the calf received eight pounds at a feed and from then on ten pounds were given.

The corn and oats were fed ground and the calf generally taught to eat the feed at six weeks old. The rations were given in such quantities as the calf would eat up clean. Hay or grass was supplied at all times and the animals were given free access to salt and water.

GROUP I.

In Group I, at the time the calf was changed to skim-milk a little linseed-meal was added to the milk and stirred in. The meal was fed in small rations, starting with a teaspoonful and increasing until the fifth period, when the animal received about one-half teacupful at a feed. The linseed-meal was stirred in the milk for the first three months, after which it was mixed with the corn and oats and fed after the milk ration.

GROUP I.—Eight calves fed linseed-meal as a fat substitute in skim-milk.

<table>
<thead>
<tr>
<th>Name of calf</th>
<th>Breeding of calf</th>
<th>Weight at birth.</th>
<th>Wt. at end of sixth period.</th>
<th>Gain during test.</th>
<th>Cost per pound of gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polo..........</td>
<td>Jersey grade.....</td>
<td>63</td>
<td>285</td>
<td>217</td>
<td>$ .044</td>
</tr>
<tr>
<td>King..........</td>
<td>Holstein-Friesian</td>
<td>90</td>
<td>340</td>
<td>250</td>
<td>.045</td>
</tr>
<tr>
<td>Charlie......</td>
<td>Angus, Shorthorn-Jersey</td>
<td>78</td>
<td>300</td>
<td>222</td>
<td>.044</td>
</tr>
<tr>
<td>Billy........</td>
<td>Jersey..........</td>
<td>52</td>
<td>275</td>
<td>223</td>
<td>.044</td>
</tr>
<tr>
<td>Dime..........</td>
<td>Jersey..........</td>
<td>42</td>
<td>285</td>
<td>243</td>
<td>.042</td>
</tr>
<tr>
<td>Sam...........</td>
<td>Jersey..........</td>
<td>50</td>
<td>270</td>
<td>220</td>
<td>.048</td>
</tr>
<tr>
<td>Mermaid......</td>
<td>Holstein........</td>
<td>70</td>
<td>310</td>
<td>240</td>
<td>.048</td>
</tr>
<tr>
<td>Comanche.....</td>
<td>Jersey..........</td>
<td>68</td>
<td>285</td>
<td>217</td>
<td>.049</td>
</tr>
<tr>
<td><strong>Average per calf.</strong></td>
<td></td>
<td><strong>64.75</strong></td>
<td><strong>293.75</strong></td>
<td><strong>229</strong></td>
<td><strong>$ .046</strong></td>
</tr>
</tbody>
</table>
The eight calves in Group I were fed about alike, and referring to the ration of the calf "Polo" it may be seen how the various feeds were given:

**Ration of Polo, a calf in Group I.**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1st period.</td>
<td>210</td>
<td>140</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td>$2.32</td>
<td>92</td>
<td>24</td>
<td>$0.098</td>
</tr>
<tr>
<td>2nd period.</td>
<td>448</td>
<td>3.00</td>
<td>4.00</td>
<td></td>
<td></td>
<td>4.00</td>
<td>.77</td>
<td>130</td>
<td>38</td>
<td>.020</td>
</tr>
<tr>
<td>3rd period.</td>
<td>560</td>
<td>6.00</td>
<td>12.00</td>
<td></td>
<td></td>
<td>12.00</td>
<td>1.10</td>
<td>180</td>
<td>50</td>
<td>.025</td>
</tr>
<tr>
<td>4th period.</td>
<td>560</td>
<td>8.00</td>
<td>16.00</td>
<td>48</td>
<td></td>
<td>16.00</td>
<td>1.32</td>
<td>220</td>
<td>40</td>
<td>.034</td>
</tr>
<tr>
<td>5th period.</td>
<td>560</td>
<td>10.00</td>
<td>18.00</td>
<td>60</td>
<td></td>
<td>18.00</td>
<td>1.41</td>
<td>255</td>
<td>35</td>
<td>.048</td>
</tr>
<tr>
<td>6th period.</td>
<td>560</td>
<td>10.00</td>
<td>18.00</td>
<td>80</td>
<td></td>
<td>18.00</td>
<td>1.48</td>
<td>285</td>
<td>30</td>
<td>.049</td>
</tr>
<tr>
<td>Total</td>
<td>210</td>
<td>2828</td>
<td>38.00</td>
<td>68.00</td>
<td>188</td>
<td>68.00</td>
<td>$8.40</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GROUP II.**

The germ oil-meal lot, or Group II, was fed about the same in every way as Group I, corn-germ oil-meal being used instead of linseed-meal.
GROUP II.—Eight calves fed corn-germ oil-meal as a fat substitute in skim-milk.

