



NATIONAL
FFA ORGANIZATION

Milk Quality and Products Career Development Event

Team Activity Guide

Updated: 06/2019

To perform well in the team event portion of the Milk Quality and Products Career Development Event, team members should be familiar with provisions of the Grade "A" Pasteurized Milk Ordinance: Section 6 – The Examination of Milk and Milk Products and Section 7 – Standards for Grade "A" Milk and/or Milk Products. These regulations are available at www.fda.gov. In addition, we have provided a list of references in the CDE Handbook that might be useful in preparation for this activity.

Team participants will be expected to evaluate data, conduct actual tests and/or calculations, and prepare an oral presentation discussing the quality of raw milk produced by an example farm.

Below are some topics participants should be familiar with from the references above:

- Maximum bacteria counts, Standard Plate Count (SPC), Somatic Cell Count (SCC), and how these are applied in the last "2 out of 4" and "3 out of 5" tests on a producer's milk.
- Application of the "3 out of 5" rule to bulk tank temperatures at time of pickup above the maximum limit.
- Standards for the three tests listed above (SPC, SCC, and Temperature).
- Preliminary Incubation Count (PIC) is not used for regulatory purposes, but can be used in conjunction with the SPC, and is often a better indication of raw milk quality, especially for some milks with a low SPC. PIC should correspond closely to the SPC. When elevated PIC is noted, investigation into sanitation and product cooling should occur.
- Tests for beta-lactam antibiotics must be conducted on each bulk milk tanker prior to receipt of milk into the manufacturing plant. A positive test makes the load of milk unacceptable.
- Periodic tests of freezing point of raw milk are conducted to detect intentional or accidental adulteration with added water. This test uses a cryoscope.
- Receiving plants often use the titratable acidity test on raw milk received when there is suspicion that high temperatures and/or high amounts of bacterial contamination may have permitted souring of the milk. Percent titratable acidity normally ranges from a low of 0.14% to a high of 0.20%. When testing indicates acid production occurred in the milk, the dairy field representative should inspect the dairy to identify the problem and aid in its solution.
- Facility and equipment inspections are an important tool when troubleshooting raw milk quality issues. Example pictures of inspection observations are available on the FFA MQP CDE website.

TEAM ACTIVITY INFORMATION FOR TEACHERS

The following information will be needed by the team to evaluate milk quality for the example farm and make their team oral presentation to a panel of judges. Numbers correspond to the table that follows.

1. Standard Plate Count (SPC) and Preliminary Incubation Count (PIC): Teams will be provided four pictures showing red colonies on the surface of Petrifilm Aerobic Count Plates.
 - a. Two pictures will represent the SPC of a raw milk, bulk tank sample
 - b. Two pictures will represent the PIC of a raw milk, bulk tank sampleThe team must count the colonies on the plates. Select the plates containing between 25 and 250 colonies, then calculate the count by multiplying the number of colonies by the reciprocal of the dilution used to make that plate. Dilutions of the samples will be provided.
2. (*See above*)
3. Somatic Cell Count (SCC): Teams will be provided average number of cells per field, and the microscopic factor (MF). The team must calculate the SCC for the sample for the month. The team must interpret the results in relation to the general udder health of the producing cows, i.e. whether there is likely to be significant mastitis in the herd.
4. Temperature: Temperature data is provided for the bulk tank at time of pickup.
5. Beta Lactam antibiotic: A photo of a SNAP test will be provided for interpretation.

6. Freezing Point (Cryoscope): The freezing point of water is 0°C at sea level. Many factors at the farm level can impact the freezing point of raw milk. Testing for freezing point is routinely done at the receiving location to determine if water has been added. The typical freezing point range of fresh raw milk from healthy cows is between -0.530°H and -0.566°H. Quality of water used for equipment cleaning can impact the quality of raw milk. Added water is considered an adulterant and causes an elevated (less negative) freezing point.

7. Titratable Acidity (%TA): Results will be provided for this test. Normal titratable acidity of fresh milk varies from 0.14 to 0.20%. Growth of bacteria that produce lactic acid from lactose increases the %TA. The team should include these test results and possible implications in their oral presentation.

8. Sanitation Swab: When troubleshooting a high PI count, the field representative might conduct swabs of product contact equipment on the farm to determine sanitation effectiveness. For this event, the team will conduct a sanitation swab on a piece of typical product contact dairy equipment. A quick swab test will be used to determine CLEAN/PASS (P) versus DIRTY/FAIL (F). The swab changes color to indicate P or F. Details on conducting the test will be provided on site.

