Milk Quality and Dairy Foods

Revised 6/2022

Purpose and Standards

The purpose of the California FFA Milk Quality and Products Career Development Event is to promote

practical learning activities in milk quality and dairy products while assisting students in developing

team decision-making skills.

The focus of the California FFA Milk Quality and Products CDE is raw milk quality, dairy products, federal

milk marketing orders and attributes of selected milk products. The five general areas that contribute

to milk quality and consumer demand are:

* Milk production.
* Milk and dairy product quality and safety.
* Milk processing or manufacturing.
* Raw milk marketing.
* Facility operations:
	+ Safety/Sanitation
	+ Labor

Fresh raw milk should possess a sweet bland flavor, be free of feed flavors and contain a low number of somatic cells and bacteria. Mixed milk from several cows (herd milk) is expected to contain approximately 3.5 percent milk fat, 3.1 percent protein and 4.8 percent lactose, the main characterizing constituents. Milk is the most important source of calcium in the diet of the average American, supplying approximately 70 percent of the dietary calcium. The production of high-quality raw milk requires the following:

* Clean and healthy cows.
* Equipment that is constructed appropriately from approved materials.
* Proper installation, cleaning, sanitizing and operation of the equipment.
* Rapid cooling of milk in compliance with regulatory requirements.
* Delivery of milk to the processor within 48 hours.
* Prevention of milk adulterants such as water, antibiotics, pesticides, cleaning and sanitizing chemicals, medicinal agents, and any other extraneous materials.
* Application of tests for acceptability of milk.

Students considering a career related to the subject matter in this CDE may wish to consider that persons of the

following groups contribute to the successful production of high-quality milk and milk products:

* Dairy farmers and herd managers manage and milk cows and prepare milk for dealers.
* Field representatives of the buying and/or selling organizations provide advice to producers and promote milk quality for buyers.
* Milk sanitarians enforce public health regulations.
* Food technologists apply chemical, physical, microbiological, and sensory tests to determine the quality and safety of milk and milk products.
* Manufacturers and dealers of dairy equipment supply and service equipment.
* Suppliers of chemicals used in cleaning and sanitizing provide chemicals and advice on proper use.
* Veterinarians treat diseased animals and advise producers on disease prevention.
* Milk plant operators process milk into the finished product for consumers.
* U. S. Food and Drug Administration manages the regulation of grade A milk.
* U. S. Department of Agriculture manages the regulation of manufacturing grade milk and provides grading services to manufacturers of butter, cheese and nonfat dry milk.
* Officials and technicians of the USDA Federal Milk Marketing Orders sample, test and account for milk marketed under federal orders. They also apply regulations to marketing raw milk.
* State departments of agriculture and/or public health manage the public health regulations applied to milk at the state level.
* State dairy extension agents provide advice to dairymen regarding production and sale of milk.
* Accountants and financial advisors with knowledge of the milk industry.
* Dairy food scientists.
* Agricultural economists with a knowledge of milk pricing, exporting and milking procedures of dairy cattle.
* Dairy food nutritionist international marketing specialist with bilingual abilities
* Feed nutritionists.
* Information technologists.
* Milk haulers

Foundation Standards: Academics 1.0; Communications 2.0, 2.1, 2.2, 2.3, 2.5; Career Planning and Management 3.0, 3.1, 3.2; Technology 4.0; Problem Solving and Critical Thinking 5.0, 5.2. 5.3, 5.4; Health and Safety 6.0, 6.2, 6.3; Responsibility and Flexibility 7.0, 7.4; Leadership and Teamwork 9.0, 9.2, 9.6, 9.7, 9.8, 9.9, 9.10, 9.12, 9.13; Technical Knowledge and Skills 10.0, 10.1, 10.2, 10.4; Demonstration and Application 11.0

Pathway Standards: Ag Business Pathway A8.1, A8.3; Agriscience Pathway C1.1, C1.3, C1.4, C1.6, C1.7, C3.1, C3.2, C3.5, C4.1, C4.3, C4.4, C5.1, C5.4, C6.1, C8.1, C8.2C8.3, C9.1, C9.2, C9.3, C9.4, C9.5; Animal Science Pathway D1.0, D2.0, D3.0, D6.0, D9.0, D12.0.

