THE QUANTITATIVE ANALYSIS OF THE BACTERIA FOUND IN THE AIR OF THE DAIRY BARN, and IN THE MILK UNDER VARYING CONDITIONS.

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In the consumption of milk the consumer puts up with the most varied conditions as regards the sanitary surroundings in the handling of milk. As the dairies in this country are under no immediate laws or rules, the cleanliness of the general dairy depends upon the owner. In some places where the dairies are subject to the city milk inspection laws of course all of them must be kept up to a certain standard of cleanliness and hygienic surroundings, but even then we find that the number of organisms that the the milk contains, collected under these ordinary conditions, is exceedingly large and gives room for vast sanitary improvement. It is stated by some authorities that milk containing over 50,000 bacteria per cubic centimeter, (16 drops), is unfit for human use. However, examination of milk from the various cities have shown a variation of from a few thousand to as many as fifty to eighty millions of germs per cubic centimeter. This, in itself, should demonstrate the necessity of a more careful handling of the milk. If these organisms were pathogenic (disease producing) one drop of such milk would be sufficient to exterminate a whole family.

This shows that milk is a most favorable media for the growth of bacteria and it is very essential that the most sanitary conditions should prevail in the collecting and handling of this product. For even though milk may contain a small number of organisms at the time it is drawn, by the time it reaches the consumer the number may be increased a hundred, and sometimes a thousand times per cubic centimeter.

The following experiments were conducted with the view of determining how the number of organisms which may gain access to the milk under varied conditions at the time it is drawn, can be reduced .

Agar plates were used, the agar having first been distributed into plates or petri dishes, then laid aside for at least forty-eight hours, to see that there is no growth and that they are perfectly sterile. The plates were exposed to the air only 30 seconds by the watch and then placed in an incubator at about 35' C. for 48 hours, the germs allowed to grow and the colonies counted.

In this work we selected four average cows as regarding cleanliness, and made determinations as to the number of bacteria in the air and milk under the following conditions: the relative number of bacteria in the air was determined by exposing plates, or petri dishes, 66.47 square centimeters in area, for 30 seconds in different parts of the barn. Again we exposed agar plates to the air for 30 seconds, over the milk pail when the milk samples were taken to see if the number of bacteria in the air varied directly with the number of bacteria found in the milk under the same conditions. The milk analized was all taken from sanitary pails. The sanitary pail is provided with a small opening, 5 inches in diameter, which is covered with a removable strainer. This may account for the small number of bacteria found in some of the experiments. Agar was used as a media in a all these experiments. Each individual organism, either from the air or from the milk, which gets into the agar multiplies and forms a colony that can readily be seen after growing for 48 hours, and by counting the colonies one can determine the number of individual organisms originally present.

OUTLINE of the EXPERIMENTS.

Experiment I. Expose four plates in the stable when it is being prepared for the cows - In the evening for three consecutive days.

II. Expose four plates in the stable after it has been prepared for the cows but before they enter - In the evening for three consecutive days.

III. Expose four plates in the stable soon after the cows have been placed in stalls - In the evening for three consecutive days.

In the following experiments, besides determining the number of bacteria in the air over the milk pail, we also determined the number of bacteria from milk samples taken under these same conditions. Two samples were taken from the milk collected from the same cows on two different days and two plate cultures were made from each sample. The samples were taken from sanitary milk pails and put into sterilized test tubes and taken immediately to the laboratory. Then 1 cubic centimeter of the milk was taken in a sterilized pipette and placed in a test tube containing 9 cubic centimeters of sterilized water. From this mixture 1 cubic centimeter was taken with a sterilized pipette and put into a tube of liquefied agar that had been cooled down to below 40 degrees C., so as not to injure the bacteria. The liquefied agar was then poured into sterilized petri dishes and placed in the incubator; after forty-eight hours the colonies were counted. By diluting the milk to this extent we were enabled to count the colonies satisfactorily. As this number represents a 1/10 dilution, in order to determine the number of bacteria, the count must be multiplied by ten.

IV. Expose one plate to the air over the milk pail of four different cows when the milking is done in the ordinary way, but without milking, just going through the motions. Two mornings and five evenings for five consecutive days, using the same animal each time. Two samples of milk were also collected on two different days, as explained above, and number of bacteria were also determined in the milk.

V. Expose one plate to the air over milk pail, of four different cows, when cows' udders have been washed and dried with a clean cloth, and cow's flanks moistened. Directions same as four. Milk samples were also collected.

VI. Expose one plate to the air over the milk pail of four different cows according to No. V, and have the floor sprinkled around the cow. Directions the same. Milk samples were also collected.