<table>
<thead>
<tr>
<th>Name of calf</th>
<th>Breed of calf</th>
<th>Weight at birth</th>
<th>Wt. at end of sixth period</th>
<th>Gain during test</th>
<th>Cost per pound of gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>Jersey</td>
<td>54</td>
<td>290</td>
<td>236</td>
<td>.042</td>
</tr>
<tr>
<td>Cobbler</td>
<td>Jersey grade</td>
<td>40</td>
<td>285</td>
<td>225</td>
<td>.049</td>
</tr>
<tr>
<td>Hobo</td>
<td>Jersey grade</td>
<td>38</td>
<td>240</td>
<td>202</td>
<td>.048</td>
</tr>
<tr>
<td>Alick</td>
<td>Holstein grade</td>
<td>78</td>
<td>320</td>
<td>242</td>
<td>.040</td>
</tr>
<tr>
<td>Max</td>
<td>Jersey</td>
<td>45</td>
<td>290</td>
<td>245</td>
<td>.050</td>
</tr>
<tr>
<td>Beauty</td>
<td>Jersey</td>
<td>54</td>
<td>280</td>
<td>226</td>
<td>.050</td>
</tr>
<tr>
<td>Bud</td>
<td>Hereford grade</td>
<td>85</td>
<td>330</td>
<td>245</td>
<td>.051</td>
</tr>
<tr>
<td>Katy</td>
<td>Holstein</td>
<td>102</td>
<td>380</td>
<td>278</td>
<td>.044</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>62</td>
<td>299.37</td>
<td>237.37</td>
<td>.047</td>
</tr>
</tbody>
</table>

FIG. 2.—SIX ANIMALS OF GROUP II. GROUP II WAS FED SKIM-MILK WITH CORN-GERM OIL-MEAL.

The ration of the calf “White” may be used for reference in the detail feeding of this Group.

Ration of White, a calf in Group II.

<table>
<thead>
<tr>
<th>Periods of four weeks each</th>
<th>Whole milk Lbs.</th>
<th>Skim milk Lbs.</th>
<th>Germ oil meal Lbs.</th>
<th>Corn Lbs.</th>
<th>Oats Lbs.</th>
<th>Pasture days</th>
<th>Cost for period $</th>
<th>Wt. at end of period Lbs.</th>
<th>Gain in wt. Lbs.</th>
<th>Cost of 1 lb. of gain $</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st period</td>
<td>245</td>
<td>60</td>
<td>.50</td>
<td>4.00</td>
<td>4.00</td>
<td>14</td>
<td>2.55</td>
<td>85</td>
<td>31</td>
<td>.082</td>
</tr>
<tr>
<td>2d period</td>
<td>448</td>
<td>3.00</td>
<td>4.00</td>
<td>4.00</td>
<td>14</td>
<td>.98</td>
<td>120</td>
<td>35</td>
<td>.030</td>
<td></td>
</tr>
<tr>
<td>3d period</td>
<td>448</td>
<td>6.00</td>
<td>8.00</td>
<td>8.00</td>
<td>28</td>
<td>1.27</td>
<td>170</td>
<td>50</td>
<td>.025</td>
<td></td>
</tr>
<tr>
<td>4th period</td>
<td>448</td>
<td>8.00</td>
<td>12.00</td>
<td>12.00</td>
<td>28</td>
<td>1.35</td>
<td>205</td>
<td>35</td>
<td>.039</td>
<td></td>
</tr>
<tr>
<td>5th period</td>
<td>560</td>
<td>10.00</td>
<td>12.00</td>
<td>12.00</td>
<td>60</td>
<td>1.36</td>
<td>235</td>
<td>30</td>
<td>.045</td>
<td></td>
</tr>
<tr>
<td>6th period</td>
<td>560</td>
<td>10.00</td>
<td>14.00</td>
<td>14.00</td>
<td>100</td>
<td>1.58</td>
<td>290</td>
<td>55</td>
<td>.029</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>245</td>
<td>2524</td>
<td>37.50</td>
<td>50.00</td>
<td>50.00</td>
<td></td>
<td>9.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GROUP III.

