Chapter 4
Dairy Products Evaluation Competitions

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4.1 Introduction

Scorecard judging is a useful and practical tool for conducting the sensory evaluation of dairy products. Scorecards contain standard terminology, which is associated with established sensory descriptors that are described in subsequent chapters of this book. Scorecards have serves as recording instruments for various county, state, regional, and national dairy product evaluation competitions. Completed scorecards may serve as records for processing plants, for routine and/or official grading of dairy products, and for commercial dairy processors to receive feedback on products entered in contests.

A scorecard is best defined as a tabulated list of the factors that contribute to, or describe, the quality of a product, with a numerical value assigned to each factor. The factors are generally arranged on a scorecard in alphabetical order and oftentimes are categorized. For instance, the flavor attributes are commonly grouped; an alphabetized list of body and texture attributes is typically grouped; appearance and color attributes are also grouped, with or without consideration of packaging.

Obviously, a scorecard for one product (e.g., milk) reads quite differently from a scorecard for another product (e.g., yogurt) due to the inherent properties and differences in the various products. A so-called ideal product is designated as a "perfect" score, which may be scored as "100," or "10" or another preset number. For instance, the "ideal" flavor scores on Collegiate Dairy Products Evaluation Contest scorecards are based on a score of "10"; body and texture and appearance and color scores are based on an ideal of "5." In contrast, in the American Cheese Society Judging and Competition, a perfect score includes the combination of an "aesthetic judge" score of 50 and a "technical judge" score of 50, for a total of 100.

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U.S. Department of Agriculture
Bureau of Dairy Industry
ScoreCard for Milk and Cream
(Approved by the American Dairy Science Association)

Place _____
Class _____ Exhibit no. _____

	Perfect score	Score allowed	Remarks
Bacteria	45		Bacteria found per cubic centimeter
Flavor and odor	25		Cowy, bitter, feed, flat, strong, cooked
Sediment	10		
Temperature (street samples) or acidicity (prepared samples)	15		Degrees or percent
Bottle and cap	5		Bottle Cap
Total	100		

Exhibitor _____
Address _____
Signed _____
Date _____

Fig. 4.1 A reproduction of the US Department of Agriculture Scorecard for Milk and Cream. (Clark & Costello, 2009)

Deviations in quality from the ideal result in demarcations on the scorecard and demerits in the total score. In some instances, these scorecards may include data from instrumental, microbiological, and/or sensory analytical techniques (Fig. 4.1). Additionally, more detailed scorecards may be used to evaluate dairy plant processing and sanitation practices or to more objectively determine product quality and/or shelf life. Although scorecards that include such data can comprehensively present or represent the relative quality of products, product compositional analysis protocols do not lend themselves to completion within a singular time period. Thus, "abridged" or student scorecards, which only include sensory analysis assessments, can provide meaningful sensory quality data in a single seating (Nelson & Trout, 1951).

There are two main types of dairy product evaluation competitions: (1) those that reward dairy manufacturers for outstanding dairy processing and (2) those that reward student judges for their accurate sensory evaluation of dairy products, as compared to an expert judging panel. This chapter is devoted to describing various US Cheese Competitions (the former) and Collegiate Dairy Products Evaluation

Contests (the latter). This chapter is not an exhaustive summary of all the various dairy product contests and sensory evaluations that take place in the USA and the world each year. Readers should gain a greater understanding and an appreciation for what preparation, knowledge, and application of developed skills goes into the training, organizing, and competing successfully in dairy products evaluation competitions, as well as what steps are involved in conducting a dairy products judging or competition.

4.2 Dairy Products Grading and Scorecard Evaluation

The official grading of dairy products did not commence until the latter part of the nineteenth century. Establishment of product grades (with their attendant scorecards), as well as standards for respective dairy products, paralleled quite closely the technical growth of the dairy industry and development of dairy product markets. Because consumers rely so heavily on sensory perceptions when purchasing products, evaluation and grading of dairy products is important if processors intend to satisfy consumer desires. As early as the 1920s, Kelly and others (1929) touted the benefits of milk and cream contests by stating, "The dairyman who furnishes a product of high quality is rewarded by recognition of his service, and the dairyman of less careful habits is spurred to greater endeavor. In extreme cases those who insist on producing an inferior product are eliminated, for consumers are more discriminating when they become better informed about milk qualities."

The scorecard used in the early twentieth century, developed by the US Department of Agriculture (USDA) and approved by the American Dairy Science Association (ADSA), included consideration of bacteria, flavor and odor, sediment, temperature, acidity, and the appearance of the bottle and cap or closure. A perfect score was assigned 100. A reproduction of this scorecard, minus the scoring directions, is included in Fig. 4.1. Today, industry compliance with Grade "A" standards, defined in the USPHS/FDA *Grade "A" Pasteurized Milk Ordinance* (USFDA, 2019), essentially eliminates the need for scorecard evaluation of bacteria, sediment, temperature, and acidity. Milk quality evaluation focuses on flavor attributes. Examples of contemporary scorecards that are used to evaluate dairy products and the attributes associated with those products are included in Chaps. 5, 6, 7, 8, 9 and 10.

The beginning of the twentieth century marked the establishment of brands and trade names for dairy products, particularly butter and cheese. This development necessitated a set of quality standards recognized by manufacturers, and the subsequent need for the grading of finished products by experienced, competent, and consistent judges. Officially assigned USDA product grades, attached to many private labels, enjoy prominent significance when seen on butter, cheese, and nonfat dry milk.

While dairy products can be analyzed for chemical composition, microorganisms, vitamin content, enzymatic activity, color, physical properties, etc., these

determinations do not measure the true or actual eating quality or sensory perceptions realized by consumers. Establishing the so-called eating quality of a dairy product requires the application and "correct" interpretation of such sensations as mouthfeel, taste, and aroma. The alert consumer experiences components of flavor (taste, aroma, and mouthfeel) when the product is taken into the mouth. While two samples of butter may have identical basic chemical composition, color, firmness, and spreadability, one sample may be highly relished by consumers, while the other product may leave a poor impression due to characteristics of flavor not observable by routine chemical tests. Thus, grading and scorecard judging have a critical role in the dairy industry. Although the essential parameters that constitute the eating quality of dairy products cannot be easily measured chemically or physically, they can be determined using sensory evaluation techniques, such as those used by competent judges or trained panelists (Bodyfelt, 1981; Bodyfelt et al., 1988).