VII. Expose four plates according to No. VI and have milker's hands thoroughly clean, and milker wear a white jacket. Directions the same. Milk samples were also collected.

VIII. Expose four plates according to No. VII and disinfect cow's udder and milker's hands, thoroughly with a saturated solution of boric acid. Directions the same. Milk samples were also collected.

IX. Expose four plates according to No. VII and disinfect cow's udder and milker's hands thoroughly with Wyandotte solution. Directions the same. Milk samples were also taken.

X. Expose four plates according to No. VII, and have cow's udder and milker's hands thoroughly disinfected with carbolated vaseline. Directions the same. Milk samples were also taken.

XI. Expose one plate to the air over milk pail of two different cows when milked in the field on a still day and on a windy day; on a dry day and on a rainy day. Use two days for each experiment. Milk samples were also taken.

XII. In this experiment a comparison is made of the number of bacteria that the milk contained when collected in an open pail and in a sanitary pail, under the same conditions. In this comparison two cows were used, taking two samples of milk, collected from each cow, for five consecutive milkings. In order to give each pail a fair test they were alternated at each milking, that cow No. 1 was milked into an open pail at one milking, and into a sanitary pail at the next.

XIII. Quantitative analysis of the bacteria found in the sediment in the bottom of the milk bottle after the milk had stood for 24 hours. The milk was poured out of the bottle leaving the sediment and ten cubic centimeters of sterile water was put into the bottle with a sterilized pipette, and thoroughly mixed with the sediment; then 1/10 of a cubic centimeter of this mixture was put into a tube of liquefied agar, poured into a petri dish and incubated for 48 hours. The colonies were then counted and the result was multiplied by 100 to determine the relative presence of bacteria found in such material.

Feb. 1, 2 - 6 degrees. No Wind.	Feb. 2, Temp. 40° No Wind.	EXPERIMENT
Plate 1 - 60 bacteria.	Plate 1 - 819 bacteria.	I.
Plate 2 - 160 bacteria.	Plate 2 - 933 bacteria.	
Plate 3 - 63 bacteria	Plate 3 - 737 bacteria.	
Plate 4 - 46 bacteria.	Plate 4 - ___	
Daily Average 82 bacteria.	Daily Average 829 bacteria.	

Feb. 3, Temp. 0°
No Wind.

Plate 1 - 1063 bacteria.

Plate 2 - 633 bacteria.

Plate 3 - 130 bacteria.

Plate 4 - 252 bacteria.

Daily Average 519 bacteria.

Average (per plate) for three days 477 bacteria.

Experiment II.

No Wind.

Plate 1 - 133 bacteria.

Plate 2 - 153 bacteria.

Plate 3 - 82 bacteria.

Plate 4 - bacteria.

Daily average 123 bacteria.

No Wind.

Plate 1 - 14 bacteria.

Plate 2 - 8 bacteria.

Plate 3 - 4 bacteria.

Plate 4 - 4 bacteria.

Daily average 8 bacteria.

Windy.

Plate 1 - 40 bacteria.

Plate 2 - 32 bacteria.

Plate 3 - 28 bacteria.

Plate 4 - 26 bacteria.

Daily average 29 bacteria.

Average (per plate) for three days 53 bacteria.

Experiment III.

Windy.

Plate 1 - 99 bacteria.

Plate 2 - 50 bacteria.

Plate 3 - 28 bacteria.

Plate 4 - 30 bacteria.

Daily Average 39 bacteria.

Windy.

Plate 1 - 93 bacteria.

Plate 2 - 48 bacteria.

Plate 3 - 60 bacteria.

Plate 4 - 56 bacteria.

Daily average 64 bacteria.

No Wind.

Plate 1 - 59 bacteria.
Plate 2 - 31 bacteria.
Plate 3 - 88 bacteria.
Plate 4 - 45 bacteria.
Daily average 56 bacteria.

Average (per plate) for three days 53 bacteria.

The above experiments show that there is a great difference in the number of bacteria found in the air under the various conditions. As the plates which were exposed while the barn was being prepared for the cows contained 900% more bacteria than it did after the dust had been allowed to settle. This would effect very materially the number of germs found in the milk. Therefore this shows that one should always allow the dust to settle before milking.

EXPERIMENT IV.

Feb. 27, Temp. 50°

No Wind.

Plate - 1

Plate 2 - 493 bacteria.

Plate 3 -

Plate 4 -

Daily average 493 bacteria.

Feb. 28, Temp. 60°

No Wind.

Plate 1 - 240 bacteria.

Plate 2 - 205 bacteria.

Plate 3 - 1044 bacteria.

Plate 4 - 89 bacteria.