In addition, several pictures of inspection observations will be available for each team to evaluate in relation to the quality of the milk. These observations should be included in the oral presentation.

SAMPLE PROBLEM MQP TEAM EVENT

Teams will be given a table showing results of monthly tests performed on a single dairy farm and will perform the five tests for the fifth month to complete the table. The team will use the completed table to decide whether actions should be taken for violations of any or all of the regulations or industry standards.

Below is a sample table. Teams must perform tests or calculations, fill in the blanks, and then prepare their oral report for presentation to a team of judges.

Test Results for Dairy Farm #335522:

	Test	Month 1	Month 2	Month 3	Month 4	Month 5
1	SPC x 103	20	120	45	350	
2	PIC x 104	3	95	7	75	
3	SCC x 103	100	500	650	750	
4	Temperature	34	36	35	50	37
5	Beta-lactam Antibiotic test	Positive	Negative	Negative	Negative	
6	Freezing Point	-0.530	-0.525	-0.540	-0.516	-0.520
7	Titratable Acidity (%TA)	0.18	0.16	0.21	0.55	0.16
8	Sanitation Swab	Pass	Fail	Pass	Pass	

REMARKS

Numbers below apply to each respective test, top to bottom of the table.

1. In this example the producer would have received a warning letter and one more SPC count above the 100,000/mL limit in month five would cause the producer’s permit to sell Grade “A” Milk to be suspended.
2. Two PIC are elevated and would warrant further investigation.
3. No count is above the SCC limit of 750,000/mL.
4. One temperature at time of milk pickup is in violation of the upper limit.
5. One shipment of milk would have been rejected and subsequently destroyed due to a positive beta-lactam antibiotic test.
6. Three elevated freezing point tests strongly suggest adulteration with water leading to action by the milk buyer.
7. The sample for month four contained an elevated amount of lactic acid indicating bacterial growth. This corresponds with the high temperature noted for that tank of milk.
8. Sanitation swab conducted in month two indicates dirty product contact equipment was found.

PMO REQUIREMENTS FOR RAW MILK

The following information taken from the Grade A Pasteurized Milk Ordinance (current edition), applies to decisions team members will need to make after they have performed the laboratory tests and entered them into the test results form. Data in the test results form will be used to prepare a report for presentation to a team of three industry professionals who will award points based on interpretation of test results and their meanings.

SECTION 6. THE EXAMINATION OF MILK AND MILK PRODUCTS

It shall be the responsibility of the bulk milk hauler/sampler to collect a representative sample of milk from each farm bulk milk tank and/or silo or from a properly installed and operated in-line-sampler or aseptic sampler, that is approved for use by the Regulatory Agency and FDA to collect representative samples, prior to transferring or as transferring milk utilizing an aseptic sampler from a farm bulk milk tank and/or silo, truck or other container. All samples shall be collected and delivered to a milk plant, receiving station, transfer station or other location approved by the Regulatory Agency.

It shall be the responsibility of the industry plant sampler to collect a representative sample of milk for Appendix N. testing from the following:

- During any consecutive six (6) months, at least four (4) samples of raw milk for pasteurization, ultra-pasteurization, aseptic processing and packaging, or retort processed after packaging, shall be collected from each producer, in at least four (4) separate months, except when three (3) months show a month containing two (2) sampling dates separated by at least twenty (20) days. These samples shall be obtained under the direction of the Regulatory Agency or shall be taken from each producer under the direction of the Regulatory Agency and delivered in accordance with this Section.
- Required bacterial counts, somatic cell counts and cooling temperature checks shall be performed on raw milk for pasteurization, ultra-pasteurized, aseptic processing and packaging, or retort processed after packaging. In addition, drug tests for Beta lactams on each producer's milk shall be conducted at least four (4) times during any consecutive six (6) months.
- Whenever two (2) of the last four (4) consecutive bacterial counts, somatic cell count, coliform determinations, or cooling temperatures, taken on separate days, exceed the standard for the milk and/or milk products as defined in this *Ordinance*, the Regulatory Agency shall send a written notice thereof to the person concerned. This notice shall be in effect as long as two (2) of the last four (4) consecutive samples exceed the standard. An additional sample shall be taken within twenty-one (21) days of the sending of such notice, but not before the lapse of three (3) days. Immediate suspension of permit, in accordance with Section 3., and/or court action shall be instituted whenever the standard is violated by three (3) of the last five (5) bacterial counts, somatic cell counts, coliform determinations or cooling temperatures.
- Whenever a drug residue test is confirmed positive, an investigation shall be made to determine the cause, and the cause shall be corrected in accordance with the provisions of Appendix N. of this *Ordinance*.