Milk producers, who are partners with dairy product manufacturers in establishing a demand for uniform-quality dairy products, recognize that *dairy products cannot be of higher quality than the raw material from which they are made* (Bodyfelt, 1980, 1983; Bodyfelt et al., 1988). Without definite knowledge as to what constitutes desirable appearance, flavor, body, and texture attributes in finished products, the successful production of high-quality raw material can be challenging. Knowledge about origins of certain off-flavors and various desirable flavors plus specific methods to minimize or eliminate objectionable off-flavors should enable the production of milk (Gamroth & Bodyfelt, 1980) and milk products suitable for inclusion in high-quality finished products, which should ultimately influence dairy product sales. The increased sales of dairy products depend upon the production and distribution of high-quality foods that impart a delicate and balanced, pleasant flavor sensation to consumers' palates.

The contests described in this chapter all have one goal in common: to promote excellence in dairy manufacturing. The scorecards used in the Collegiate Dairy Products Evaluation Contest have been developed and fine-tuned by hundreds of academic and industry experts over a period of 100 years. Although designed for six different dairy products (detailed in Chaps. 5, 6, 7, 8, 9 and 10), the commonality among the scorecards is their ability to communicate deviation from a standard or ideal product concept. Students properly trained for the Collegiate Dairy Products Evaluation Contest gain skills to enter the dairy industry while possessing the tools not only to evaluate product quality but also to remedy deviations from standard quality parameters.

It is important to stress that scorecard judging involves assessment compared to a standard or ideal product concept. A product sample that is assigned the highest score in the Collegiate Dairy Products Evaluation Contest cannot be guaranteed to attain the greatest sales in the market. For instance, light-oxidized milk has become quite common in the marketplace because of the convenience, product visibility, and cost savings of high-density polyethylene (HDPE) milk containers. Most of the clear or transparent plastic milk containers used in the marketplace (with the exception of H. P. Hood's LightBlock® and some other examples of light-protective containers) permit transmission of ultraviolet light through the packaging material, thus

initiating both light oxidation and vitamin degradation. Light contributes to partial loss of vitamins A, riboflavin (B_2), C, D, and some amino acids (Bradley Jr. 1980; Bradley et al., 2006). With the passage of time, a majority of US consumers have thus become accustomed to this particular milk flavor, and they do not generally consider this as a flavor defect. Compared to an assigned score of "10" for ideal milk, a declared light-oxidized milk receives a score of "6" or lower in the Collegiate Dairy Products Evaluation Contest. Nonetheless, more US consumers drink packaged milk from translucent HDPE containers (that presumably have some degree of light oxidation) than any other packaged form of milk in the marketplace.

Surprisingly and unfortunately, some cheese judges, upon the mere detection of a sulfide note in a medium-aged Cheddar cheese, downgrade the sample, since it tends to possibly deviate from the expected mild nutty character. However, many consumers would actually select a sulfide-containing cheese over another cheese devoid of such character. This is where a "balance of reason" needs to occur; once a given Cheddar cheese achieves a certain point of maturity (e.g., aging), it is generally expected to exhibit some degree of "flavor complexity," compared to a mild cheese. Medium-aged Cheddar's expected flavor intensity typically includes flavor notes such as nutty-like, modest acidity, diacetyl and other carbonyls, and hopefully a hint or more of a sulfur-like aroma in the end.

The American Cheese Society Judging and Competition and other dairy product contests combine technical and aesthetic judging to determine award-winning products. As will be described later, technical judges subtract points for defects, while aesthetic judges add points for features that may help sell the product. While scorecard judging in the Collegiate Dairy Products Evaluation Contest involves only the use of numerical scores, the evaluation forms used in other dairy product competitions contain spaces for feedback in addition to numerical scores. The American Cheese Society Judging and Competition and other dairy product contests are designed to recognize excellence and encourage processors to improve.

Ultimately, consumers are the judges, not necessarily of dairy product quality, but of what they like, and they make their final judgment when they exchange money for a product. Nevertheless, recognition of superior quality from some contests is sometimes noted on the product label or other promotional material and may permit the manufacturer to eventually achieve a higher price for a product. On the other hand, some state- and regional-based contests prohibit the use of any contest or product evaluation "results" or "winnings" within any form of packaging, promotions, advertising of any form (e.g., the Oregon Dairy Industries Association).

4.3 The Collegiate Dairy Products Evaluation Contests

In 1916, the first National Collegiate Dairy Products Evaluation Contest was held in Springfield, MA. That year, butter was the only product evaluated because of its commercial importance at that time. Milk and Cheddar cheese were added to the

1917 competition, and vanilla ice cream, cottage cheese, and strawberry yogurt gained inclusion in 1926, 1962, and 1977, respectively.

Since 1916, over 95 Collegiate Dairy Products Evaluation Contests have been held throughout the USA and Canada (contests were not held in 1918, during WWII, 1942–1946, or 2020–2021). Although the number of team competitors is limited by official rules, many schools train more students than can officially participate in the competition each year. Thus, while over 3000 students have participated since the inception of the contest, many times that number have undertaken and received this valuable dairy product evaluation training. The record year for greatest college participation in the contest was in 1956, when 33 colleges and universities entered student teams. During the nearly 100 national contests conducted, over 65 different schools have participated (Table 4.1), with an average of 18 schools per contest. In

Table 4.1 Teams that have participated in the Collegiate Dairy Products Evaluation Contest, between 1916 and 2022