Daily average 395 bacteria.

March 1, Temp. 60°

No. Wind.

Plate 1 - 1348 bacteria.

Plate 2 - 575 bacteria.

Plate 3 - 1381 bacteria.

Plate 4 - 729 bacteria.

Daily average 1024 bacteria.

March 1, Temp. 65°

No Wind.

Plate 1 - 580 bacteria.

Plate 2 - 118 bacteria.

Plate 3 - 260 bacteria.

Plate 4 - -- bacteria.

Daily average 319 bacteria.

March 2, Temp. 68°

No Wind.

Plate 1 - 795 bacteria.

Plate 2 - 391 bacteria.

Plate 3 - 629 bacteria.

Plate 4 - 232 bacteria.

Daily average 512 bacteria.

March 3, Temp. 35°

No Wind.

Plate 1 - - - - - - -

Plate 2 - 350 bacteria.

Plate 3 - 295 bacteria.

Plate 4 - - - - - - - -

Daily average 323 bacteria.

Average (per plate) for seven milkings 499 bacteria.

Exp. IV Con.

Mar. 3, Tem. 75°.

No Wind.

Plate 1 - 806 bacteria. Plate 3 - - - bacteria.

Plate 2 - 156 bacteria. Plate 4 - 328 bacteria.

Daily average 430 bacteria.

Average (per plate) for seven milkings 499 bacteria.

MILK SAMPLES.

Mar. 3, Temp. 35°. No Wind.

Plate 1 - 22890 X 10 228900 bacteria per cubic centimeter.

Plate 2 - 14990 149900 bacteria per cubic centimeter.

Plate 3 - 2880 28800 bacteria per cubic centimeter.

Plate 4 - 4300 43000 bacteria per cubic centimeter.

Average number of bacteria per c.c. of milk 112650.

EXPERIMENT V.

Mar. 6, Temp. 60°

No Wind.

Plate 1 - 320 bacteria.

Plate 2 - 260 bacteria.

Plate 3 - 345 bacteria.

Plate 4 - 115 bacteria.

Daily average 260 bacteria.

Mar. 7, Temp. 42°.

No Wind.

Plate 1 - 407 bacteria.

Plate 2 - 129 bacteria.

Plate 3 - - -

Plate 4 - - -

Daily average 266 bacteria.

Mar. 8, Temp. 35°.

No Wind.

Plate 1 - 286 bacteria.

Plate 2 - 463 bacteria.

Plate 3 - 591 bacteria.

Plate 4 -1127 bacteria.

Daily average 617 bacteria.

Mar. 9, Temp. 29°.

No Wind.

Plate 1 - 914 bacteria.

Plate 2 - 530 bacteria.

Plate 3 - 373 bacteria.

Plate 4 - 734 bacteria.

Daily average 638 bacteria.

Exp.5, Con.

Mar. 9 Temp. 50°.

No. Wind.

Plate 1 - 170 bacteria.

Plate 2 - 243 bacteria.

Plate 3 - 291 bacteria.

Plate 4 - 1039 bacteria.

Dailybaverage 436 bacteria.

Mar. 10, Temp.40°.

No Wind.

Plate 1 - 162 bacteria.

Plate 2 - 247 bacteria.

Plate 3 - 369 bacteria.

Plate 4 - 922 bacteria

Daily average 425 bacteria.

Mar. 11, Temp. 25°.

No Wind.

Plate 1 - 255 bacteria.

Plate 2 - 325 bacteria.

Plate 3 - 470 bacteria.

Plate 4 - 1116 bacteria.

Daily average 542 bacteria.

Average (per plate) for seven milkings 455 bacteria.

MILK SAMPLES.

Mar.9, Temp.29°. No Wind.

Plate 1 - 480 X 10 4800 bacteria per cubic centimeter.

Plate 2 8 120 1200 bacteria per cubic centimeter.

Plate 3 - 200 2000 bacteria per cubic centimeter.

Plate 4 - 80 800 bacteria per cubic centimeter.

Average number of bacteria per cubic centimeter of milk 2200.

EXPERIMENT VI.

Mar. 13, Temp.60°.

No Wind.

Plate 1 - 339 bacteria.

Plate 2 - 717 bacteria.

Plate 3 - 360 bacteria.

Plate 4 - 455 bacteria.

Daily average 468 bacteria.

Mar. 14, Temp.55°.

No Wind.

Plate 1 - 374 bacteria.

Plate 2 - 143 bacteria.

Plate 3 - 79 bacteria.

Plate 4 - 180 bacteria.

Daily average 194 bacteria.

Exp.VI, Con.

Mar. 15, Temp.60°.

No Wind.