The corn-oil lot, or Group III, was given corn-oil in place of the oil-meals of the other Groups. The ration of the calf "Rose" represents this Group.

Some difficulty was experienced in using this feed. It was first attempted to produce a milk having about a three per cent fat, by simply pouring in the oil and stirring to mix it with the milk. This could not be done, as the oil was much lighter than the milk and would not mix by such a slight agitation. A twenty-gallon barrel churn was then used to emulsify the oil and milk by churning. This was successful, and a very palatable emulsion could be made by churning from four to five minutes. The emulsion was not lasting but would hold for about twenty minutes which was long enough to last while the calves were being fed.

It was found necessary to make a two per cent mixture instead of three as the food proved too laxative and even at the lower per cent it was difficult to feed.

GROUP III.—Eight calves fed corn-oil mixed with skim-milk to substitute butter fat.

<table>
<thead>
<tr>
<th>Name of calf</th>
<th>Breeding of calf</th>
<th>Weight at birth.</th>
<th>Wt. at end of sixth period.</th>
<th>Gain during test.</th>
<th>Cost per pound of gain.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rose</td>
<td>Jersey</td>
<td>65</td>
<td>265</td>
<td>200</td>
<td>$ .061</td>
</tr>
<tr>
<td>Bebe</td>
<td>Jersey</td>
<td>45</td>
<td>200</td>
<td>215</td>
<td>.060</td>
</tr>
<tr>
<td>Ellen</td>
<td>Holstein grade</td>
<td>85</td>
<td>320</td>
<td>235</td>
<td>.058</td>
</tr>
<tr>
<td>Bo</td>
<td>Angus grade</td>
<td>69</td>
<td>285</td>
<td>216</td>
<td>.060</td>
</tr>
<tr>
<td>Beatrice</td>
<td>Holstein-Friesian</td>
<td>115</td>
<td>360</td>
<td>245</td>
<td>.057</td>
</tr>
<tr>
<td>Olive</td>
<td>Holstein grade</td>
<td>94</td>
<td>314</td>
<td>220</td>
<td>.063</td>
</tr>
<tr>
<td>Bold</td>
<td>Angus grade</td>
<td>78</td>
<td>310</td>
<td>222</td>
<td>.058</td>
</tr>
<tr>
<td>Cora</td>
<td>Jersey</td>
<td>45</td>
<td>275</td>
<td>230</td>
<td>.059</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>74.5</td>
<td>208.62</td>
<td>224.12</td>
<td>$.059</td>
</tr>
</tbody>
</table>
**A Test of Calf Rations.**

**FIG. 3.—FOUR CALVES OF GROUP III. GROUP III WAS FED SKIM-MILK WITH CORN-OIL.**

*Ration of Rose, a calf in Group III.*

<table>
<thead>
<tr>
<th>Periods of four weeks each.</th>
<th>Whole milk</th>
<th>Skim-milk</th>
<th>Corn-oil</th>
<th>Corn</th>
<th>Oats</th>
<th>Days pasture</th>
<th>Cost for period</th>
<th>Wt. at end of period</th>
<th>Gain in wt.</th>
<th>Cost of 1 lb. of gain.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st period</td>
<td>240 Lbs.</td>
<td>60 Lbs.</td>
<td></td>
<td>4.00</td>
<td>4.00</td>
<td>7</td>
<td>2.49 Lbs.</td>
<td>85 Lbs.</td>
<td>20 Lbs.</td>
<td>$0.124</td>
</tr>
<tr>
<td>2nd period</td>
<td>448 Lbs.</td>
<td>9.00</td>
<td>4.00</td>
<td>8.00</td>
<td>8.00</td>
<td>28</td>
<td>1.42 Lbs.</td>
<td>110 Lbs.</td>
<td>25 Lbs.</td>
<td>$0.056</td>
</tr>
<tr>
<td>3rd period</td>
<td>460 Lbs.</td>
<td>9.20</td>
<td>8.00</td>
<td>8.00</td>
<td>8.00</td>
<td>28</td>
<td>1.77 Lbs.</td>
<td>145 Lbs.</td>
<td>35 Lbs.</td>
<td>$0.051</td>
</tr>
<tr>
<td>4th period</td>
<td>460 Lbs.</td>
<td>9.20</td>
<td>8.00</td>
<td>8.00</td>
<td>8.00</td>
<td>28</td>
<td>1.80 Lbs.</td>
<td>180 Lbs.</td>
<td>35 Lbs.</td>
<td>$0.051</td>
</tr>
<tr>
<td>5th period</td>
<td>500 Lbs.</td>
<td>10.00</td>
<td>12.00</td>
<td>12.00</td>
<td>12.00</td>
<td>28</td>
<td>1.97 Lbs.</td>
<td>222 Lbs.</td>
<td>42 Lbs.</td>
<td>$0.042</td>
</tr>
<tr>
<td>6th period</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>265 Lbs.</td>
<td>43 Lbs.</td>
<td>$0.045</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>240 Lbs.</td>
<td>2376</td>
<td>46.40</td>
<td>40.00</td>
<td>40.00</td>
<td></td>
<td><strong>$11.25</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A Test of Calf Rations.