Aims Community College	Iowa State U.	Oregon State U.
Alabama A & M U.	Kansas State U.	Pennsylvania State U.
U. of Alberta (Canada)	U. of Kentucky	Purdue U.
Alfred U.	Laval (Canada)	Quebec (Canada)
U. of Arizona	Louisiana State U.	U. of Rhode Island
U. of Arkansas	U. of Manitoba (Canada)	Rutgers U.
Auburn U.	U. of Maryland	San Francisco Univ. at Quito (Ecuador)
Brigham Young U.	U. of Massachusetts	South Dakota State U.
U. of California (Davis)	Michigan State U.	Southern Illinois U.
U. of California (Fresno)	Middle Tennessee State U.	U. of Tennessee (Knoxville)
California Polytechnic State U.	U. of Minnesota	Tennessee State U.
Clemson U.	U. of Missouri	Texas A & M U.
College of the Sequoias	Modesto Junior College	Tuskegee U.
Colorado State U.	Moraine Park Tech. Institute	Utah State U.
U. of Connecticut	Nanjing U. (China)	U. of Vermont
Cornell U.	U. of Nebraska	Virginia Tech
U. of Delaware	U. of New Hampshire	Virginia State U.
U. of Florida	U. of New Mexico	Washington State U.
Florida State U.	North Carolina State U.	U. of West Virginia
The French National Dairy College (France)	North Carolina Agri. & Tech. State U.	U. of Wisconsin (River Falls)
U. of Georgia	Northwest Missouri State U.	U. of Wisconsin (Madison)
U. of Guelph (Canada)	The Ohio State U.	U. of Wyoming
U. of Idaho	Oklahoma State U.	
U. of Illinois	U. of Orange Free State (South Africa)	

addition to the cooperation of college and university faculty and students, 125–150 dairy industry companies participate in and support the contest each year by donating, transporting, and storing dairy product samples; providing employees as official contest judges, proctors, and scorers; and donating the required supplies and space. This contest requires a great deal of planning, organizing, coordination, staffing, appropriate facilities, and product samples preparation.

Throughout the years, some regions of the country have held and conducted regional (eastern, western, southern, and midwestern) contests prior to the National Collegiate Dairy Products Evaluation Contest. Of these regional contests, only the Midwest Regional Contest survives. The Midwest Regional Collegiate Dairy Products Evaluation Contest is typically held 1 or 2 weeks before the national contest.

For decades, the National Collegiate Dairy Products Evaluation Contest took place in the fall. Since 2017, the contest has been held in the spring, alternating between Milwaukee and Madison, WI. College students judge the quality of dairy products in six product categories: butter, Cheddar cheese, cottage cheese, vanilla ice cream, milk, and strawberry Swiss-style yogurt. Originally raw whole milk was evaluated, then pasteurized whole milk, and now 2% fat pasteurized milk is evaluated, based upon its dominance in the marketplace. For cottage cheese and yogurt, the fat contents of the products have evolved from only their full-fat versions to include a range of low, reduced, and full-fat versions in the contest. Yogurt also allows with natural and/or high-intensity sweeteners, as well as Greek-style yogurt.

According to the official rules of the contest, "Any undergraduate student of a land-grant, state or provincial agricultural college or a college of corresponding rank who: (a) is regularly matriculated in a program leading to a Bachelor of Science degree or its equivalent; (b) has never competed in the Collegiate Dairy Products Evaluation Contest as a contestant or alternate; (c) has never acted as an official judge of dairy products; and (d) has not taught the manufacturing of or the judging of dairy and other food products, is eligible to compete in the contest." Three students from any one college or university constitute a team. Students from credit-transferable 2-year agricultural colleges are also eligible, provided they meet the criteria in (b), (c), and (d). One or two additional undergraduate or graduate students from a school may compete if they meet the criteria, but compete for individual, not team, awards. Additionally, on occasion, study-abroad students participating in collegiate dairy products judging training have been allowed to compete in the contest representing their international institutions.

The first butter judging contest was sponsored by the National Dairy Association. Between 1930 and 2005, the major sponsor of the Collegiate Dairy Products Evaluation (CDPE) Contest was either the Dairy and Food Industry Suppliers Association (DFISA) or the International Association of Food Industry Suppliers (IAFIS) Foundation. Beginning in the 1980s, the IAFIS Foundation became the only association to financially sponsor the contest teams, by providing a generous stipend to each team to offset travel expenses for student competitors. Since the turn of the twenty-first century, however, awards have been provided to top individuals and top placing colleges and university teams, by numerous industry donors,

including but not limited to Agrana Fruit US, Inc.; Cheese Market News; Chr. Hansen, Inc.; Dairy Foods; Danone Wave; Edlong; FairLife LLC; Idaho Milk Products; Nelson Jameson; Pecan Deluxe; Tate & Lyle; United States Department of Agriculture; Wisconsin Cheesemakers Association; and Wisconsin Dairy Products Association.

In 2015, the CDPE Contest Board of Directors was established to conduct the business of ensuring sustainability of the CDPE Contest. Formerly, governance was regulated by a standing committee of the American Dairy Science Association. The CDPE Contest Board of Directors guides "strategic development, [is] responsible for the overall public image of the contests or events and strive[s] to enhance working relationships between educational institutions and dairy industries and industry professionals." The CDPE Contest Board of Directors is composed of no more than 15 members, who serve for 3-year terms and with a limit of two consecutive terms. Members include four coaches, five judges, and four industry representatives. The contest superintendent is an ex officio member. Financial management is overseen by the National Dairy Shrine Executive Director.

The CDPE Contest Coaches Committee is responsible for the contest rules and overall policy for conducting the contest. The Coaches Committee develops and revises the official scorecards for the contest. The committee is also responsible for any modifications to the scoring guides.

Prior to 2018, upon completion of each session of the contest, contestant scorecards were turned over to the contest superintendent, who worked with industry volunteers to enter the scorecard results into the official electronic reader. Specially printed, "scanner-ready" scorecards were used, in which contestants filled in drawn "bubbles" to indicate their assigned numerical scores and selection of flavor, body and texture, and color/appearance characteristics per each product sample judged per category. Each scorecard was scanned, and a computer using software written specifically for the contest captured each contestant entry. Now, software has been designed that enables tablet usage. The program effectively computes both individual and team results according to the official contest rules and generates a ranking of individuals and teams from the lowest composite score to the highest. A team of contest officials carefully verifies scores and checks for potential ties and ascertains that the scoring software has broken the possible ties according to the official rules. Individual scores, along with team scores, are returned to each competing team at the conclusion of the awards ceremony.

Since the early days of the contest, the USDA Agricultural Marketing Service (AMS) has typically supplied the superintendent of the contest. The contest superintendent is responsible for organizing the official judges, making arrangements for on-site sample storage and distribution, maintaining current mailing lists for officials and universities, and mailing the scoring guides and team forms to the various possible participating schools, tabulating scorecards, and developing and delivering results for the annual awards program.

The Collegiate Dairy Products Evaluation Contest is typically a 2- or 3-day commitment. Day 1 generally involves travel to the contest site by teams and the Coaches Committee meeting. Day 2 is the day of the contest and awards announcements.