**Objectives**

*This Event Will Provide the Participant With The Ability To Do The Following:*

**Utilize knowledge of milk quality related to:**

1. Producing quality milk:
	1. Regulations
	2. Grades and classes of milk
	3. Factors necessary to produce quality milk
2. Cleaning and sanitizing:
	1. General types of cleaners and sanitizers
	2. Water hardness
	3. Milkstone
	4. Approved milking equipment and design
	5. Proper milking procedures
3. Cooling milk.
4. Identifying diseases transmitted to consumers via milk.
5. Recognizing causes of off flavors in milk.

**Utilize knowledge of milk pricing related to:**

1. Marketing and marketing concepts:
	1. Pricing trends
	2. Economics
	3. Supply and demand
2. Federal milk marketing orders, economics, and distribution:
	1. Transportation costs
	2. Cooperatives
	3. Pricing

**Utilize knowledge of the composition and quality characteristics of raw and pasteurized milk and milk products including:**

1. Nonfat solids portion:
	1. Milkfat
	2. Adulterants, including water
	3. Bacterial standards and testing
	4. Quality testing
2. Understanding the causes and control of mastitis, its influences on milk quality and cheese yield and the use of mastitis detection methods in controlling the disease, specifically including the following:
	1. Causes
	2. Prevention
	3. Detection (California Mastitis Test and Direct Microscopic Somatic Cell Count)
	4. Treatment
	5. Regulatory programs
3. Identification of cheese varieties and characterize properties
4. Identification flavor defects and evaluate milk quality
5. Understanding the importance of dairy food safety programs
6. Identification and comparison of dairy vs. non-dairy products

**Scoring**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Activity** | **Points/Sample** | **Samples** | **Individual Points** | **Team Points** |
| Milk Flavor Identification and Evaluation | 5 pts for flavor defect / 10 points for intensity range  | 10samples | **150** | **600** |
| Cheese Identification | 10 pts/sample | 10samples | **100** | **400** |
| Dairy vs Non-Dairy Identification / Fat % | 6 pts for product identification / 4 pts for fat % | 10samples | **100** | **400** |
| Written Exam | 2 pts / question | 50questions | **100** | **400** |
| **Total Possible Individual Points** | **450** | **1800** |
| **Team Activity** | **390** |
| **Total Points Per Team** | **2190** |

Tie Breaker

If ties occur, the following events, in this order, will be used to determine award recipients:

 Team

1. Team activity
2. Milk identification total score of all team members
3. Cheese identification score for all team members
4. Dairy vs Non-Dairy score for all team members
5. Written exam score for all team members

Individual

1. Milk identification score
2. Cheese identification score
3. Dairy vs Non-Dairy score
4. Written exam score

**Awards**

The winning team of this contest with the highest score will be eligible to represent the state at the National FFA CDE. If the winning team is unable to participate in the national finals, the second-place team may represent California.

**Sub-contest Awards**

Team and individual awards will be given in the following five areas: Milk Flavor Identification, Cheese Identification, Dairy vs Non-Dairy and Fat percentage, Written Exam, and Team Presentation.

Rules

1. Teams will consist of four members.
2. Team ranking is determined by combining the scores of all team participants.
3. All participants must be in FFA Official Dress for this event.
4. Any participant in possession of an electronic device in the event area is subject to disqualification.
5. Prior to the start of the state qualifying finals, the top five coaches representing the previous year’s state qualifying finals will assess/confirm the scoring of the four state qualifying milk classes. Final official scores will be determined by a majority consensus of the top five coaches represented, the CATA approved contest consultant, and the host facility contest chair.