Plate 1 - 146 bacteria.

Plate 2 - 461 bacteria.

Plate 3 - 370 bacteria.

Plate 4 - 82 bacteria.

Daily average 265 bacteria.

Mar. 16, Temp.50°.

Rainy

Plate 1 - 151 bacteria.

Plate 2 - 116 bacteria.

Plate 3 - 386 bacteria.

Plate 4 - 411 bacteria.

Daily average 411 bacteria.

Mar. 16, Temp.46°.

No Wind.

Plate 1 - 163 bacteria.

Plate 2 - 333 bacteria.

Plate 3 - 135 bacteria.

Plate 4 - 104 bacteria.

Daily average 1840 bacteria.

Mar. 17, Temp.50°.

Rainy.

Plate 1 - 161 bacteria.

Plate 2 - 150 bacteria.

Plate 3 - 129 bacteria.

Plate 4 - 64 bacteria.

Daily average 51 bacteria.

Mar.17, Temp.50°.

R a i n y .

Plate 1 - 37 bacteria.

Plate 2 - 39 bacteria.

Plate 3 - 69 bacteria.

Plate 4 - 59 bacteria.

Daily average 51 bacteria.

Average (per plate) for seven milkings 222 bacteria.

MILK SAMPLES.

Mar. 15, Temp.60°. No Wind.

Plate 1 - 20 X 10 200 bacteria per cubic centimeter.

Plate 2 - 40 400 bacteria per cubic centimeter.

Plate 3 140 1400 bacteria per cubic centimeter.

Average number of bacteria per cubic centimeter of milk 525 .

No.VI Con.

MILK SAMPLES.

Mar.17, Temp.50°. Rainy.

Plate 1 - 40 X 10 400 bacteria per cubic centimeter.

Plate 2 -260 2600 bacteria per cubic centimeter.

Plate 3 -350 3500 bacteria per cubic centimeter.

Plate 4 - 560 5600 bacteria per cubic centimeter.

Average number per cubic centimeter, 3025 bacteria.

Total average for both days 1775 bacteria per cubic centimeter

EXPERIMENT VII.

Mar.20, Temp.50°.

Windy.

Plate 1 - 399 bacteria.

Plate 2 - 175 bacteria.

Plate 3 - 461 bacteria

Plate 4 - 224 bacteria.

Daily average 315 bacteria.

Mar.21, Temp.55 .

Windy.

Plate 1 - 141 bacteria.

Plate 2 - 66 bacteria.

Plate 3 - 91 bacteria.

Plate 4 - 46 bacteria.

Daily average 86 bacteria.

Mar.22, Temp.48°.

No Wind.

Plate 1 - 219 bacteria.

Plate 2 - 125 bacteria.

Plate 3 - 237 bacteria.

Plate 4 - 93 bacteria.

Daily average 169 bacteria.

Mar.22, Temp.65°.

Windy.

Plate 1 - 130 bacteria.

Plate 2 - 155 bacteria.

Plate 3 - 177 bacteria.

Plate 4 - 107 bacteria.

Daily average 127 bacteria.

Mar.23, Temp.54°.
No Wind.

Plate 1 - 153 bacteria.

Plate 2 - 186 bacteria.

Plate 3 - 94 bacteria.

Plate 4 - 98 bacteria.

Daily average 133 bacteria.

Mar.24, Temp.60°.
No Wind.

Plate 1 - 358 bacteria.

Plate 2 - 232 bacteria.

Plate 3 - 159 bacteria.

Plate 4 - 140 bacteria.

Daily average 222 bacteria.

Exp.VIII, Con.

March.24, Temp.60°.

Windy

Plate 1 - 269 bacteria.

Plate 2 - 133 bacteria.

Plate 3 - 121 bacteria.

Plate 4 - 114 bacteria.

Daily average 159 bacteria.

Average per plate for seven milkings 173 bacteria.

MILK SAMPLES.

Mar. 28, Temp.60°. No Wind.

Plate 1 - 111 X 10 1110 bacteria per cubic centimeter.

Plate 2 - 282 2820 bacteria per cubic centimeter.

Plate 3 - 105 1050 bacteria per cubic centimeter.

Plate 4 - 194 1940 bacteria per cubic centimeter.

Average number of bacteria per cubic centimeter of milk 1618.

The last four experiments show some very interesting facts. They go to prove that with a little extra care very beneficial results can be obtained in lessening the number of bacteria in the milk. Each of these four experiments are directed toward the various ways or sources by which bacteria gain access to the milk, and each experiment beginning with four shows how each source of contamination may be overcome.