Day 3 may include attending the WCMA Cheese Conference and/or travel home. Contest sites have included the headquarters complex of large national or regional dairy processors (Land-O-Lakes, Publix, Safeway, and H.E.B. Grocery) and dairy convention or meeting sites ranging from Lakeland, FL, to San Francisco, CA, in the USA, to Montreal (1975 and 1989) and Toronto (1998) in Canada. The contest has been held in conjunction with the World Wide Food Expo (1979–2005) or the Pack/Process Expo (2006) in Chicago, IL. Currently, the contest is held in conjunction with WCMA's alternating between WCMA's Milwaukee Cheese Expo (even years) and WCMA's Madison Cheese Con (odd years). The contests and student teams are supported largely by the WCMA, the USDA AMS, and dozens of other donor companies and individuals.

Team coaches must be aware of some important rules before even entering a team into the national or a regional contest. Rules and entry forms are sent to institutions at least 1 month prior to the contest, and entries are due to the contest superintendent not later than 3 weeks before the contest. Eligible institutions may enter as few as one student to as many as seven students. No more than seven students per school are allowed to participate in the contest (i.e., a maximum of three undergraduates, two graduates, and two alternates).

Coaches and students must be informed of the rules. For instance, contestants are only allowed to take a cheese/butter trier and sheath, fanny pack, cup (if desired), clipboard, and black lead # 2 pencils into the contest. Students are not allowed to identify or reflect their respective school affiliations in any way, nor are they allowed to carry bottled water or palate cleansers into the contest. Furthermore, contestants are not allowed to use or apply strong aromatic perfume, cologne, shaving lotion, etc., which could readily interfere with the sensory evaluation of the products. Additionally, the use of cellular phones, paging, and/or internet devices, including PDAs, is strictly prohibited.

The Coaches Committee meeting is held on the day before the contest, in order to disseminate and discuss information related to the current-year contest procedure. Additionally, future contest sites and potential changes to contest rules or scorecards are discussed. The Coaches Committee meeting is attended by contest officials, university team coaches, and official judges. Contest officials, board members, contest superintendent, and proctors may also participate. Official and associate judges are selected by the contest superintendent from one or more commercial dairy enterprises or other impartial (i.e., government) entities.

Head judges of each category contact potential donors for products to be evaluated by student contestants. Products (at least eight different products for each of the six categories) are donated by commercial dairy processors. The processors do not receive awards for high scoring entries, as that is not the intention of the competition, and scores on products are not typically shared with the donors. Some lead judges share official product scores with donors after they have been coded for privacy – the given donor would only ascertain their code to see how their product(s) scored. Identities of other products remain secret. The products are stored under appropriate refrigeration or frozen conditions at one or more dairy processing facilities local to the contest site.

The Collegiate Dairy Products Evaluation Contest is a carefully coordinated event. Official judges of the contest are established industry experts in the product category. Some regional judges also participate in the national contest. However, it is required that judges may not judge the same category in the regional and national contests. All six products are evaluated by at least two, but generally three, judges per product: a head judge and one to two judges. Official judges initially rate each product set without input from coach judges and/or coach observers (described later). Official judges typically evaluate 10–12 different products per category so that the most representative or the most interesting may be selected for the contest. The official judging occurs 1 day prior to the student contest.

On the day of the contest, "coach judges" and "coach observers" arrive early (i.e., 6:45 or 7 am) at the contest site to review the official judges' evaluations. Coach judges and coach observers are university team coaches. Coach judges and official judges evaluate the products along with the official judges, consult with one another, and meet consensus about product attribute and scores on all eight product samples entered into a given product category. The coach judges (typically ~3 for each contest product) and coach observers (typically 1 for each contest product) are invited to evaluate the set of products. If there is disagreement about either a product attribute or score, the all products judge or contest superintendent is called to serve as a referee. If the particular disagreement cannot be rectified, the lead official product judge will then replace the sample(s) in question by another sample(s) for which there is agreement. The additional responsibilities of the all products judge are to examine all products set out for the contest, noting whether (a) the products selected fairly represent the different sections of the country; (b) the set of samples constitute a good, representative class for student judging; and (c) the products are appropriately judged.

Official scorecards are filled out for each of the six product sets and signed by official judges and coach judges. These six official scorecards are entered into the computer system as the official scores against which all students' product evaluations are compared and scored (graded). While coach judges can be considered as calibrators of the official judges, coach observers may be considered as apprentices. Coach observers are individuals who may have little experience at the contest; hence, they basically observe the "official scoring" process, in preparation for future contests when they most likely will serve as coach judges.

Meanwhile, student teams meet in assembly with the contest superintendent; contestants and alternates are assigned a contestant number and a group number, are reminded of the contest rules, and are informed of any pertinent or limiting venue, location, or site circumstances. The contestants are divided into six approximately equal groups (since there are six contest products) and informed of the progression of judging by assigned group. Contestants are given iPads, with unique identifiers, to record judgments electronically.

At about 8:00 a.m., contestants are ushered into the contest arena, group by group. Contestants are directed to be seated in chairs that are arranged in general proximity to the tables that contain the contest products. Individual products per category are arranged in sets of eight, within six distinct areas or regions in the

contest arena. Contestants are not allowed to commence judging until directed to do so.

For contestants, there is no preset judging order, and the order of judging cannot be predicted, since the product sample display tables and freezer cabinet(s) are set up based upon convenience and/or efficiency, as the contest site may change annually. Ice cream cabinets must be near outlets, while temperature-sensitive yogurt, milk, and cottage cheese are set up in close proximity to refrigerated units hidden behind curtains or walls. Since butter and Cheddar cheese samples are not replenished during the contest, these products can be placed at any non-utilized location within the contest arena. Additionally, student contestants are randomly assigned to groups and are allowed no preference for a starting (or ending) product.

Contestants are allowed 35 min for scoring each product category. Each contestant criticizes, scores, and follows the marking instructions on the computer scorecard in the proper places. A 10-min notice or warning is given prior to the close of each given scoring period. After completion of the judging of each product category, students are directed to return to pre-arranged seats. Students are allotted 2 min to check entries or fill in omitted scores. After the designated time interval has elapsed, students are directed to rotate clockwise to the next product. A 5-min rest period is allowed between the judging of each product. Strictly enforced is the rule that no communication among any contestants is to occur during the contest or the 5-min rest periods. The process continues as described until all six sets of eight samples have been evaluated by all groups of contestants.

