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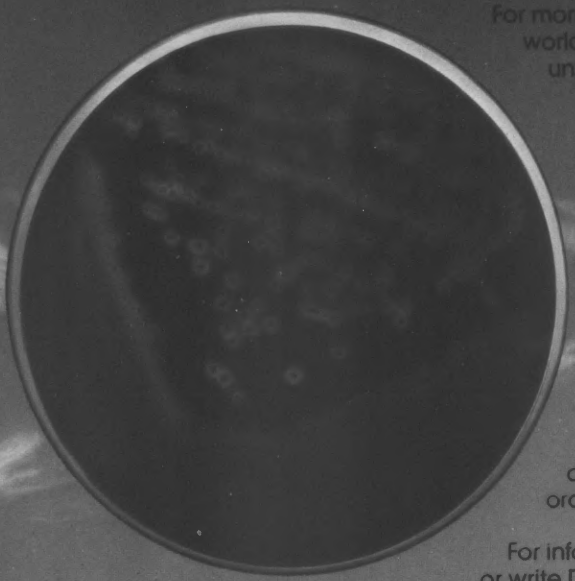

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A MARKETING PERSPECTIVE OF DAIRY PRODUCT QUALITY

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This article suggests that quality may be the most important variable in determining a consumer's product perceptions for dairy products. The article also focuses on various critical factors in the manufacturing, storage and distribution, and managerial areas that can materially affect dairy product quality, all within a marco food control perspective. Finally, the article implies that quality can be the best marketing tool imaginable.

OVERVIEW OF PRODUCT QUALITY

For a product to be manufactured and effectively marketed, a certain minimum number of consumers must be favorably inclined toward the point of purchasing the product. In the dairy industry, our products and marketing efforts must permit satisfactory answers to such questions as the following: How fresh is it? How long will it last? Is it made from good ingredients? How does it taste? The answers to these and other questions relate to the efficacy of our marketing efforts, and due to the distinctive and perishable nature of our products, the issue of quality emerges as a fundamental element, if not the dominant element, in the marketing practitioner's marketing mix. Stated differently, the effectiveness of dairy marketing is conditioned to a large extent by the quality of our products.

In general, the quality of a product is determined by its ingredients, its materials, the manufacturing technique employed, the grade of workmanship, the design and specifications, and its eye appeal. Flavor also can be a very important determinant of quality, and the package of a product can sometimes be a factor affecting quality. The characteristics on which quality depends vary from product to product and within a single product class, and color may be very important in determining the usefulness or fitness of some products and play no part in determining the suitability of others. Nevertheless, the combined result of all these factors, and many others, is weighed by prospective consumers against the price at which the product is offered for sale. Given this, a product's quality, and the determinants of that quality, should be given careful attention. In the dairy industry, the quality of our products is influenced by all the characteristics or attributes that in any way affect its capacity for filling a particular need, and all these characteristics and attributes deserve special attention. It is of paramount importance to realize that the combination of all the characteristics that constitute product quality determine, to a great extent, how well merchandise fulfills the needs and desires of consumers.

Any analysis of quality must recogonize that it is the product as a whole that sells rather than the individual quality attributes. Most definitions emphasize that a product is more than a combination of raw materials and brand name, and that a product is a sum total of consumer impressions. The consumer's perception of quality may not be the same as that of the packaging experts or of the quality or marketing experts, or of the engineers, and although they will adjust the clues by which they judge quality if performance is unsatisfactory, it is the consumer rather than the experts who must, in the final analysis, be satisfied. It is the consumer's perception of total product quality that is important, and at all times the marketing and technical experts should carefully consider the consumer's perception and not their own.

FOOD CONTROL OF DAIRY PRODUCTS

When examining the concept of quality from a marketing perceptive, one must take into consideration the term "food control," since it describes a field of activity and function more comprehensive than what the dairy industry commonly refers to as "quality control" or "quality assurance." The terms "quality control" and "quality assurance" have been used synonymously, and the distinction between the two terms is correctly stated by Bianco[1] in the following lengthy quote:

> "...let's look at today's Quality Control involved in the processing of packaged food products. Perhaps first, it would be well to define Quality Assurance, Quality Control as we know it today. "Quality

Assurance; as a departmental name, in place of Quality Control," is fast becoming very popular in many companies to describe their staff-level activities. In others, for all practical purposes, the terms "Quality Assurance" and/or "Quality Control" are used interchangeably and are considered synonymous. We use "Quality Assurance" in my company, as an overall department name at both the corporate and company staff levels. At operating levels of management, Quality Control titles continue to be used at both the general office staff and plant levels. Now for the term Quality Control, which may be more familiar to many of you. I wonder how many of us really understand the true meaning and function of Quality Control. Using a little imagination, one could conceive tht the idea of Quality Control might well have originated at the dawn of history, when a man pointed to an object and said, "I want another just exactly like it." Needless to say, he failed to get it, and neither does anyone get it today. For it was true then, as it is now, that no one thing is precisely, exactly, like another. You've heard the common expression, "No two people are exactly alike," so it is true with material things as well. Variation inevitably exists in natural composition, in packaging materials, and even in the precise manufacturing operations known today. Strive as we may for exact duplication, we really never quite obtain it. As far as we are concerned in Quality Assurance or Controls, variation need not bother us until it reaches a degree, level, point or an extent where it causes difficulty in a packaging operation or is otherwise harmful in any way to the product. In Quality Control work, the variables are pinpointed, highlighted, and eventually, we hope most of them are reduced or eliminated which really results in Quality product production. So this is where a department such as Quality Control or Quality Assurance fits into a Company's operation. This function must exist at both the top management and plant levels and the responsibilities, though relative, are necessarily different."

The term food control, however, describes and embodies a macro perspective toward the concept of product quality. Blanchfield refers to food control as described and defined by the Institute of Food Science and Technology of the United Kingdom as follows:

"Food control encompasses more than the scientific and technological factors affecting food product quality. But there can be no effective food control without thorough and extensive knowledge of the physical, chemical, biochemical, microbiological, nutritional and other characteristics and behavior of foods, and of the principles and practices involved in the conversion and stabilization operations and process constituing the technology of manufacture, storage, distribution, etc., of finished food products. This is necessary to translate required product properties into raw material and packaging specifications, ingredients formulation, processing, and storage procedures, conditions, and precautions, to establish the connections and relationship between properties required and parameters selected for specification and measurement; to establish what tolerances might be acceptable on particular parameters; to decide (other than by rule of thumb) what modifications and adjustments to formulation or to processing conditions will produce what qualitative and quantitative effects, when control results indicate that something should be done; to understand how to exercise control so as to produce consistent products from inherently variable biological materials; and to take on board products and processes with which one has had no previous experience, which is essential in these days of product diversification, mergers, takeovers, and technologist mobility among companies and even among sectors of the food industry."[2]

This description of food control more accurately focuses in on what product quality means from a marketing perspective. This concept of food control gets to the heart of what product quality really is when discussing dairy products. Product quality for dairy products results from the total organization having a good grasp on all aspects of a dairy operation (i.e., manufacturing, storage, distribution, etc.). Even though it is the function of a quality control department to identify product variations, and reduce or eliminate them when required, it is the function of the total organization to ensure that optimal product quality is maintained even after the product is purchased by the consumer. Thus, product quality, or the more pervasive concept of food control, relates to all organizational aspects, and the

quality control function, as well as the quality assurance function, must exist at all levels including top management.