REMARKS AND CONCLUSIONS.

From the results obtained in this experiment it is safe to say that linseed-meal is not only an excellent food for replacing butter fat in skim-milk for calf feeding, but also an economic food in comparison with others.

Germ oil-meal gave about as good results as linseed-meal and may be recommended as a calf food.

Corn-oil in this test proved too expensive and required too much work for profitable calf rearing. A two per cent oil mixture proved rather laxative for obtaining the best results.

The calves fed linseed-meal and germ oil-meal were in good condition at the end of the test and most of them were weaned.

The cost of rearing the calves varied from $8.35 to $12.00 for the twenty-four weeks of the feeding experiment.
METHODS OF CONTROLLING CONTAMINATION OF MILK DURING MILKING.

BY A. L. HAECKER AND C. W. MELICK.

Pure milk is a subject of public interest, and of all our common foods perhaps none is more easily contaminated. The recent custom in Nebraska of grading cream by the acid test has aroused added interest in preventing the product from souring or accumulating bad flavors.

Milk contamination takes place largely during the process of milking, especially when the cows are kept in the barn. It was, therefore, thought best to start with investigations along this first and most troublesome source of infection, namely, milking.

The plan of the experiment was to test a number of advocated methods of lessening milk contamination. To do this, four cows were selected from the University dairy herd, all uniform in breed, weight, and time of lactation, so as to avoid, as much as possible, variation among individual animals. They were treated before each milking in the following manner:

The udder of cow No. 1, Diana, was sponged with water. The udder of cow No. 2, Annie, was sponged with a five per cent solution of carbolic acid. The udder of cow No. 3, Hat tie, was rubbed with vaseline. The udder of cow No. 4, Cora, was not treated, but the dust merely brushed off with the milker's hand as in the usual way.

The animals were tested both in the barn and out-of-doors. Exposures were also taken to compare cement and wood floors with and without bedding. Exposures were also made in the barn, both when the cows were present and when they were absent, to determine the condition of the air. In all, some two hundred plates were exposed, developed, and examined for bacteria with the microscope.
Controlling Contamination of Milk.

METHOD USED.

The exposures were made on sterile petri dishes containing 78.5 square centimeters and taken for one-half minute in all cases. Great care was used in making the exposures to avoid extreme cases. The petri dishes were kept in a specially made case, in which they were also transported to and from the barn.

Fig. 4 illustrates the method of making the exposures, the milker simply going through the motions of milking but not extracting any milk, to avoid danger of splattering small drops on the plate.

The agar medium covering the bottom of the petri dishes was made in the following way: First, the dishes were
Controlling Contamination of Milk.

washed and sterilized in dry air at a temperature of 374°F. for thirty minutes, then twenty grams of agar was added to twenty grams of peptone, ten grams salt, five grams beef extract, and two liters of distilled water. This mixture was sterilized for one-half hour at 212°F. for three consecutive days to kill any bacteria germinating from spores which might exist in the medium.

After making the exposures, the plates were allowed to remain in the University bacteriological laboratory for twenty-four hours at a temperature of 70°F., after which they were placed in an incubator and developed for twenty-four hours at 100°F. This was to give the different species of bacteria whose favorable temperature varied a chance to develop. After the plates were thus treated, the colonies were counted in each case and the predominating species determined.