All products in each product category selected for evaluation in the competition are labeled clearly with consecutive numbers (1–8). Any markings on the containers that might indicate quality or brand identity are either removed or otherwise blocked from view of contestants and observers.

In the case of milk, for each judging period, fresh 2% milk samples are set out at a temperature of 10 °C (50 °F) at the time of scoring. A new set of milk samples is used for each of the six rotating teams of contestants. Milk is evaluated only for "flavor."

The official ice cream lead judge assures that the ice cream is tempered properly for dipping prior to the start of competition. The generally advised temperature (optimum) range for sampling ice cream is −18 to −15 °C [0–5 °F] (Bodyfelt et al., 1988), but it can be a logistical challenge to maintain this temperature throughout the competition. A more practical, feasible, or likely upper limit for ice cream sampling is <−13.3–12.2 °C (≤8–10 °F). In spite of the best efforts of the official judges, precise temperature maintenance of the frozen samples within the aforementioned ranges across the duration of the contest can be a struggle. The ice cream samples must be scooped by individual contestants, who are expected to not leave the scoop in the ice cream after sampling.

Butter and Cheddar cheese are generally provided as 40-pound blocks (Fig. 4.2). Samples are tempered to 7.2–13.2 °C (45–55 °F) immediately preceding the contest. Butter is evaluated only for "flavor." Butter blocks are sectioned off into 1/sixth partitions to enable every set of students to evaluate the same product without opening a new (and potentially different) block of butter. For each contestant group, a

Fig. 4.2 Student contestants evaluate butter quality in a Collegiate Dairy Products Evaluation Contest

Fig. 4.3 Extracted cheese plugs on display for student contestants in Collegiate Dairy Products Evaluation Contest

fresh or "undisturbed" 1/sixth portion of the butter is revealed for contestant evaluation.

Cheddar cheese is evaluated for "flavor" and "body and texture." For observation by students, a representative plug is drawn from each Cheddar cheese sample in the contest and placed into a clean test tube, sealed, and securely taped in place beside each corresponding cheese sample (Fig. 4.3). This display plug is used for grading sample appearance and must not be disturbed or manipulated in any way during the contest. For Cheddar cheese, the blocks are halved horizontally, and parchment paper is placed between. The cheeses are partitioned so that contestants can only

draw plugs from one-quarter of the visible cheese surface area. For each contestant group, a fresh quadrant of the Cheddar cheese is revealed for evaluation. Four sets of contestants draw plugs from the upper half of the Cheddar cheese block prior to the cheese being inverted to the other side (bottom four quadrants) for sampling by the remaining groups.

Cottage cheese samples are of the small curd type. Samples for visual "appearance" evaluation are carefully placed on platters with the aid of spoons, while sample portions for "body and texture" and "flavor" observations are placed in bowls. The appearance samples are not to be handled by anyone during the contest. The appearance samples need to be judged within the first 10 min, after which time the plates are removed from the contest display area. A time warning is announced after the elapse of the first 8 min. Official judges assure that the appearance display is consistent among individual samples of a given sample number displayed across the six time periods. By saving portions of such defects as matted curd, free cream, and/or free whey for placement on observation plates, the official judges thus guarantee fairness among the contestants by maintaining uniformity of "color and appearance" displays.

The official judges of strawberry-flavored, Swiss-style yogurts provide three replicates of each sample in their original commercial containers. Replicates #2 and #3 are covered with foil or a blank carton. Replicate #1 is inverted onto a plate for observation (Fig. 4.4). The contestants are instructed not to disturb the display sample on the plate. These samples are to be judged in the first 10 min of the 35 min

Fig. 4.4 Student contestants are allowed 10 min to evaluate the appearance and color of eight strawberry Swiss-style yogurt samples prior to removal of the cups and plates from the display table. Cups with spoons in them remain for the entire 35 min period

judging period, after which they are removed from the contest area. A warning is given after an 8 min elapse. Replicate #2 contains a spoon(s) for removal of samples by the contestants. Samples for flavor and texture evaluation should be removed by students without disturbing or contaminating the remainder of the cup. Replicate #3 is to be left undisturbed and is used to judge only for the attributes "free whey" and/or "shrunken." These samples must be judged within the first 10 min, after which they are removed from the contest area. A time warning is given after the elapse of 8 min.

Sometimes, simultaneously with the collegiate contest, coaches may participate in a pre-arranged coaches clinic. These clinics enable coaches to focus on a specific product (e.g., ice cream) and "recalibrate" their product-judging approaches for the designated product. An expert judge (generally a lead judge) in a given product category leads this flavor assessment session, explains definitions used within the industry, and provides suggestions for training students to detect and identify particular attributes. Lively discussion and idea interchange are generally generated because all coaches have unique insights into training and degrees of standardization on descriptors, intensity, and scoring strategies.

With the use of tablets, scoring occurs simultaneously with the contest. A contestant's score for each sample is given a grade expressed by the difference between his/her score, except as indicated below, and the official score. In essence, the competitor's objective is to earn zero points or no deviation from the official scorecard. For example, if a contestant scores "flavor" as 7 and the judges' score is 5, the contestant receives a grade of 2 points. If, however, a contestant recognizes that the sample scores perfect but fails to indicate that score on his/her scorecard, he/she shall receive a grade equivalent to the maximum points cut for that sample. For example, the normal range of score on "body and texture" of cottage cheese is 1–5, so the maximum cut is 5 points. The contestant's grade, therefore, shall be 5 when she/he fails to indicate the numerical score for that given item. This particular rule holds, regardless of the official score.

The grading of attributes assessment is independent of the grading of product scores and is based on the contestant's proficiency in recognizing the same quality merits and defects of the various samples as noted by the official judges. Each attribute indicated by the contestant will be involved in the grading. The contestant's grade on attributes for a single item is scored electronically. Details of the process are beyond the scope of this chapter.