DETERMINANTS OF QUALITY IN DAIRY PRODUCTS

Within this spectrum of food control, how does one in the dairy industry decide what is important in determining the quality of a product? In general, one answers this question by considering each of the traditional factors listed in Table No. 1. It is submitted that this list of traditional product quality determinants is inadequate for the dairy industry, since the quality characteristics which our products are to possess are also determined on the basis of some other factors generic to the dairy industry. For example, the dairy quality control department and its personnel are fundamentally as important, if not more important, than any of the market or competitor-related factors listed in Table No. 1. Due to the unique nature of dairy products, the quality control function can pay a major role in conditioning the consumer's perception of quality. These critical factors are illustrated in Table No. 2, and must also be considered when determining the quality of a dairy product. Each of these factors will be examined in the paragraphs that follow.

The most important factor in deciding dairy product quality could be the quality of the raw milk. Much has been said concerning this issue, but it is submitted that dairy processors cannot consistently produce products with good keeping quality if the products are made from raw milk supplies of less than ideal bacteriological quality. White, *et. al.*, have stated that "while there is almost universal agreement concerning the desirability of having high quality raw milk, there is a decided lack of agreement as to the best way of determining the quality of this milk."[3] This specific issue is left to the quality experts to resolve, but it must be resolved, since an assured, high quality raw milk supply will help translate into an acceptable product for the consumer, one that is uncontaminated. It is imperative to evaluate the incoming raw milk to determine how long our products will last before the development of odors and off-flavors. White, *et. al.*, clearly state that evaluative tests are good predictors of shelf-life,[4] and the rationale for conducting these tests is important for two reasons. First, the quality of milk decreases as it goes from the farm to the retail outlet, which makes shelf-life, and raw milk's contribution to it, critically important. Second, pasteurization is not a cure-all, making the quality of raw milk even more important.

Other manufacturing factors that determine the quality of dairy products are the dairy's processing equipment and the plant's cleaning process. Obviously,

TABLE NO. 1

DETERMINANTS OF PRODUCT QUALITY

1. The price at which the product is to be offered.
2. The characteristics of similar products sold by competitors at the same price and at other prices.
3. The characteristics of related products.
4. The sales record, past and current, of the product.
5. The sales records of competitors' products.
6. Information obtained from consumers, distributors, and dealers as to their likes and dislikes regarding the product and competing products.
7. Current trends of any sort likely to influence the desires of prospective buyers.
8. Cost of incorporating various seemingly desirable characteristics of the product.
9. The reports and recommendations of various groups of organizations.
10. New materials and manufacturing techniques.
11. The whole foundation of good merchandising, turning out a product having some advantage over competitive products that induces a certain number of customers to prefer it, or at any rate to buy it.

Source: Albert W. Frey, ed., *Marketing Handbook*, 2nd ed. (New York: The Ronald Press Company, 1948), 5-32.

TABLE NO. 2

FACTORS DETERMINING DAIRY PRODUCT QUALITY

Manufacturing Factors:
- Utilization of high quality raw milk
- Dairy processing equipment
- Dairy cleaning processes

Storage/Distribution Factors:
- Retail level storage practices
- Distribution process storage temperatures
- Consumer product handling practices

Managerial Factors:
- Efficacy of sanitation personnel
- Inplant quality control program
- Management's commitment to quality control

the "better" the processing equipment, the "better" the final product. Most dairy processors take their processing equipment's contribution to quality for granted, however, the technology of our manufacturing process is one of our major industry strengths.

In marketing milk and cream products, marketing practitioners look for good shelf life,[5] and if the keeping quality suffers, then we will loose consumer acceptance, customer confidence, and sales of our products. Related to the keeping quality of our products is the dairy equipment cleaning process, which is critical to quality since the chemical composition of milk is highly susceptible to contamination, odors, off-flavors, etc. After pasteurization, clean lines present the proper environment in which milk is to travel. It is important that the lines be totally clean, because as aptly stated by Bodyfelt: "97 percent clean is still 3 percent dirty in any language."[6] This means that one should not take a cleaning program for granted and high performance demands of dairy sanitation people will translate into high quality products in the marketplace and a low level of product quality problems. Remember, the cleaning process is not automatic! Bodyfelt's advice to scrutinize CIP systems, detergents, and sales representatives, is good, sound quality control management; for without this level of examination, product quality problems will assuredly abound.

With respect to storage and distribution factors that affect the quality of dairy products, the task of protecting the raw milk starts at the farm level and continues until the consumer uses the product. Storage practices throughout the total distribution system, such as cooler handling and proper temperatures, are extremely important in maintaining a quality product, and the importance of this aspect increases during the warmer months of the year.

The storage temperatures at the retail level are also critical determinants of product quality. A study conducted by the American Dairy Association revealed that the temperatures in 20.3% of the dairy cases were above 43°F. - a level that can cut product shelf life in half.[7] This abuse will undoubtedly result in sour or spoiled dairy products. It is also important to maintain proper temperatures in reserve cases. The American Dairy Association study indicated that "more than 20 percent of dairy storage rooms checked also had improper temperatures."[8] Proper management can correct these problems and the American Dairy Association recommends preventive procedures (providing adequate air flow, keep doors closed and in good working condition; do not leave dairy products outside of refrigeration; check temperatures regularly; inspect and adjust refrigeration equipment) in its dairy department management training program. The importance of proper refrigeration and handling can be summarized by the following quote:

> "Consumers are quality concious and demand fresh, wholesome products from their grocers. The quality control maintained by manufacturing and processing plants, by warehouses and during deliveries can be lost by poor handling at the store level. By following these procedures, dairy department managers can be sure that properly refrigerated, fresh dairy products are reaching your valuable customers."[9]

Consumer abuse, meaning the improper handling of dairy products by consumers, can also affect quality. This factor, like light-induced flavors, is indirectly beyond our control. However, we can minimize the amount of consumer abuse by providing the consumer with informative, educational, and warning vehicles (e.g., utilizing side panels on paper gallons and one-half gallons for educational information). These provisions will most likely prevent consumers from leaving milk in their automobiles, especially in trunks, for extended periods of time.

There are also managerial factors that can dramatically affect product quality. Product quality and consumer acceptance of products depends to a great extent on the ability of sanitation personnel and their supervisors to perform effectively. Ellison states that: "A dairy processor can develop the best sanitation program, and use modern cleaning equipment and effective procedures, however, product quality, shelf life and operating costs will suffer if sanitation personnel are not properly trained, motivated, rewarded, or do not buy into the established program."[10] Even though most dairy processors have a sophisticated cleaning technology, they can fall short of good sanitation objectives if their sanitation people are improperly utilized. The result could be serious quality problems. Can you think of a situation where consumers reacted unfavorably toward your product due to a sanitation-related problem? If the answer is yes, how frequently has it happened?