The following are condensed tables made by averaging one hundred exposures under the methods named:

TABLE I.—Showing the average of exposures made in barn under each of the treatments.

<table>
<thead>
<tr>
<th>Colonies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dishes exposed under udders treated with 5 per cent carbolic acid (see fig. 6)</td>
</tr>
<tr>
<td>Dishes exposed under udders treated with vaseline</td>
</tr>
<tr>
<td>&quot; &quot; &quot; &quot; &quot; &quot; &quot; &quot; &quot; water</td>
</tr>
<tr>
<td>Dishes exposed under udders not treated (see fig. 5), about</td>
</tr>
</tbody>
</table>

TABLE II.—Showing differences between cement and board floors, with and without bedding, cows present and absent.

<table>
<thead>
<tr>
<th>Colonies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dishes exposed on cement floor, cows present, bedding present</td>
</tr>
<tr>
<td>Dishes exposed on board floor, cows present, bedding present</td>
</tr>
</tbody>
</table>
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Dishes exposed on cement floor, cows absent, bedding present ........................................ 42
bedding absent ........................................ 16
Dishes exposed on board floor, cows absent, bedding present ........................................ 83
bedding absent ........................................ 40

Table III.—Showing the average of exposures made in pasture under each of the treatments.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Colonies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dishes exposed under udder treated with 5 per cent carbolic acid</td>
<td>86</td>
</tr>
<tr>
<td>Dishes exposed under udder treated with vaseline</td>
<td>92</td>
</tr>
<tr>
<td>“ “ “ “ “ “ water</td>
<td>120</td>
</tr>
<tr>
<td>“ “ “ “ “ “ not treated</td>
<td>310</td>
</tr>
</tbody>
</table>

Fig. 5.—Shows a plate exposed one-half minute under cow's udder treated by merely brushing with the hand. Each of the little spots represents a colony of some kind of bacteria.
By comparing the four methods of treatment, in Table I it will be seen that udders treated with the five per cent solution of carbolic acid showed less contamination than by any of the other methods. The vaseline treatment was about the same as the carbolic acid, while the sponging with water showed but a slight increase.

The untreated udders are in striking contrast to those treated. Many of the petri dishes were so covered as to render counting impossible, but the average of those counted showed over twenty thousand:

In the comparison of cement and board floors (Table II) it will be seen that cement floors showed less than half the contamination of the board floors. The exposures in this
Controlling Contamination of Milk.

case were taken in the center of the barn between the two rows of cows and simply tell the condition of the air in the cow stable.

When cows were absent, a better air existed in the barn, as might be expected. The condition was also improved by the absence of bedding.

![Image: A plate exposed in pasture where the air must have been very pure and free from spores.]

The open air milking (Table III) showed much better results than those obtained in the barn, the untreated condition being even better than the treated cases in the barn.

While in nearly all cases the bacteria found were harmless, the quality of the milk both as to flavor and keeping quality was injured by their presence.

The records obtained in this experiment, while giving the desired comparisons, show conditions very much above the average, for in all cases the cows would be considered clean and the stable well kept.
CONCLUSIONS.

It is safe to conclude from the foregoing experiment that some means of preventing milk contamination during milking should be employed.

The work required to sponge an animal’s flank and udder is but a trifle, and great improvement can be made on the milk and its products.

The acid-solution costs two cents per gallon, which is enough to treat ten cows. The only objections to this method are the disagreeable odor and the bother of mixing.

The vaseline costs about the same as the carbolic acid and serves as a good preventive for chapped or sore teats. It is also to be recommended for cows with short teats which have to be milked by the stripping method. This treatment will not answer when the cows have dirty udders.

The water treatment is to be recommended for general use above the other three, as it is cheaper and does the work practically as well. This method can be used on any farm with little or no inconvenience and the results obtained would more than compensate for the extra time required.

Cement floors are not only easier to keep clean, but are also less favorable to the growth and development of bacteria.

While it is necessary to use bedding in winter, in summer when cows are kept in the barn only during milking and feeding time it may be dispensed with to the betterment of the milk.

Milking out of doors in clean yards or pasture gives better results than in clean barns, even under the best of conditions.
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No. 33, Meteorological Observations for 1893.
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Address AGRICULTURAL EXPERIMENT STATION,
Lincoln, Nebr.