In experiment four where nothing was done to prevent contamination we find that there is a relatively large number of bacteria in the air over the milk pail, and that the milk collected at this time contained an excessively large number of germs; 112650 (per c.c.)

In experiments five, six and seven where in each succeeding one some additional precautions were taken, we find a steady decreace in the number of bacteria present both in the air over the milk pail and in the milk; so that by following the directions as in experiment

VII which includes all the precautions, we have only 173 bacteria per plate, from the air, which denotes that the number of bacteria in the air is greatly lessened and that the small number found in the milk 1618 (per c.c.) will repay from a practical standpoint for the extra precautions taken:

EXPERIMENT VIII.

Apr. 3, Temp.50°.
No Wind.

Plate 1 - 48 bacteria.

Plate 2 - 48 bacteria.

Plate 3 112 bacteria.

Plate 4 - 509 bacteria.

Daily average 179 bacteria.

Apr. 4, Temp.42°.
Windy.

Plate 1 - 42 bacteria.

Plate 2 - 87 bacteria.

Plate 3 - 84 bacteria.

Plate 4 63 bacteria.

Daily average 69 bacteria.

Apr. 5, Temp.45°.
Windy.

Plate 1 - 112 bacteria.

Plate 2 - 59 bacteria.

Plate 3 - 118 bacteria.

Plate 4 - 76 bacteria.

Daily average 91 bacteria.

Apr.4, Temp.36°.

No Wind.

Plate 1 - 86 bacteria.

Plate 2 - 133 bacteria.

Plate 3 - 93 bacteria.

Plate 4 - 284 bacteria.

Daily average 149 bacteria.

Apr. 5, Temp.32°.
No Wind.

Plate 1 - 60 bacteria.

Plate 2 - 117 bacteria.

Plate 3 - 92 bacteria.

Plate 4 - 47 bacteria.

Daily average 79 bacteria.

Apr.6, Temp.45°.
No Wind.

Plate 1 - 151 bacteria.

Plate 2 - 157 bacteria.

Plate 3 - 111 bacteria.

Plate 4 - 98 bacteria.

Daily average 129 bacteria.

Average per plate for six milkings 116 bacteria.

Exp.VIII Con.

MILK SAMPLES.

Apr. 4, Temp.42°. Windy.

Plate 1 - 300 X 10 3000 bacteria per cubic centimeter.

Plate 2 - 218 2180 bacteria per cubic centimeter.

Plate 3 - 118 1180 bacteria per cubic centimeter.

Plate 4 - 202 2020 bacteria per cubic centimeter.

Average number of bacteria per cubic centimeter of milk 2095.

Apr. 6, Temp.30°. No Wind.

Plate 1 - 116 X 10 1160 bacteria per cubic centimeter.

Plate 2 - 141 1410 bacteria per cubic centimeter.

Plate 3 - 250 2500 bacteria per cubic c ntimeter.

Plate 4 - 184 1840 bacteria per cubic centimeter.

Average number of bacteria per cubic centimeter of milk 1728.

Total average both days 1912(per c.c.) bacteria in the milk.

EXPERIMENT IX.

Apr. 7, Temp.36°.
No Wind.

Plate 1 - 67 bacteria.

Plate 2 - 34 bacteria.

Plate 3 268 bacteria.

Plate 4 - 89 bacteria.

Daily average 115 bacteria.

Apr. 7, Temp.70°.
No Wind.
No Wind.

Plate 1 - 96 bacteria.

Plate 2 - 92 bacteria.

Plate 3 - 38 bacteria.

Plate 4 - bacteria.

Daily average 76 bacteria.

Apr. 8, Temp.80°.
No Wind.

Plate 1 - 120 bacteria.

Plate 2 - bacteria.

Plate 3 - 71 bacteria.

Plate 4 - 55 bacteria.

Daily average 55 bacteria.

Apr. 9, Temp.60°.
No Wind.

Plate 1 - 100 bacteria.

Plate 2 - 103 bacteria.

Plate 3 - 48 bacteria.

Plate 4 - 55 bacteria.

Daily average 77 bacteria.

Exp.IX Con.

Apr. 9, Temp.85°.
No Wind.

Plate 1 - 25 bacteria.

Plate 2 - 20 bacteria.

Plate 3 - 35 bacteria.

Plate 4 - 375 bacteria.

Daily average 109 bacteria.

Apr. 10, Temp.46°.
No Wind.

Plate 1 - bacteria.

Plate 2 - 17 bacteria.

Plate 3 - 75 bacteria.

Plate 4 - 14 bacteria.

Daily average 35 bacteria.

Average per plate for six milkings 82 bacteria.

MILK SAMPLES.

Apr. 13, Temp.38°. No Wind.