As determinants of product quality, the importance of plant quality controls have never been greater than they are today. This has been emphasized by Bianco in an article delineating the guidelines for a dramatic quality control program in a changing market. Bianco maintains that product quality assurance and consumer satisfaction are the two essential ingredients for success in today's competitive market place. He states that: "Now it is recogonized by most companies that quality controls are vital and represent, in many instances, the very life blood that is necessary to compete successfully in today's competitive and changing market."[11] A plant quality control program must be established and the quality control, or quality assurance manager, and his staff must effectively accomplish all of the following:

1. Scrutinize quality data on all raw materials, in process product mixes, finished product, product keeping quality samples, and product complaints, to know the general quality characteristics of the operations.
2. Become involved in how to stay within procedures and specifications.
3. Identify major and minor product quality problems and learn how and why undesirable situations occurred and how to retify it.
4. Work out with the plant production team the means of providing remedies for plant quality problems.
5. Take immediate safe-guard actions to prevent the same quality defect situations from recurring.
6. Consult with technical management, making the best use of their technical capabilities whenever conditions dictate.[12]

These are basic elements to a good quality control program, but elements that are vital to product quality.

Finally, the total organization, including top management must be committed to quality control! Typically, quality control departments are not profit-oriented, and as a result cost money to accomplish their tasks. During austerity programs quality control staffs are normally cut in size due to their non-revenue producing status. These cutbacks are obvious mistakes, normally resulting in inferior quality products. However, if top management is committed to quality, these mistakes should not take place, and consequently, the total organization will be committed to the task of maintaining quality. How can we expect the supervisors to be quality conscious if his management is not? Quality is an attitude, an attitude that permeates the total organization, and the attitude begins at the top of the organization. Darrah states it well: "The Plant Manager will, be direction, example and actions, demonstrate that his plant shall be the leading plant in the Company in quality and housekeeping."[13] Darrah maintains that "training toward a quality attitude is a neverending process."[14] Who then is responsible for the quality control function? Darrah states:

> "No one person can be entirely responsible for product quality. It can be said that the owner manager of a company is responsible in that the buck stops there. Or, that the quality control supervisor is the person responsible because that's his or her job. Well, is it? Isn't the foreman also responsible for quality? He is, after all the person that translates a production order into a finished product by directing the people on his shift to do specific jobs. And how about those people on the job, that individual or group that process the product? Aren't these people responsible for quality? The answer is yes."[15]

FEEDBACK AND CONTROL

As with any program, in order to control quality a quality control or food control program will provide for feedback through monitoring vehicles. This monitoring aspect is not limited to the production floor only, and while discussing food control, Blanchfield states: "Although that monitoring, with rapid feedback of data and advice on which appropriate action may be taken, is an essential constituent of food control."[16] In fact, a company-wide quality control program is for naught if monitoring and feedback vehicles are not included because the company will not be controlling its program toward the quality ends established if it does not have regular feedback regarding its quality activities and results. Blanchfield states it well:

> "The totality of control, however, extends much further in both chronological directions from participation in all aspects of the product and methods of insuring that it is capable of being achieved in prac-

tice; through the monitoring/feedback process to ensure conformance with design, supplemented by checks on a representative proportion of product units to ensure compliance with legal and company standards; to the subsequent behavior of the product, its quality characteristics when it reaches the consumer, and the consumer's reaction thereto."[17]

In this way the firm's quality control program contributes to the attainment of overall firm objectives, but this can only be measured if the program includes monitoring devices as well as follow-up vehicles.

SUMMARY AND IMPLICATIONS

This article has attempted to suggest that dairy product quality is determined by more than the traditional determinants of product quality. Due to the special nature of our products, there are important manufacturing, storage and distribution, and managerial factors, all within a macro food control perspective, that determine the consumer's perception of our product's quality. Interwoven within this marketing spectrum is the role and efficacy of a quality control department, as well as that of a quality assurance program. Both functions are critical to quality, but not more critical than the handling of our products at the retail level. It is important to note that if one person in the manufacturing and distribution system fails to do his job, all other quality efforts will be negated and there will be quality problems.

Why is this note on product quality important? In these times of severe competitive pressures the dairy manufacturer cannot afford to let its quality guard down! From a marketing respective, the firm's existance depends upon the sales and profitability of its products. If quality deteriorates, so will the consumer's perception of the firm's products, and consequently sales and profits will decrease. And, given the fact that we are entering an age of imitation dairy products, an age of imitators, the quality of our products could very well be the best marketing tool imaginable.

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15. Darrah, "A Quality Control Program For The Food Industry," p. 274, also discusses the effectiveness of management stating that managerial skill is an essential element when looking at the concept of food control. Blanchfield also states that: "The management, effective practice, and operation of the food control function, like any other, requires managerial skill and ability, especially in dealing with people and organizing activities. It also necessarily involves a combination of knowledge and understanding of bases; of how to operate across functional interfaces; and of how to its interact effectively with its constraints," in "The Philosophy of Food Control." p. 51.
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Dairy and Food Sanitation, Vol. 2, No. 7, Pages 276-279 (July 1982)

Checking Electronic Somatic Cell Count Machines

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Nearly 4.5 million cows are on a milk testing and recording program in the U.S. and 40 percent of these cows are screened for mastitis monthly. Electronic somatic cell counting (ESCC) has become one of the success stories of dairy record systems. Because of its inverse relationship to milk production, ESCC has become a widely accepted management tool. Therefore, it is important to have check samples so that mastitis screening results between laboratories are comparable.

Calibration of somatic cell counting at low levels is difficult and requires special procedures. Several organizations requested that a ESCC reference sample be developed. Therefore our research objective was to develop one ESCC reference that could be used on all ESCC devices. The references needed to confirm ESCC over a broad range from 100,000 to well over a million cells/ml. The Europeans are using two different references for the electronic particle counting devices (Coulter Counter) and the fluoro-opto-electronic device (Fossomatic). These references are not interchangeable between machines.

By adopting parts of each procedure and making a few modifications, a procedure was developed that produced a reference set that can be used with the major electronic somatic cell counters and the DMSCC. These reference sets have been shipped successfully coast-to-coast in the U.S. and Europe. Outline of procedures involved in making reference:

1) Milk having approximately 800,000 cell/ml is warmed, mixed, and dichromate is added.
2) Milk fat is separated from the milk by centrifugation in a refrigerated centrifuge and then the solidifed fat is removed from the sample tube.
3) The somatic cells are harvested from the skim milk and resuspended in a small volume of skim milk.
4) The milk cells are then pooled and the concentration of cells determined by ESCC.
5) The cells are then diluted with dichromate preserved skim milk to the approximate desired concentrations - usually 300,000 600,000 and 1,200,000 cells/ml.
6) The cells in milk are then placed in 10 ml plastic screw cap tubes.
7) A quality check is run on random samples using both DMSCC and ESCC.
8) Samples are pasteurized by heat (the cells are very liable to extremes of temperatures and frequently are destroyed at this point if not processed properly).
9) Somatic cell concentration is again checked by DMSCC, Coulter Counter and Fossomatic.
10) Pasteurization is confirmed by streaking samples on blood agar plates and incubating samples for 48 hours. No growth of bacteria indicate asceptic samples.
11) Samples are stored at 5°C until shipped.