**Event Format**

**Equipment**

1. Approved materials to be provided by the student:
	1. Two no. 2 pencils
	2. Clipboards
	3. Cover sheet (May not have any contest related information on it)
	4. Blank scoresheet to document answers
	5. Bottled water (if desired)
2. Materials provided by the CDE committee:
	1. Scorecard
3. Participants are not to bring these items:
	1. Glass of any kind to the event.
	2. Cell phones, calculators or other electronic devices.
	3. Notes cards, information or other materials related to participation in the contest.

**Flow Of Event**

1. Milk Flavor Identification and Evaluation: 20 minutes
2. Dairy vs Non-Dairy Product Identification: 20 minutes
3. Cheese Identification: 20 minutes
4. Written Exam: 20 minutes
5. Team Activity: Varies based on activities

**Team Activity (390 Points)**

Teams will have to analyze test results representing 5 consecutive months. Team members will work together to determine producer milk acceptability based on data from the following tests.

Examples of acceptability tests include the following:

* Percent TA (acidity)
* DMSCC (Direct Microscopic Somatic Cell Count)
* SPC (Standard Plate Count)
* PIC (Preliminary Incubation Count)
* Antibiotic screening test
* Sample temperature
* Sample freezing point
* Sanitation

Teams will present their test findings, acceptability solution and improvement recommendations to a

panel of judges. Order of participation and presentations will be based upon a random lottery draw. Lottery will take place at the start of the critique following the end of the contest (prior to team activity).

Teams must confirm their participation or non-participation in the team presentation prior to the lottery to assist in creating/confirming the number of time slots. Teams that do not confirm prior to the lottery will be forfeited from the team presentation (“0” score). Teams must be present at their lottery determined start time for the team activity, otherwise they will be forfeited from the team activity (“0” score).

The contest coordinator will designate a time for each team to check in and receive the Team Activity information. Upon receipt of the information by the designated team representative; the 15 minutes preparation time will begin.

Teams will make a 5 minute or less oral presentation (no visual aids) to a panel of two or three judges. Each of the individual judge’s scores will be totaled, added together, and divided by the number of judges to determine each team’s team activity score.

Scoring will be based on a scoring rubric (Located in the Resources section).

Judges will be required to have knowledge and understanding of the data, acceptable parameters, and consequences associated with the test data. The judges for the team activity will be approved by the contest coordinator.

**Team Activity Scoring (390 Points)**

|  |  |
| --- | --- |
|  | Points: |
| Test Indicator (s) Information | 300 |
| Organization/Speaking | 30 |
| Postures, Gestures, and Eye Contact: | 30 |
| Time and all members participating: | 30 |
| Total Points: | 390 |

**Individual Activities – Milk Flavor Identification and Evaluation (150 Points)**

1. Ten milk samples will be scored on flavor defect (taste and odor) using the computerized scorecard.
2. Check only the most serious defect in a sample even if more than one flavor is detected
3. All samples of milk are prepared from pasteurized whole vitamin D milk intended for table use.
4. Milk samples will be 60 degrees F.
5. Only the (tasting) cups provided at the event may be used by contestants.
6. Five points awarded for each defect correctly identified. (50 points).
7. Participants are to use whole numbers when scoring “Defect Intensity.” If no defect is noted, participants should check “No defect” and score as a ten (See Scoring Guide below).
8. 10 points will be awarded for each correctly scored sample (100 points total), one point will be deducted for each space the sample is placed away from the official flavor score.
9. The range score will be determined by subtracting the contestant range number from the official range number to determine the score value.