In this contest a "grade" means "points lost"; the contestant with the lowest grade is declared the winner of the product evaluation. Each contestant's grade on a given sample is the sum of his/her grades on "score" and "attributes" of that sample. His/her grade on a product accordingly is the sum of his/her grades on the eight samples of that product. Student contestants are then ranked. A team grade for each product is thus the sum of the ranks of its three respective members. The team with the lowest sum of ranks is declared the winning team for the product evaluation. For example, a team with team members ranking first, third, and 34th (sum 40) in butter will

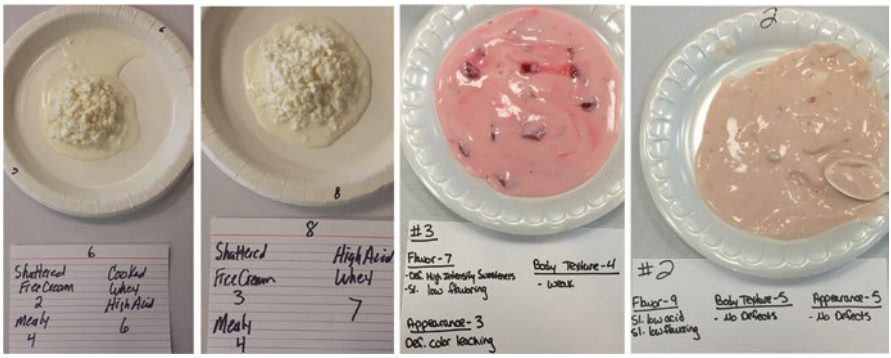

Fig. 4.5 At the conclusion of the contest, official scores and explanations are placed near corresponding entries (all 48 products)

place UNDER a team with team members ranking second, sixth, and 7th (sum 15) because the sum is lower (stronger overall team).

Upon completion of the contest, product official judges display the official scores and respective product criticisms (via a display card) for each of the eight samples per product category in the contest (Fig. 4.5). All coaches and contestants are invited to observe the official scores and product critical evaluations. The official judges stand by at this time to help both the coaches and the contestants understand why the particular decisions were made by the official judging team per each product category and to help convey how to better recognize and score attributes.

At the closing of the event, an awards ceremony is held, where student contestants and coaches are recognized for excellence in the sensory evaluation of dairy products. Among the undergraduate competitors, the top 10 individuals for each product and top 10 overall teams are recognized. To help build suspense within the awards program, the place winners are announced tenth place through first place. Also, special awards and recognition are given to the top three individuals and top three teams per each product category; the top 10 individual and team winners in the all products category are also singled out for recognition. The top performing graduate student in each product category and best overall performing graduate student for all products are also recognized.

In addition, one undergraduate student is recognized each year with the Joe Larson Merit Award. This award acknowledges the student who "best upholds the ideals of the Contest: potential leadership, professionalism, mature behavior, and an understanding of the importance of the sensory techniques applied to dairy products." Along with a plaque, the winning student receives a $500 award, funded by a generous donation from the late Joe Larson, founder and president of the Sparta Brush Company and a long-time, strong supporter of the contest.

4.4 Midwest Regional Collegiate Dairy Products Evaluation Contest

The Midwest Regional Collegiate Dairy Products Evaluation Contest was initiated in the mid-1950s, in conjunction with the International Dairy and Livestock Show. Contest logistics were managed by the Chicago Dairy Technology Society. After the International Dairy Exposition was terminated as part of the livestock show, the Chicago Dairy Technology Society assumed full sponsorship of this contest.

The Midwest Regional Contest is the sole survivor of a number of other regional contests that were organized to provide additional training and competition opportunities for students and teams' preparatory to the annual national contest. Because all the other regional contests have ceased operation, the Midwest contest is no longer strictly regional and attracts teams and contestants from across the USA; however, international teams are not permitted in this regional event. The number of participating teams fluctuates from 6 to 12 each year and averages approximately 8.

The rules of the Midwest contest are identical to the National Collegiate Dairy Products Evaluation Contest except that contestants are not limited to a singular lifetime participation. Contest official judges are recruited from industry and public health associations with extensive experience in the products they judge. The all products judge may be from industry or academia, provided that the judge is not from an institution fielding a team in the contest. Judges are responsible for choosing products used in this contest from commercial sources and only modify or "adulterate" products as permitted by the National Collegiate Dairy Product Evaluation Contest rules.

The contest is traditionally scheduled to precede the national contest by 2 weeks. The Midwest contest was hosted for many years by the Kraft Research Center in Glenview, IL. Along with the physical facilities, Kraft Foods (now Kraft-Heinz) provided products, judges, a free continental breakfast for all workers, as well as a free lunch for all contestants and work volunteers. A post-competition tour of Kraft research facilities was also offered as a part of the Midwestern contest experience. From 2017 to 2019, Continental Dairy Facilities, LLC, MI, hosted the Midwest Regional Collegiate Dairy Products Evaluation Contest, along with a post-competition tour.

The top four individuals in each product and in all products receive certificates of achievement, and the top All Products individual is awarded a trophy. The top teams in each product category earn additional recognition, with a special plaque awarded to the top All Products team. Awards are also made to top performing graduate students, who compete as individuals. All prizes are sponsored/provided by industry sponsors.

4.5 American Cheese Society Judging and Competition

The American Cheese Society (ACS) Judging and Competition recognizes the craftsmanship of artisanal and specialty cheese making (ACS, 2022). The goals of the ACS competition are to (1) recognize quality cheese making and (2) to encourage better cheese making. The coordinators of the contest stress that promoting good cheese making is the goal.

For four decades, the ACS Judging and Competition was conducted in conjunction with the ACS Annual Conference. But by 2019, the contest had grown so large (120 categories and over 2000 entries) that the logistics of holding the Judging and Competition at different locations every year had become unwieldy. In 2022 and ongoing, the ACS Judging and Competition will be conducted in advance of the ACS annual conference, in Minnesota.