Plate 1 - 180 X 10 1800 bacteria per cubic centimeter.

Plate 2 - 126 1260 bacteria per cubic centimeter.

Plate 3 - 232 2320 bacteria per cubic centimeter.

Plate 4 - 221 2210 bacteria per cubic centimeter.

Average number of bacteria per cubic centimeter of milk 1890.

Apr. 13, Temp.60°. No Wind.

Plate 1 - 142 X 10 1420 bacteria per cubic centimeter.

Plate 2 - 187 1870 bacteria per cubic centimeter.

Plate 3 - 184 1840 bacteria per cubic centimeter.

Plate 4 - 163 1630 bacteria per cubic centimeter.

Average number of bacteria per cubic centimeter of milk 1690.

Average number for both days 1790 bacteria per c.c.

EXPERIMENT X.

Apr. 11, Temp.52°.
No Wind.

Plate 1 - 123 bacteria.

Plate 2 - 253 bacteria.

Plate 3 - 60 bacteria.

Plate 4 - 100 bacteria.

Daily average 134 bacteria.

Apr. 12, Temp.32°.
No Wind.

Plate 1 - 43 bacteria.

Plate 2 - 41 bacteria.

Plate 3 - 49 bacteria.

Plate 4 - 31 bacteria.

Daily average 41 bacteria.

Exp.X,Con.

Apr. 12, Temp.65°. No Wind.	Apr. 13, Temp. 38°. No Wind.
Plate 1 - 1 bacteria.	Plate 1 - 48 bacteria.
Plate 2 - 45 bacteria.	Plate 2 - 60 bacteria.
Plate 3 - 85 bacteria.	Plate 3 - 70 bacteria.
Plate 4 - 58 bacteria.	Plate 4 - 40 bacteria.
Daily Average 47 bacteria.	Daily Average 55 bacteria.
Apr. 13, Temp. 60°. No Wind.	**Apr.14,Temp.60°. No Wind.**
Plate - 1 33 bacteria.	Plate 1 - 21 bacteria.
Plate 2 - 92 bacteria.	Plate 2 - 21 bacteria.
Plate 3 - 18 bacteria.	Plate 3 - 48 bacteria.
Plate 4 - 115 bacteria.	Plate 4 - 57 bacteria.
Daily average 65 bacteria.	Daily average 37 bacteria.

Average per plate for six milkings 63 bacteria.

MILK SAMPLES.

Apr. 12, Temp. 38°. No Wind.

Plate 1 - 114 X 10 1140 bacteria per cubic centimeter.

Plate 2 - 123 1230 bacteria per cubic centimeter.

Plate 3 - 150 1500 bacteria per cubic centimeter.

Plate 4 - 127 1270 bacteria per cubic centimeter.

Average number of bacteria per cubic centimeter of milk 1285.

Apr. 13, Temp.52°. No Wind..

Plate 1 - 134 X 10 1340 bacteria per cubic centimeter.

Plate 2 - 124 1240 bacteria per cubic centimeter.

Plate 3 - 122 1220 bacteria per cubic centimeter.

Plate 4 - 123 1230 bacteria per cubic centimeter.

Average number of bacteria per cubic centimeter of milk 1258 bacteria

Average number for both days was 1271 bacteria per cubic centimeter of milk.

Exp.X, Con.

In these tests VIII, IX & XI, we have compared the effectiveness of boric acid, wyandotte and carbolized vaseline as disinfectants, and find that when boric acid was used the plates exposed over the milk pail contains 116 bacteria and the milk contained 1912 organisms per c.c.

When the wyandotte solution was used the number of bacteria in the plates exposed over the milk pail was reduced from 116 to 82 bacteria. There was also a reduction of 122 organisms (per c.c.) in the milk. But when carbolized vaseline was used the number of bacteria on the plates exposed over the milk pail was reduced from 82 to 63, and from 1790 to 1270 (per c.c.), in the milk a difference of 519 (per c.c.)

These three experiments go to show that of the three disinfectants used carbolized vaseline proved to be the most effective from a bacteriological standpoint.

EXPERIMENT XI.

Apr. 27, Temp. 80°. No Wind.	Apr. 28, Temp. 78°. No Wind.
Plate 1 - 61 bacteria.	Plate 1 - 73 bacteria.
Plate 2 - 116 bacteria.	Plate 2 - 105 bacteria.
Daily average 88 bacteria.	Daily average 89 bacteria.

Average (per plate) for two days 88 bacteria.

MILK SAMPLES.

Apr. 27, Temp. 80°. No Wind.