**Milk Scoring Guide**

*Refer to the current scorecard being used.*

Scores may range from 1 to 10 on a quality basis:

|  |  |
| --- | --- |
| **10** | Excellent (no defect) |
| **8 to 9** | Good |
| **5 to 7** | Fair |
| **2 to 4** | Poor |
| **1** | Unacceptable |

 Example – Milk Flavor

|  |  |  |  |
| --- | --- | --- | --- |
| **Defects** | **Slight** | **Definite** | **Pronounced** |
| **Acid** | 3 | 2 | 1 |
| **Bitter** | 5 | 3 | 1 |
| **Feed** | 9 | 8 | 5 |
| **Flat / Watery** | 9 | 8 | 7 |
| **Foreign** | 5 | 3 | 1 |
| **Garlic / Onion** | 5 | 3 | 1 |
| **Malty** | 5 | 3 | 1 |
| **No Defect** | 10 | 10 | 10 |
| **Oxidized** | 6 | 4 | 1 |
| **Rancid** | 4 | 2 | 1 |
| **Salty** | 8 | 6 | 4 |

*\*Suggested scores are given for three intensities of flavor. All numbers within the range may be used.*

*Intermediate numbers may also be used; for example, a bitter sample of milk may score four.*

**Individual Activities – Cheese Identification (100 Points)**

* Ten cheese samples for identification will be selected from the refence list.
* Cubes of the cheeses will be available for tasting. Note: More than one sample of a given cheese may be used.
* A score of ten points is given for each variety correctly identified. Uncolored cheeses may be used. (100 points possible)

**Cheese Reference List**

|  |  |  |
| --- | --- | --- |
| Blue / Bleu | Gouda / Edam | Processed American |
| Brie | Gruyere | Provolone |
| Cheddar Mild | Havarti | Queso Fresco |
| Cheddar Sharp | Monterey Jack | Ricotta |
| Colby | Mozzarella | Romano |
| Cream | Muenster | Swiss |
| Feta | Parmesan |  |

**Individual Activities – Product Identification – Dairy vs Non-Dairy** **(100 Points)**

1. A total of 10 samples consisting of dairy and non-dairy products will be identified and assigned a
2. milk-fat content score.
3. A score of six points is given for each correct product identified.
4. A score of four points is given for each correct fat content identified.
5. The following products may be included among the samples:
6. Dairy Products: nonfat (skim) milk (.05%), lowfat milk (1.0%), reduced fat milk (2%), milk (3.25%), half and half (10.5%), butter (80%), sour cream (18%), flavored milk (0.05%–.5%, 1%-2%, 3.25%-3.5%) light whipped cream (30%), heavy cream (36%).
7. Non-Dairy Products: margarine, non-dairy creamer, non-dairy sour cream, non-dairy milk, nondairy flavored beverage and non-dairy whipped topping. All of these are to be categorized as non-dairy fat.

**Individual Activities – Written Exam (100 Points)**

1. Contestants shall complete a 50-question multiple choice exam based on a 200-question test bank.
2. Test bank exam questions and answer key are available for download via the California FFA Association and/or CATA Curricular Code website.
3. California FFA Milk Quality and Dairy Foods CDE Test Bank will be created and approved by the “Top 5” California Milk Quality and Dairy Foods team coaches every five years between June 1st and December 31st of the fifth calendar year cycle for use beginning January 1st of the new five-year cycle. Yearly cycles are 2020-2024, 2O25-2029, and 2030-2035.
4. Test bank generated questions will utilize resources that include past/recent National FFA Organization’s Milk Quality and Dairy Foods exam questions, other state current Milk Quality and Dairy Foods test banks.
5. Four points awarded for each question answered correctly

**References**

This list of references is not intended to be all-inclusive. Other sources may be utilized, and teachers are encouraged to

make use of the very best instructional materials available. The following list contains references that may prove helpful

during event preparation.

* National FFA National Career Development Event Questions and Answers, FFA.org, Event Resources, Past exams and practicums

• Dairy Foods: Producing the Best, Dr. Robert Marshall; Instructional Materials Laboratory, https://ffa.box.com/Dairy Foods booklet

• The Dairy Practices Council: Guidelines, www.dairypc.org

#21 – Raw Milk Quality Tests

#24 – Troubleshooting High Bacteria Counts of Raw Milk

#38 – Preventing Off-Flavors in Milk

#71 - Prevention of and Testing for Added Water in Milk

#98 – Milking Procedures for Dairy Cattle

• Pasteurized Milk Ordinance, https://www.fda.gov/media/114169/download

 Section 1. Definitions

Section 6. The Examination Of Milk and/or Milk Products

Section 7. Standards for Grade “A” Milk and/or Milk Products

Item 15p. Protection from Contamination

Appendix E. Examples of 3-Out-Of-5 Compliance Enforcement Procedures

Appendix G. Chemical and Bacteriological Tests

Appendix K. HACCP Program

Appendix N. Drug Residue Testing and Farm Surveillance

• NOTE: In the document, items followed by a “P” referred to the Pasteurized side while items followed by an “R” refer to the Raw side.