Blind-coded entries are judged by pairs of one technical and one aesthetic judge (Fig. 4.6), with each pair scoring each individual entry, based on a cumulative point system. The judges are selected from the academic, dairy industry, dairy science, cultures manufacturing, food retailing, food distributing, food press communities, etc. While the technical judge subtracts 0.5–1 point from a perfect score of 50 for each technical defect (depending on severity), the aesthetic judge adds single points, up to 50 points, for aesthetic qualities and values. For instance, a fresh goat cheese producer may lose points for "musty" and "unbalanced" (technical) off-flavors but may gain points for the appearance of "vivid fresh flowers" on the surface of the cheese. Technical judges' scorecards begin with 3 points for aroma, 25 points for flavor, 15 points for body and texture, and 7 points for appearance and numbers decrease based on defects. Aesthetic judges must award a minimum of 1 and up to 3 points for aroma, minimum of 22 and up to 30 points for flavor, minimum of 3 and up to 7 points for body and texture, and minimum of 5 and up to 10 points for

Fig. 4.6 Pairs of technical and aesthetic judges evaluate entire categories of dairy products. (S. Clark images)

AMERICAN CHEESE SOCIETY | **2016 Judging & Competition** | **Technical Score Sheet**

Category B (Soft-Ripened Cheeses)

Entry Code	00	xx	00	**Judge's Signature**

THE TECHNICAL JUDGE WILL DEDUCT POINTS FOR DEFECTS IN CHEESE QUALITY *

AROMA	**3** points maximum	**Score**	

ammoniated _____ animal or barnyard _____ atypical _____ chemical aroma _____ fruity/fermented _____
moldy or musty _____ rancid _____ unclean _____ unpleasantly earthy _____ yeasty _____
other (list): _____

FLAVOR	**25** points maximum	**Score**	

too acidic _____ atypical _____ bitter _____ fermented _____ feed _____
flat/lacks characteristic flavor _____ fruity _____ metallic _____ lacks freshness _____ lacks salt _____
old milk _____ rancid/lipase _____ too salty _____ unclean _____ whey taint _____ yeasty _____
other (list): _____

TEXTURE AND BODY	**15** points maximum	**Score**	

crumbly (atypical) _____ curdy (atypical) _____ gassy _____ mealy (atypical) _____ open _____
pasty _____ pin holes _____ short _____ spreadability (atypical) _____ weak _____ woody/tough _____
grainy/sandy _____ gummy _____ lacks creaminess _____
other (list): _____

APPEARANCE/RIND DEVELOPMENT	**7** points maximum	**Score**	

cracked or disturbed rind _____ excessive rind _____ greasy rind _____ rind rot _____
crooked or lopsided _____ free whey/wet _____ immature mold _____ surface mold _____
uneven mold distribution _____ dull color _____ uneven color _____ seamy _____ slipped rind _____
rough surface _____ excess fines (fresh curds category) _____ *PACKAGING* **_____
other (list): _____

ADDITIONAL COMMENTS

* *DEFECT POINT REDUCTION: SLIGHT = 0.5, DEFINITE = 1, PRONOUNCED = 1.5*
** *PACKAGING POINT REDUCTION: 7 POINTS*
Scoring ranges: **1st** 93 to 100; **2nd** 86 to 92; **3rd** 80 to 85 **SUM OF SCORES**

Fig. 4.7 Technical Judge Scoresheet for 2016 ACS Cheese Competition

appearance. This is based on the assumption that every entry must have some basic level of achievement to reach at least the minimum score. Scorecards, previously on paper (Figs. 4.7 and 4.8) and now (since 2022) computerized (Fig. 4.9), are organized with boxes for noting defects or attributes in products, with space left for additional comments, which are required. Comments are meant to help processors improve product quality.

AMERICAN CHEESE SOCIETY	2016 Judging & Competition	Aesthetic Score Sheet

Category M (Farmstead Cheeses)

Entry Code	00	xx	00	Judge's Signature

THE AESTHETIC JUDGE WILL ADD POINTS FOR DESIRABLE QUALITIES FOUND IN THIS CHEESE*

AROMA — Points: **1** minimum **3** maximum — **Score**

fresh cream _____ pleasantly fruity _____ nutty _____ sweet _____ earthy _____ herbal _____
floral/fresh flowers _____ buttery _____ toasted/caramel _____
other comments: _____

FLAVOR — Points: **22** minimum **30** maximum — **Score**

butter/cream/milk flavors _____ sweet/nutty _____ nice salt content _____ meaty/brothy _____
tangy finish _____ well balanced flavor _____ Nice piquant note _____ toasted/caramel _____
grassy/herbal _____ earthy _____ long finish _____
other comments: _____

new or noteworthy flavor profile (explain):

TEXTURE AND BODY — Points: **3** minimum **7** maximum — **Score**

smooth/creamy texture _____ nice mouthfeel _____ evenly moist _____ evenly firm _____
evenly smooth paste _____ good openness _____ good crumbliness _____ nice dense paste _____
even distribution of crystals _____
other comments: _____

APPEARANCE/RIND DEVELOPMENT — Points: **5** minimum **10** maximum — **Score**

nice rind appearance _____ rustic appearance _____ nice color _____ nice shape and size _____
artisan appeal _____ Appealing ash or cloth coating _____
other comments: _____

ADDITIONAL COMMENTS

** POINT VALUES FOR DESIRABLE QUALITIES: DESIRABLE +1, MORE DESIRABLE +2 to +3 DESIRABLE AND UNIQUE + 4 OR MORE*

Scoring ranges: **1st** 93 to 100; **2nd** 86 to 92; **3rd** 80 to 85 **SUM OF SCORES**

Fig. 4.8 Aesthetic Judge Scoresheet for 2016 ACS Cheese Competition

Another key distinction from other dairy products competitions is the fact that all entries are blind-coded to minimize potential for bias. Shipping materials with codes that blind-code the producer and specify the subcategory are sent to entrants for product labeling (Fig. 4.10). Points are subtracted from products revealing identity.

Fig. 4.9 ACS J & C Scorecards are now computerized for efficiency. (S. Clark image)

A great deal of coordination is involved in the successful administration of the ACS Judging and Competition. A committee composed of volunteers and an ACS staff liaison makes up the ACS Judging and Competition Committee, which works all year to review and update rules, ensure appropriate category names and descriptions, review and recategorize entries, select and invite judges, train judges, receive products, oversee the event, announce and distribute awards, etc.

All entries are received by ACS Judging and Competition Committee members and additional volunteers in a 2-day window. Although products initially arrive with identifying information on the external box, once opened, blind-coded products are revealed (Fig. 4.11a). The products are temperature checked, inventoried against the entry information supplied by the producer, and sorted to separate products from their identifying external boxes (Fig. 4.11b). Blind-coded products are categorized by subcategory, placed on speed racks (Fig. 4.12), and taken to designated refrigerated trucks (i.e., smoked cheeses are placed in a single truck), where they are sorted by category and size. Products are removed from the trucks according to a schedule (based upon when they are to be judged) to ensure proper tempering prior to judging. Volunteer stewards take speed racks of tempered products to judges, who evaluate flights, at their own pace, until the entire category is evaluated.