Initial observations

Use of samples shipped to various laboratories over a wide geographical area indicated the initial use by laboratories gave erratic results. Subsequent shipments gave better results as laboratories improved their procedures. Results from our first major field trial in the U.S. are presented in Table 1. The results have two built in biases. Results of the Virginia laboratory were included to help each laboratory assess the operation of their machine. Also, samples were sent to more laboratories than indicated in the tables, as a few laboratories did not report results.

In December 1980 duplicate high, medium, and low cell count sets of reference samples were mailed from Virginia to points across the U.S. These samples were analyzed on various dates in other laboratories at their convenience from January through May, 1981. The laboratories were instructed to mix the samples vigorously and then use immediately.

Some laboratories used the samples for more than a week but only the first days results are given. Several laboratories tested one of the duplicate samples sets approximately one month later. These results are in Table 2.

Five of the receiving laboratories performed the DMSCC on the dates given. The mean results and standard deviation for DMSCC were 1374 ± 240, 673 ± 160, and 250 ± 48 (Table 1). The range (highest result minus lowest) for each cell concentration were 690, 474, and 122. Likewise, the Fossomatic results were 1460 ± 156, 734 ± 103, and 259 ± 40 from 12 laboratories. Coulter Counter results from a mixture of automated and manual machines in 6 laboratories were 1286 ± 92, 670 ± 54, and 249 ± 32. When looking at the same machine in a laboratory, they showed very repeatable results. The large difference expressed in Table 1 represents results from various machines. This further establishes the need within the industry for use of reference samples to make results comparable. Each laboratory conducting its own DMSCC is not the correct solution to the problem as evidenced by the wide variation of qualified laboratories in DMSCC results on a common reference sample.

Table 2 compares the results from the December reference when held unopened for up to two months. Similar results were experienced after long storage in our low laboratory. The mean of high,

TABLE 1. *Electronic somatic cell count reference, December 1980.*

	VA	2	3	4	5	6	7	8	9	10	11	12	$\bar{X}$	SD	Range
							X10^{-3}								
							DMSCC								
High	1340	1314	1300	1845	1288	1155							1374	240	690
Med	660	672	742	931	574	457							673	160	474
Low	200	233	297	322	228	222							250	48	122
$\bar{X}$	733	740	780	1032	697	611							766		421
Date	12/18	12/31	2/6	1/14	1/6	1/8									
							FOSSOMATIC								
High	1350	1332	1335	1549	1486	1249	1441	1284	1743	1609	1644	1496	1460	156	494
Med	660	564	664	766	737	640	714	716	940	756	891	754	734	103	376
Low	240	174	232	284	243	237	285	228	296	300	312	271	259	40	138
$\bar{X}$	750	689	744	866	822	709	813	743	993	888	949	840	818		260
Date	12/18	1/12	1/8	12/31	1/15	1/15	1/14	1/14	1/14	1/14	1/14	1/6			
							COULTER COUNTER								
High	1136	1276	1292	1320	1272	1422							1286	92	286
Med	580	651	715	658	680	733							670	54	153
Low	230	233	277	207	257	292							249	32	85
$\bar{X}$	649	720	761	728	736	816							735		167
Date	12/18	1/13	1/20	1/8	1/9	1/9									

TABLE 2. *Electronic somatic cell count reference, December 1980, comparison of results from January, February and May.*

	Fossomatic X10^{-3}						
	Jan n=12			*Feb* n=5			*May* n=1
	$\bar{X}$	SD	Range	$\bar{X}$	SD	Range	
High	1460	156	494	1426	117	329	1430
Med	734	103	376	768	74	195	740
Low	259	40	138	244	34	106	237
$\bar{X}$	818		260	813		148	802

medium, and low cell count references for January, February and May were very comparable, 818, 813 and 802 demonstrating the long life of these samples under various conditions.

Later trials

Table 3 gives results for a set of 3 reference samples in duplicate made in mid-January. These were sent to those cooperating laboratories that promptly returned results from the December trial. As demonstrated by the comparison of the mean of the range of counts for DMSCC, Fossomatic and Coulter Counter in Tables 1 and 3, it can be concluded that the variation between laboratories is reduced. This was in part due to laboratories having the summary of the December results, and changes made in individual laboratories operations based on these results.

The results in Table 4 for the reference set produced in April are similar to January and serve to show that the results are repeatable. To reduce the space used in Table 4, results from one laboratory for more than two Fossomatics were averaged.

The results from the August reference set (Table 5) demonstrate another concern when dealing with references for electronic somatic cell counting. Again the variation between laboratories was less as the users gained more experience with electronic somatic cell counting. However, since few laboratories like to perform DMSCC, we received a poor response on DMSCC portion of the reports.

General observation on calibration of ESCC

From our experience, the Fossomatic is a machine that has little need for recalibration other than by very experienced people such as a Foss representative. Most deviation of the Fossomatic can be traced to component failure, technician error, improper maintenance of the equipment, or sample.

The Coulter Counter, on the other hand, must be calibrated more often by the operator as conditions within the laboratory or machine change, ie, variations in preservation or the change of an electrical circuit board or other components. This is not a particular problem as long as laboratory personnel recognize these changes.

Both techniques of counting cells are very precise and reliable but one never knows when they will fail, therefore, check samples must be used many times during the day.

Summary and conclusion

Check samples for ESSC from within a laboratory are tedious to make, require much skill and equip-

TABLE 3. *Electronic somatic cell count reference, January 1981.*

	VA	2	3	X10⁻³ 4	5	$\overline{X}$	SD	Range
				DMSCC				
High	1399	1549	1170	1433		1388	159	379
Med	763	706	600	814		721	92	214
Low	145	207	136	150		160	32	71
$\overline{X}$	769	821	635	799		756		186
				FOSSOMATIC				
High	1293	1530	1454	1299	1295	1374	110	237
Med	658	842	701	669	641	702	81	201
Low	159	204	141	162	168	167	23	63
$\overline{X}$	703	859	765	710	701	748		158
				COULTER COUNTER				
High	1284	1239	1236			1253	27	48
Med	701	614	628			648	47	87
Low	156	121	179			152	29	27
$\overline{X}$	714	658	681			684		50

ment and, in general, are so variable that it is very difficult when comparing ESCC with DMSCC to discern the source of the errors.

Enough interest has been shown for an industry-wide electronic somatic cell count check samples that steps are being taken to prepare them. Estimates are that a duplicate reference set of three samples could be produced on a monthly basis for 30 or more laboratories for about $50 per laboratory.

This work shows that a reference sample for electronic somatic cell counting is practical. It will have greater reliability than the use of DMSCC in individual laboratories. It should be competitive cost-wise with laboratory produced references if enough laboratories are interested.