• Code of Federal Regulations Title 21, Part 133 – Cheeses and Related Cheese Products,

<http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?CFRPart=133>

• Code of Federal Regulations Title 21, Part 131 – Milk and Cream,

<http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?CFRPart=131>

• Swab Procurement: Hygiena PRO-Clean Rapid Protein Residue Test. 25 of the swabs come in a sealed aluminum

foil envelope. <https://www.hygiena.com/food-and-beverage-sales/united-states.html>. Web site that a teacher can resource to obtain the sanitation swabs (Hygiena PRO-Clean Rapid Protein Residue Test), obtain a product

brochure, and watch a video demonstration on use of the swabs. Updated for 2019. [https://www.hygiena.com/proclean-food-and-beverage.html](https://www.hygiena.com/pro%20clean-food-and-beverage.html). Another possibility is to contact a local dairy processing plant laboratory and ask the lab tech if they would either have some available or be able to order them for the school

* California FFA Milk Quality and Dairy Foods CDE Test Bank

**Resources**

* General (Acceptable) Milk Parameters

Bacteria Counts <100,000/mL

 Somatic Cell Count <750,000/mL

 PIC Count <50,000-100,000/mL

 (industry goal is less than 3 – 4 times the SPC)

Temperature 0◦C - 7.0◦C

 32◦F - 45◦F.

 Antibiotics Negative (-)

 Freezing Point -0.530◦H and -0.566◦H

 Titratable Acidity 0.13% to 0.17% (up to 0.20% acceptable)

 Sanitation Swab Clean / Pass

**California Milk Quality and Products Team Activity Rubric Team: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Indicators** | **Very Strong Evidence 15 – 11 points** | **Moderate Evidence Present****10 – 6 points** | **Strong Evidence Not Present****5 – 0 points** | **Points Earned** | **Scoring****Weight** | **Total Score** |
| Bacteria Count | Team clearly identified the test and the results outside of the standards and explained the consequences of the violations. | Team was marginal in identifying the test and results outside of the standards and/or explaining the consequences of the violations. | Team did not identify the test and/or results outside of the standards and/or explain the consequences of the violations. |  | **X 3** |  |
| Preliminary Incubation Count (PIC) | Team clearly identified the test results outside of the standards and explained correlation with bacteria count. | Team was marginal in identifying the test results outside of the standards and explained correlation with bacteria count. | Team did not identify the test results outside of the standards and explained correlation with bacteria count. |  | **X 1** |  |
| Somatic Cell Count | Team clearly identified the test and the results outside of the standards and explained the consequences of the violations. | Team was marginal in identifying the test and results outside of the standards and/or explaining the consequences of the violations. | Team did not identify the test and/or results outside of the standards and/or explain the consequences of the violations. |  | **X 3** |  |
| Temperature (°F) | Team clearly identified the test and the results outside of the standards and explained the consequences of the violations. | Team was marginal in identifying the test and results outside of the standards and/or explaining the consequences of the violations. | Team did not identify the test and/or results outside of the standards and/or explain the consequences of the violations. |  | **X 3** |  |
| Antibiotic Test | Team clearly identified the test and the results outside of the standards and explained the consequences of the violations. | Team was marginal in identifying the test and results outside of the standards and/or explaining the consequences of the violations. | Team did not identify the test and/or results outside of the standards and/or explain the consequences of the violations. |  | **X 3** |  |
| Freezing Point (°H) | Team clearly identified the test and the results outside of the standards and explained the consequences of the violations. | Team was marginal in identifying the test and results outside of the standards and/or explaining the consequences of the violations. | Team did not identify the test and/or results outside of the standards and/or explain the consequences of the violations. |  | **X 3** |  |
| Titratable Acidity (%) | Team clearly identified the test and the results outside of the standards and explained the consequences of the violations. | Team was marginal in identifying the test and results outside of the standards and/or explaining the consequences of the violations... | Team did not identify the test and/or results outside of the standards and/or explain the consequences of the violations. |  | **X3** |  |
| Sanitation Swab | Team clearly identified the test and results outside of the standards and explained purpose of test. | Team was marginal in ID of the test results outside of the standards and explained purpose of test. | Team did not identify the test results outside of the standards and explained purpose of test. |  | **X 1** |  |
| Organization / Speaking | Presentation was well-thought, organized, easy to follow, and articulately spoken. | Presentation was marginally well-thought, organized, easy to follow, and articulately spoken. | Presentation was not well-thought, organized, easy to follow, and articulately spoken. |  | **X2** |  |
| Posture, Gestures, and Eye Contact | Confident posture. Hand motions natural/expressive. Strong eye-contact. | Confident posture, mannerisms, eye, contact, and body language most of the time. | Lacked positive body language. Hand motions distracting. Occasionally looked elsewhere. |  | **X2** |  |
| Time / All Members Participated | All members took an active role in the presentation. Presentation was 5 minutes or less. | Three team members took and active role in the presentation. Presentation was over 5 minutes. | Two or less team members took an active role in the presentation. Presentation was over 5 minutes. |  | **X2** |  |