Plate 1 - 197 X 10	1970 bacteria per cubic centimeter.
Plate 2 - 180	1800 bacteria per cubic centimeter.
Plate 3 - 148	1400 bacteria per cubic centimeter.
Plate 4 - 205	2050 bacteria per cubic centimeter.

Average number (per c.c.) of milk 1825 bacteria.

Exp.XI,Con.

Apr. 28, Temp.78°. No Wind.

Plate 1 - 172 X 10 1720 bacteria per cubic centimeter.

Plate 2 - 159 1590 bacteria per cubic centimeter.

Plate 3 - 234 2340 bacteria per cubic cantimeter.

Plate 4 - 216 2600 bacteria per cubic centimeter.

Average number of bacteria per cubic centimeter of milk, 1927.

Average number for the two days 1876 bacteria per cubic centimeter.

May 1, Temp.78°.
Windy.

Plate 1 - 135 bacteria.

Plate 2 - 277 bacteria.

Daily average 203 bacteria.

May 5, Temp.80°.
Very Windy.

Plate 1 - 470 bacteria.

Plate 2 - 932 bacteria.

Daily average 701 bacteria.

Average (per plate) for two days 452 bacteria.

MILK SAMPLES.

May 1, Temp.78°.
Windy.

Plate 1 - 230 X 10 2300 bacteria per cubic centimeter.

Plate 2 - 670 6700 bacteria per cubic centimeter.

Plate 3 - 480 4800 bacteria per cubic centimeter.

Plate 4 - 420 4200 bacteria per cubic centimeter.

Average number of bacteria (per c.c.) of milk 4500.

May 5, Temp. 80°.
Windy.

Plate 1 - 750 X 10 7500 bacteria per cubic centimeter.

Plate 2 - 440 4400 bacteria per cubic centimeter.

Plate 3 - 600 6000 bacteria per cubic centimeter.

Plate 4 - 590 5900 bacteria per cubic centimeter.

Average number of bacteria (per c.c.) pf milk 5950.

Average number for both days 5225 bacteria per c.c.

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Exp.XI,Con.

Apr.24, Temp.55°.
Rainy.

Plate 1 - 34 bacteria.

Plate 2 - 97 bacteria.

Daily average 65 bacteria.

Apr. 25, Temp.55°.
Rainy.

Plate 1 - 53 bacteria.

Plate 2 - 30 bacteria.

Daily average 21 bacteria.

Average (per plate) for ten days 43 bacteria.

MILK SAMPLES.

Apr.24,55°. Rainy.

Plate 1 - 180 X 10	1800	bacteria per cubic centimeter.
Plate 2 - 160	1600	bacteria per cubic centimeter.
Plate 3 - 130	1300	bacteria per cubic centimeter.
Plate 4 - 110	1100	bacteria per cubic centimeter.

Average number of bacteria (per c.c.) of milk 1450.

Apr.25,Temp.55°. Rainy.

Plate 1 - 160 X 10	1600	bacteria per cubic centimeter.
Plate 2 - 180	1800	bacteria per cubic centimeter.
Plate 3 - 250	2500	bacteria per cubic centimeter.
Plate 4 - 160	1600	bacteria per cubic centimeter.

Average number of bacteria (per c.c.) of milk 1875.

Average number of bacteria for both days 1662 bacteria per cubic centimeter.

Exp.XI, Con.

In this experiment we have made a comparison of the number of bacteria found in the milk and in the air when the cows were milked in the field on a rainy day, clear day, windy day and still day. In comparing the rainy day with the clear day we find a great difference. The milk on the clear day contained 1876 bacteria per cubic centimeter. On the rainy day the number was reduced to 1612 per cubic centimeter. On the clear day we found 88 colonies on the plates exposed over the milk pails and on the rain day only 43, less than one half the number found on the plate for the clear day.

This shows that the number of bacteria in the air on a rainy day is small as compared with that of a clear day.

A comparison of a still day with a windy day gave a difference of five times as many bacteria on the plate exposed over the milk pail and a difference of about three times as many in the milk, in favor of the still day.

We found a great difference in the number of bacteria in milk when cows were milked in the field and in the barn. In the fourth experiment where the cows were milked in the barn in the ordinary way, the milk contained 110774 more bacteria per cubic centimeter than milk drawn in the field on a still day Even when disinfectants were used in the barn the milk contained practically as many organisms as that milked in the field.

EXPERIMENT XII.

May 16.

Plate 1 -	100 X 10	1000 bacteria per c.c. in sanitary pail.
Plate 2 -	400	4000 bacteria per c.c. in sanitary pail.
Plate 3 -	500	5000 bacteria per c.c. in open pail.
Plate 4 -	400	4000 bacteria per c.c. in open pail.