TABLE 4. *Electronic somatic cell count reference, April 1981*

	VA	2	3	4	5	X10⁻³ 6	7	8	$\overline{X}$	SD	Range
						DMSCC					
High	1321	1403	1185	1207	1450	1081			1275	414	369
Med	809	871	808	759	705	647			766	81	224
Low	486	532	528	413	622	489			512	70	209
$\overline{X}$	872	935	840	793	926	739			851		196
Date		4/29	6/16	7/14	4/29	5/11					
						FOSSOMATIC					
High	1157	1245	1589	1220	1275	1307*	1267*	1200*	1283	132	432
Med	726	663	745	742	797	776	808	755	752	45	145
Low	491	444	515	N/A	549	584	555	525	523	46	140
$\overline{X}$	791	784	950		874	889	877	827	853		166
Date		4/29	5/5	6/4	5/10	4/29	6/16	7/13			
						COULTER COUNTER					
High	1172	1392	1284	1534	1196	1098			1279	161	436
Med	765	780	776	802	826	743			782	29	83
Low	537	570	556	573	564	518			553	21	36
$\overline{X}$	825	914	872	970	862	786			871		184
Date		9/15	7/22	8/13	5/11	4/24					

* More than two machines in one lab.

TABLE 5. *Electronic somatic cell count reference, August 1981.*

	VA	2	3	4	5	X10⁻³ 6	7	8	$\overline{X}$	SD	Range
						FOSSOMATIC					
High	1179	1226	1386	1427	1257	1128	1241	1262	1263	99	299
Med	539	582	630	609	540	501	568	546	564	42	129
Low	342	404	440	422	386	395	398	407	399	29	98
$\overline{X}$	687	737	819	819	728	675	736	738	742		144
Date		8/27	8/27	9/8	9/3	9/16	9/8	10/6			
						COULTER COUNTER					
High	1256	N/A	1264						1260	6	8
Med	578	674	546						599	67	128
Low	398	376	371						382	14	27
$\overline{X}$	744		727						747		17
Date											

Calendar

1982

July 7-11---SOYFOODS EXPO 82, University of Washington, Seattle, WA. For more information contact: Soyfoods Comes West Director, Soyfoods Association, 100 Health Road, Colrain, MA 01340.

July 15-August 1---EUROPEAN DAIRY STUDY TOUR. For more information contact: Mr. Tony Nankervis, G&N Travel Service, "ACMAL House", 566 St., Kilda Rd., Melbourne 3004, Victoria, Australia.

July 20-24---HOSPITAL, INSTITUTION, AND EDUCATIONAL FOOD SERVICE SOCIETY (HIEFSS) is announcing the relocation of its 1982 Annual Meeting. The 22nd Annual Meeting and Exposition is at Stouffer's Inn On The Square in Cleveland, Ohio. This is a change in date, city and hotel. For more information contact: Carolyn Isch, 4410 West Roosevelt Road, Hillside, IL 60162, 312-449-2770.

Aug. 10-12---SOUTHERN REGION FOOD EDUCATIONAL WORKSHOP. Vanderbilt Holiday Inn, Nashville, Tennessee. Food Sanitation Institute, Jean Day, Coordinator, 1019 Highland Avenue, Largo, FL 33540.

Aug. 13---SANITATION THROUGH DESIGN: Vanderbilt Holiday Inn, Nashville, Tennessee. Food Sanitation Institute, Jean Day, Coordinator, 1019 Highland Avenue, Largo, FL 33540.

Aug. 22-26---IAMFES ANNUAL MEETING. Galt House, Louisville, KY. Contact: Earl Wright, IAMFES, PO Box 701, Ames, IA 50010, 515-232-6699.

Sept. 1-2---THIRD ANNUAL JOINT EDUCATION CONFERENCE. Program Theme "Focus On Our Future." Sheraton Inn, Madison, WI. For more information contact: Jon R. Dresser, P.O. Box 7883, Madison, WI 53707, 603-266-3109.

Sept. 1-2---"PROSPECT FOR FOOD". The Summer Symposium of the Institute of Food Science and Technology will be held at the University of York and will be on the theme "Prospect of Food", dealing with aspects of nutrition, storage and raw materials. Details and registration forms available on request from: Dr. K. C. Yates, Hon. Secretary, IFST North of England Branch, Kelloggs Co., of Great Britain Limited, Park Road, Stretford, Manchester, *M32 8RA*.

Sept. 15-17---20th YANKEE CONFERENCE ON ENVIRONMENTAL HEALTH. Cromwell, Connecticut. Contact: Leon F. Vinci, P.O. Box 1300, Middletown, CT. 06457.

Sept. 15-18---3rd INTERNATIONAL CONGRESS OF THE NATURE INTERNATIONAL ACADEMY, Spoleto, Italy. For more information contact: Mrs. C. Rotoli Fucci, N.I.A. Via Enamuele Filiberto, 271 00185, Rome, Italy.

September 24---1982 FOCUS ON FOOD SCIENCE SYMPOSIUM IV. Kansas State University, Manhattan, KS. For more information contact: F. E. Cunningham.

October 13---IOWA ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS FALL EDUCATION MEETING. Holiday Inn, Cedar Rapids, IA. For more information contact: Jack Schoop, 602 East 1st St., Des Moines, IA 50307, 515-286-3929.

Nov. 7-10---NATIONAL FROZEN FOOD CONVENTION, New Orleans, LA. For more information contact: Scott Ramminger, 703-821-0770.

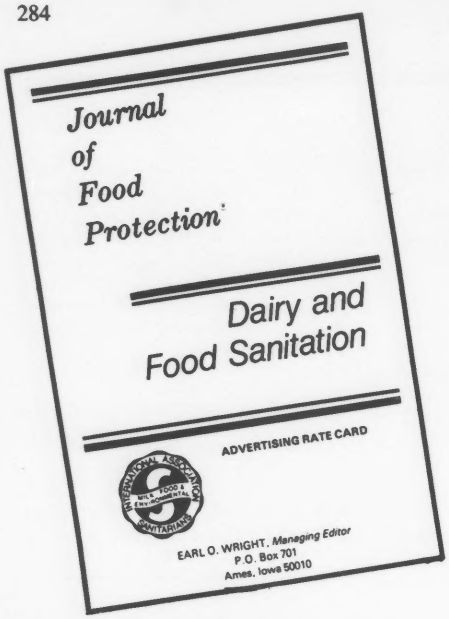
1983

August 6-11. 1983---IAMFES ANNUAL MEETING. Stouffers. St. Louis. MO.

Aug. 14-19, 1983---5th WORLD CONFERENCE ON ANIMAL PRODUCTION, Nihon Toshi Center, Tokyo, Japan. For more information contact: The 5th WCAP Conference Secretarial, c/o National Institute of Animal Industry, Tsukuba Norindanchi, PO Box 5, Ibaraki 305, Japan.

1984

August 3-9. 1984---IAMFES ANNUAL MEETING, Edmonton, Alberta, CN.