**Judge #** (circle one) **#1 #2 ` #3 Total Points \_\_\_\_\_\_ / 390**

* Sample Team Activity Data Sheet

**Sample Milk Quality and Products Team Activity – Data**

Test Results for Dairy Farm #442255

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Test** | **Month 1** | **Month 2** | **Month 3** | **Month 4** | **Month 5** |
| Bacteria Count x 103 | 50 | 40 | **120** | **325** | 95 |
| Preliminary Incubation Count x 104 | 5 | 5 | 10 | **70** | 9 |
| Somatic Cell Count x 103 | 100 | 100 | **600** | **740** | **800** |
| Temperature (°F) | 38 | 40 | 40 | **50** | 38 |
| Antibiotic Test (+/-) | **+** | - | - | - | - |
| Freezing Point (°H) | -0.530 | **-0.516** | -0.5240 | -0.530 | -0.538 |
| Titratible Acidity (%) | 0.15 | 0.16 | 0.17 | **0.40** | 0.21 |
| Sanitation Swab | Pass | Pass | Pass | **Fail** | Pass |

**BOLD** are violations (exceeds parameters) – Violations will NOT be bolded for contest

Contestants will be given similar data chart without the violation numbers/data being in “bold”.

Teams will need to research/identify consequences for violations for presentation (see References).

Sample Team Activity Start/Presentation Time Sheet

|  |  |  |
| --- | --- | --- |
| **Team** | **Data Review Start Time** | **Presentation Time** |
| Team 1 | 10:30 am | 10:45 am |
| Team 2 | 10: 40 am | 10:55am |
| Team 3 | 10:50 am | 11:05 am |
| Team 4 | 11:00 am | 11:15 am |
| Team 5 | 11:10 am | 11:25 am |
| Team 6 | 11:20 am | 11:35 am |
| Team 7 | 11:30 am | 11:45 am |
| Team 8 | 11:40 am | 11:55am |
| Team 9 | 11:50 am | 12:05 pm |
| Team 10 | 12: 00 am | 12:15pm |
| Team 11 | 12:10 am | 12:25 pm |
| Team 12 | 12:20 am | 12:35 pm |
| Team 13 | 12:30 am | 12:45 pm |
| Team 14 | 12:40 am | 12:55 pm  |
| Team 15 | 12:50 am | 1:05 pm |