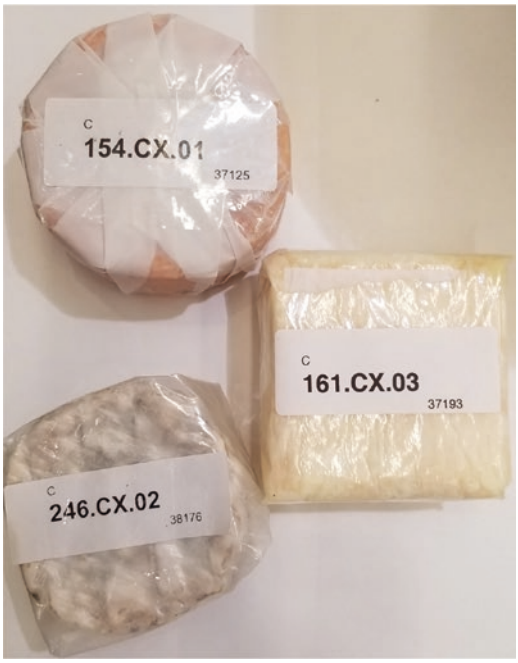

Fig. 4.10 Entries in the ACS competition are blind-coded based on company (in the example below, 154, 161, and 246), on category (i.e., C) and subcategory (i.e., X), and numbered entry for the given company (first entry by company 154, third entry by company 161 and second entry by company 246). Now, with the computerized system, simply the category letters and a 4-digit code track the product throughout the process

Fig. 4.11 Once opened, blind-coded products (**a**) are temperature-checked, inventoried, and sorted to separate products from their identifying external boxes (**b**)

Fig. 4.12 Blind-coded products are categorized by subcategory, placed on speed racks, and taken to refrigerated trucks

Fig. 4.13 Cheeses are staged in preparation for the Best of Show Finalist round in the ACS Judging and Competition

Awards in the ACS Judging and Competition are only earned by the top-scoring products in each class, if the minimum score is attained. In fact, the quality of American products has improved since the inception of the ACS Judging and Competition, such that products must now attain a minimum of 85 points to earn the third place award, a minimum of 90 to earn the second place award, and a minimum of 95 points to earn the first place award. Only the three highest-scoring products receive awards. However, for tie scores, multiple awards can be given. All first place products become eligible for the best of show rounds of judging (Fig. 4.13). The three top-ranking products in the entire ACS Judging and Competition are awarded best of show and runners-up awards.

4.6 The US and World Dairy Product Contests

Hosted by the nonprofit Wisconsin Cheesemakers Association (WCMA), the World Championship Cheese Contest is a technical evaluation of cheese and butter, by class. Since its inception in 1957, the contest (conducted on even-number years) has grown rapidly and is now the largest international cheese, butter, yogurt, and dairy ingredients competition in the world (WCMA, 2022b). The 34th biennial contest, held in 2022, had 141 classes. Entrants may send products in their original packaging, with or without labels; labels are not considered in the evaluation.

Products must be received at the shipping destination by an early spring deadline; judging takes place later in the spring; and awards are presented at the Cheese Industry Conference in April. Judges of the World Championship Cheese Contest are trained experts in cheese evaluation. Approximately 40 US and international cheese experts evaluate products in teams of two. Starting with a maximum possible 100 points, each entry is examined for defects. Deductions are taken for each defect. Defects are noted in the areas of flavor, body and texture, salt, color, finish, packaging, and other possible appropriate attributes. Deductions are made in 0.1-point increments. Thus, each entry is judged on its own merits against what the judge considers perfection for that product. The judging teams work silently and the score from each judge is averaged with his/her partner to determine the final score for each entry. Gold, silver, and bronze medal winners are decided based on the highest average scores in each class. Each entrant in the World Championship Cheese Contest benefits from this professional evaluation. Official score sheets, marked and signed by the judges, are returned to each entrant.

The Gold medal cheeses from appropriate cheese classes are judged a second time to determine a World Champion Cheese. The entire panel of judges participates and the cheese that earns the highest average score is named “World Champion.” The next two highest scores are awarded first and second runner-up. This competition is open to public viewing and typically gains national media exposure within the USA. Previous contest medal winners have built marketing campaigns around their success in this highly competitive contest.

Gold medals and monetary awards are presented to the best of class winners. Silver and bronze medals are awarded to second- and third-place entries. The World Champion cheese maker currently earns a cash award of US $1000. All winners are honored at a gala awards banquet during the International Cheese Technology Exposition.

Since 1981, on alternate years (odd number), the US Championship Cheese Contest is conducted by the WCMA (2022a). The 2023 contest, boasting 118 entry classes, is the 21st biennial contest. It is run almost the same way as the World Championship Cheese Contest.

4.7 World Dairy Expo Championship Dairy Product Contest

Sponsored by the Wisconsin Dairy Products Association (WDPA, 2022), the World Dairy Expo Championship Dairy Product Contest welcomes entries into over 90 dairy product categories. Products range from fluid milk to powder, yogurt to drinkable yogurt, sour cream to dips, and butter to ice cream. An additional class is called "Open Class for Creative & Innovative Products." Some entry examples include smoothies, probiotic products, dairy-based beverages and desserts, novelty cheese products, sports drinks, frappuccinos, calcium-fortified products, cheesecakes, cajeta, etc. All entries must conform to their respective standards of identity and contain a minimum of 25% dairy. Over 1500 products were entered in 2022 (WDPA, 2022). Entry fees support scholarships for students preparing for careers in the dairy industry, culinary arts scholarships, and the National Collegiate Dairy Products Evaluation Contest.

4.8 Conclusion

The contests described in this chapter all have one goal in common: they are designed to promote excellence in dairy manufacturing. The primary objective of the Collegiate Dairy Products Evaluation Contest is to train students in the fundamentals of the sensory evaluation of dairy products in order to prepare them for careers that promote a focus on high quality dairy products. Dairy products contests are designed to recognize workmanship. These contests publicize their excellence to the consuming public. Because consumers rely so heavily on sensory perceptions when purchasing products, there will always be a place for sensory evaluation and grading of dairy products if producers intend to satisfy consumer desires. Knowledge about the relative importance and origins of certain off-flavors and various desirable flavors, plus specific methods to minimize or eliminate objectionable off-flavors, should enable the production of milk (Gamroth & Bodyfelt, 1980) and milk products suitable for inclusion in high-quality finished products, which should ultimately influence dairy product sales.

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