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General Sanitation	18.50
Laboratory	15.20
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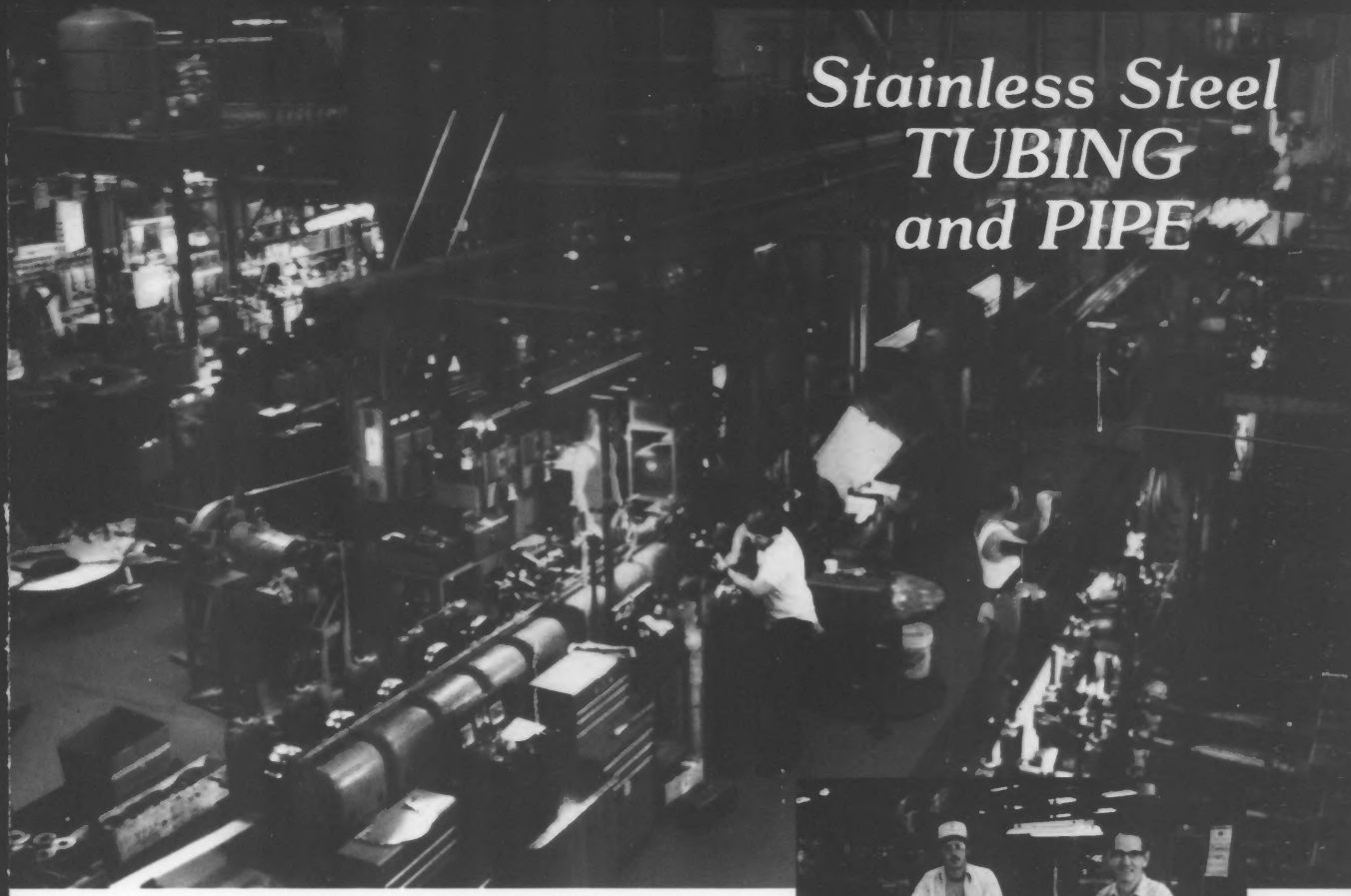

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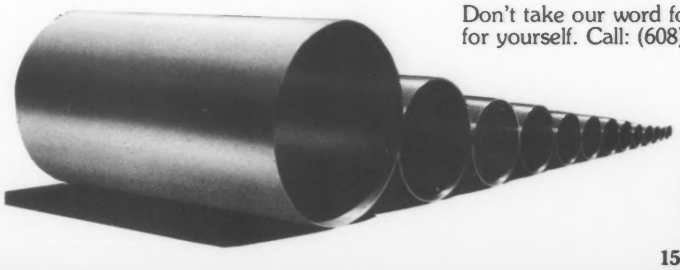

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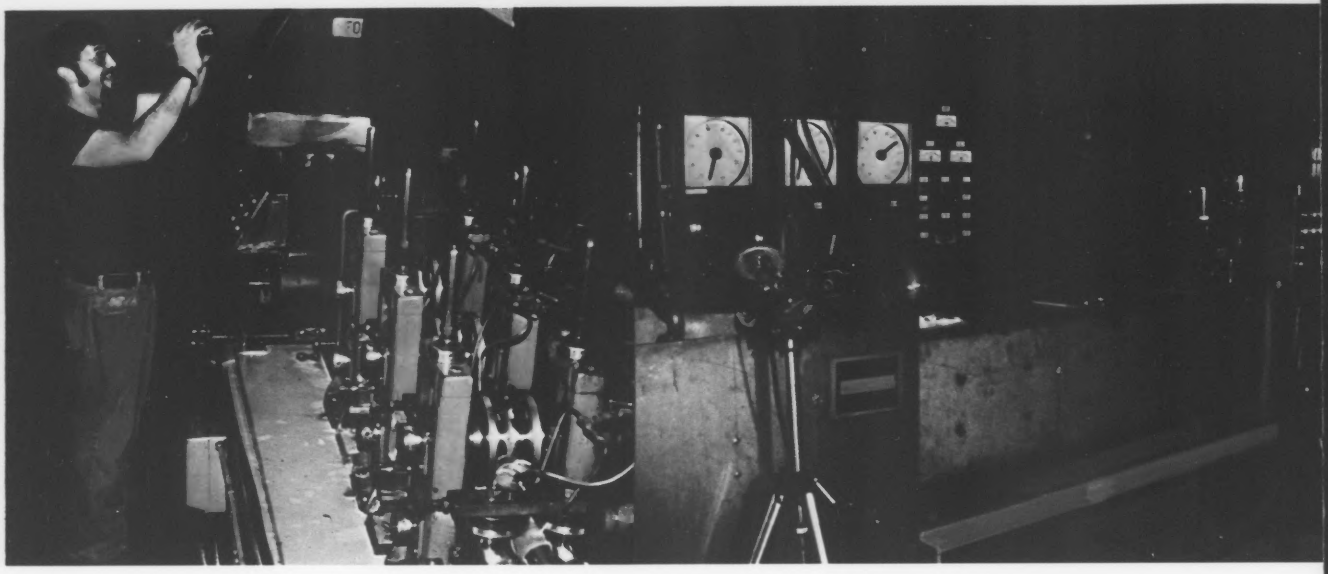

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Precision saw automatically cuts to length and tolerance repeatedly, according to presetting.