Milk in open pail contained an average of 2000 more bacteria per c.c. than the milk in the sanitary pail.

Exp.XII,Con.

May 18.

Plate 1 - 400 X 10 4000 bacteria per c.c. in sanitary pail.

Plate 2 - 310 3

Plate 3 - 650 6500 bacteria per c.c. in open pail.

Plate 4 - 590 5900 bacteria per c.c. in opan pail.

Milk in open pail contained an average of 1200 more bacteria per c.c. than milk in the sanitary pail.

May 19.

Plate 1 - 200 X 10 2000 bacteria per c.c. in sanitary pail .

Plate 2 - 310 3100 bacteria per c.c. in sanitary pail.

Plate 3 - 1620 16200 bacteria per c.c. in open pail.

Plate 4 - 360 3600 bacteria per c.c. in open ;pail.

Milk in open pail contained an average of 7350 more bacteria (per c.c.) than milk in the sanitary pail.

May 20.

Plate 1 - 450 X 10 4500 bacteria per c.c. in sanitary pail.

Plate 2 - 130 1300 bacteria per c.c. in sanitary pail.

Plate 3 - 7600 76000 bacteria per c.c. in open pail.

Plate 4 - 2100 21000 bacteria per c.c. in open pail.

Milk in the open pail contained 45600 more bacteria per c.c. then milk in the sanitary pail .

May 21.

Plate 1 - 4700 X 10 47000 bacteria per c.c. in sanitary pail.

Plate 2 - 3640 36400 bacteria per c.c. in sanitary pail.

Plate 3 - 6200 62000 bacteria per c.c. in open pail.

Plate 4 - 3600 36000 bacteria per c.c in open pail.

Milk in the open pail contained 7300 more bacteria per c.c. than milk in the sanitary pail.

The total average for the week for sanitary pail was 2843 bacteria per c.c. in the milk.

The total average for the week for open pail is 17175 bacteria per c.c. in the milk.

In the six milkings the open pail averaged 14332 bacteria (per c.c.) more than the sanitary.

In the twenty samples analyzed in this experiment the open pail averaged 17175 more bacteria per c.c. than the sanitary pail. This difference is of course due to the fact that the sanitary pail kept out a great deal of dirt and hair which would have carried thousands of bacteria into the milk. This goes to prove the effectiveness of the sanitary milk pail from a bacteriological standpoint, and shows that this kind of a pail should always be prefered to an open pail.

EXPERIMENT XIII.

Bottle No. 1 Average number of bacteria per c.c. in sediment - 432,000
Bottle No. 2 Average number of bacteria per c.c. in sediment - 1,360,000
Bottle No. 3 Average number of bacteria per c.c. in sediment - 505,600
Bottle No. 4 Average number of bacteria per c.c. in sediment - 368,000
Bottle No. 5 Average number of bacteria per c.c. in sediment - 3,064,000
Bottle No. 6 Average number of bacteria per c.c. in sediment - 240,000
Bottle No. 7 Average number of bacteria per c.c. in sediment - 220,000
Bottle No. 8 Average number of bacteria per c.c. in sediment -3,188,000

The average number of bacteria per c.c. in the sediment of the eight samples was 1 . 172,200.

This experiment demonstrates the necessity of carefully washing and sterilizing the milk bottles after using, for if left to stand the sediment serves as a most favorable medium for the propogation and growth of bacteria, pathogenic and non-pathogenic. And if not cleaned this would contaminate any fresh milk that may be placed in them, and render it unfit for use in a short time. Whereas, milk put in bottles is supposed to be more hygienic and should always contain a less number of bacteria.

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SUMMARY.

In summarizing all the experiments we have observed that the number of bacteria under the most favorable conditions for their contamination of the milk was 800% greater than when they were combated in various ways. That is, bacteria which the air contained were reduced from 499 to 63 per plate.

We also reduced the number of bacteria in the milk by overcoming the different sources in which they gained access to the milk from 112650 to 1271 bacteria per c.c.

If no extra precautions were taken at all to reduce the number of organisms in the milk we have observed that if it is convenient, it is preferable to milk in the field, from a bacteriological standpoint. This is true because there was no practical difference in the number of bacteria in the milk drawn in the field and that drawn in the barn when disinfectants and other precautions were used.

The greatest decrease in the number of bacteria per c.c. of milk at any one time was when the cow's udders had been washed and dried with a clean cloth. From the data we readily see that when the air was full of dust there was the grestest number of bacteria present, and when it was raining we had comparatively few in the air and milk. This goes to prove that the bacteria are carried by dust particles, and anything that will prevent the dirt and dust from gaining access to the milk will necessarily check their progress.

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