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Sizing rolls make the tubing round and also reduce the diameter to proper size. These are very high pressure rolls.

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This instrument indicates the controlled temperature of the tube leaving the chamber before quenching.

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Tubing leaving annealing chamber and entering the quench must be 1900° F. minimum at this point.

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The dial (right) indicates the controlled temperature of the tube entering the annealing chamber.

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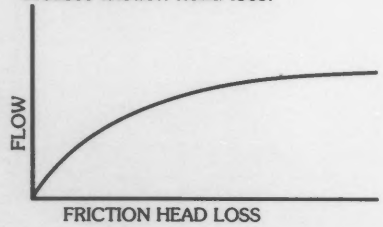
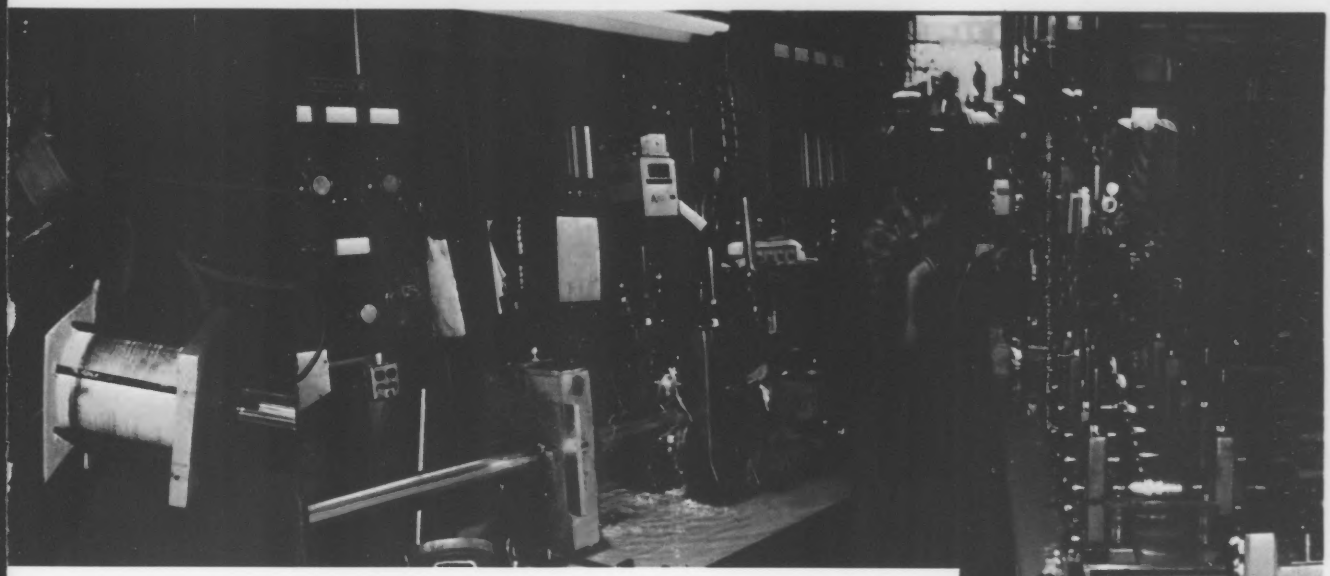


LONGER TUBE LIFE!

2. The finer the finish the less corrosion. Corrosion is accelerated by roughness resulting in eventual pitting. Pitting is promoted by galvanic corrosion where the pit, acting as anode reacts electrochemically with the passive overall surface acting as cathode. Polished surfaces reduce the possibility of galvanic corrosion.

LESS CLEANING, REDUCED DOWNTIME!

3. The finer the finish the less particles collect on the inside of the tube, and, the easier it is to remove those that do. The accumulation of particles is a factor in the start of galvanic corrosion. Reduced accumulation increases flow and heat transfer efficiency, resulting in less frequent cleaning, less down time and increased energy efficiency. **Saves Energy!**



Annealing...
High frequency induction coil brings the temperature from room temperature to 2000 degrees F or higher in a matter of seconds, before the tube enters the annealing chamber.

Internal bead roll...
The bead rolls - inside the tube is a Mandrel with small rollers held by a bar that extends upstream and is secured by a bracket where the tube is still open. The bead rolls the weld bead out and makes the inside as smooth as the parent metal.

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The weld box has rollers that hold the tubing seam in register with the proper amount of tension. This is a very delicate and important operation.

Here is where the Tungsten Electrodes draw the arc and weld the tubing. The arc is shielded by Argon, Helium, and Hydrogen.

Sundstrand 5 head grinders with automatic load and unload tables.

Check the physical dimensions to be sure they meet A269 and A270, whichever your order specifies. There is a significant difference in physicals between A269 and A270. This is notable in tolerance. A270 requires that the weld bead be cold worked by rolling or hammering, with no apparent variation in thickness from parent metal. This is not a requirement of A269. This difference can be detected by sight. The inside surface of A270 in particular must be smooth without severe scratches or blemishes.

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The breakdown rollers form the strip into the tube contour. For every set of perpendicular rolls there is a row of horizontal rolls in between.

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Coil of steel for 3" tubing is 9" plus in width and .065 - .083 thick. This steel must be of superior quality and to very close dimensions as to width and thickness. A full coil weighs approximately 4,000#.

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SURFACE TEXTURE DEFINITIONS

The surface texture on the inside of the tube is defined and measured in accordance with American Standard ASA B46.1-1962. This defines the roughness height as Arithmetic average (AA) which is the sum of the absolute values of the peaks and valleys divided by the number of such values. The unit of measurement is the microinch which is defined as one millionth of an inch (0.000001) abbreviated MUin. Expressed as formuli

$$AA = \frac{a+b+c+d+e+\ldots}{n}$$

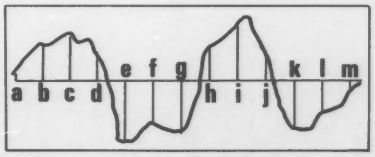

Fig. 1 represents a very short cross section of a surface greatly magnified illustrating the principle involved in determining the roughness value of a surface. The letters a, b, c, d, e, etc. represent distances in microinches above or below the mean reference line.

The root-mean-square average (rms or RMS), formerly in wide use, is the square root of the mean of the sum of the squares.

$$RMS = \sqrt{\frac{a^2+b^2+c^2+d^2+e^2+\ldots}{n}}$$

For the same surface the RMS average is generally 11% higher than the arithmetic average (AA), the difference resulting from the fact that the squaring process used to obtain RMS average gives greater weight to the larger surface deviation than the smaller ones.

The ASTM Code states that each manufacturer of tubing must send a certification of the physical and chemical analysis to his customer if the customer requests it . . . However, this seldom happens. Consequently, a lot of wrong steel is used and severe failures take place. United Industries sends a certification with every shipment. This certification specifies the physical and chemical characteristics of the steel and identifies it by means of the mill heat number. It should be received with a shipment or in the mail within 2 or 3 days after shipment.

With this certification and using the charts on the back page you can readily see if you have received the proper steel tubing.

SUMMARY OF ASTM SPECIFICATIONS

A249 • A268 • A269 • A270 • A312 • A358 • A409

O.D. Size (Inches)	Tolerances (Inches) O.D.	Wall	Cut Lgt.(a)
-1"	±.004"	+18% -0" Avail. in Average Wall	+⅛" -0"
1 to 1½"	±.006"		
+1½ to -2"	±.008"		
2 to -2½"	±010"		+3/16 -0"
2½ to -3"	±012"		
3 to 4"	±.015"		
+4 to 5"	+015" -.025"		

Size (Inches)	Tolerances (Inches) O.D.	Wall	Oval 2x Tol.	Cut Lgt. (b)
-½"	±.005"	±15%		+1/8" -0"
½ to - 1½"	±.005"	±10%	-.065"	
1½ to -3½"	±.010"	±10%	-.095"	+3/16" -0"
3½ to -5½"	±.015"	±10%	-.150"	
5½ to -8"	±.030"	±10%	.....	

Size (In.)	Tolerances (Inches) O.D.	Cut Lgt.
1" 1½"	+.002" -.008"	+1/8" -0"
2" 2½"	+.002" -.011"	
3"	+.003" -.012"	
4"	+.003" -.015"	
O.D. Tolerance is for .049" & Thicker. Under .049" by agreement		

Nom. Pipe Size (Inches)	Tolerances (Inches) O.D.	Wall & Weight (All Sizes)	Cut Lgt.
1/8" to 1½"	+.015" -.031"	12½% max. Under nom. wall thick, & 10% over 3½% under specified weight	+½" -0"
2 to 4"	+.031" -.031"		
5 to 8"	+.062" -.031"		
10&12"	+.093" -.031"		

(a) For lengths, 24' or less. Over 24' add 1/8" per 10' to 1/2" max. tol. Specification size range: 1/2" to 5" O.D. x .015 to .320 min. walls.

Tests per ASTM A249 & A450

- Flatten to $H = \frac{(1 + .09)t}{.09 + t/D}$ D = nom. O.D. t = nom. wall
- Flange.
- Reverse bend.
- Hardness: Rockwell B90 max.
- Yield Strength: "L" grades 25,000 psi min., Other grades 30,000 psi min.
- Tensile Strength: "L" grades 70,000 psi min. Other grades 75,000 psi min.
- % Elongation in 2" = 56t + 17.50 Mechanical tests not applicable to 1/8" O.D. & .015" wall.
- Hydrotest: P = 2St/D S = 16,000 or 24,000 psi max. if ordered
- Alternate: Non-destructive electrical test permitted unless order specifies test to be used. Test to A450.

(b) For cut lengths 24' or less. Over 24' add 1/8" per 10' to ½" max. tolerance. Tubes not heat-treated to be stencilled: "HT-0"

Tests per ASTM A269 & A450 .

- Flare for seamless tubes.
- Flange for welded tubes.
- Reverse flatten for welded tubes.
- Hardness: Rockwell B90 to BHN 200 Max. Mechanical tests not applicable to 1/8" O.D. & .015" wall.
- Hydrotest: At 1000 to 4500 psi depending on diameter provided stress does not exceed 26,000 or 24,000 psi max. if ordered per P = 2St/D.
- Alternate: Non-destructive electrical test permitted unless order specifies which test to be used. Test to A450.
- For details, refer to A450 specifications.

Wall Tol: ±12½%

Finish: 80, 120, 180 grit or rouge (R).

Test per ASTM A270 & A450

- Reverse flatten for Welded tubes
- Hydrotest: At P = 2St/D where S = 16,000 or 24,000 psi if ordered.

S = 50% of min. yield strength

t = specified min. wall thickness, inches

- Alternate: Non-destructive electrical test permitted unless order specifies which test to be used. Test to A450.

Tests per A312 & A350

- Flatten to $H = \frac{(1 + .09)t}{.09 + t/D}$ D = nom. O.D., t = nom. wall.

Yield strength: "L" grades 25,000 psi min.—Other grades 30,000 psi min.
Tensile strength: 70,000 or 75,000 psi min. depending on grade and size.

- % Elongation in 2" Longitudinal = 56t + 17.50 Transverse = 40t + 17.50.
- Hydrotest: P = 2 St/D. 2500 psi max. for 3" IPS and under and 2800 psi max, for 3½ to 12" IPS. S = 50% of Min. Y.S. Pressure exceeding 2800 psi guage shall be negotiated.
- See A530 on testing details.

Tests per A312 & 530

Chemical Requirements for Austenitic Chromium-Nickel Stainless Steels

AISI Type	C max	Mn max	P max	S max	Si max	Composition, % Cr	Ni	Mo	Other
201	0.15	5.50-7.50	0.060	.030	1.00	16.00-18.00	3.50-5.50	—	N 0.25 max
202	0.15	7.50-10.00	0.060	.030	1.00	17.00-19.00	4.00-6.00	—	N 0.25 max
301	0.15	2.00	0.045	.030	1.00	16.00-18.00	6.00-8.00	—	—
302	0.15	2.00	0.045	.030	1.00	17.00-19.00	8.00-10.00	—	—
302B	0.15	2.00	0.045	.030	2.00-3.00	17.00-19.00	8.00-10.00	—	—
303	0.15	2.00	0.20	0.15 min	1.00	17.00-19.00	8.00-10.00	0.60 max	—
303Se	0.15	2.00	0.20	.06	1.00	17.00-19.00	8.00-10.00	—	Se 0.15 min
304	0.08	2.00	0.045	.030	1.00	18.00-20.00	8.00-12.00	—	—
304L	0.03	2.00	0.045	.030	1.00	18.00-20.00	8.00-12.00	—	—
305	0.12	2.00	0.045	.030	1.00	17.00-19.00	10.00-13.00	—	—
308	0.08	2.00	0.045	.030	1.00	19.00-21.00	10.00-12.00	—	—
309	0.20	2.00	0.045	.030	1.00	22.00-24.00	12.00-15.00	—	—
309S	0.08	2.00	0.045	.030	1.00	22.00-24.00	12.00-15.00	—	—
310	0.25	2.00	0.045	.030	1.50	24.00-26.00	19,00-22.00	—	—
310S	0.08	2.00	0.045	.030	1.50	24.00-26.00	19.00-22.00	—	—
314	0.25	2.00	0.045	.030	1.50-3.00	23.00-26.00	19.00-22.00	—	—
316	0.08	2.00	0.045	.030	1.00	16.00-18.00	10.00-14.00	2.00-3.00	—
316L	0.03	2.00	0.045	.030	1.00	16.00-18.00	10.00-14.00	2.00-3.00	—
317	0.08	2.00	0.045	.030	1.00	18.00-20.00	11.00-15.00	3.00-4.00	—
D319	0.07	2.00	0.045	.030	1.00	17.50-19.50	11.00-15.00	2.25-3.00	—
321	0.08	2.00	0.045	.030	1.00	17.00-19.00	9.00-12.00	—	Ti 5 x C min
347	0.08	2.00	0.045	.030	1.00	17.00-19.00	9.00-13.00	—	Cb-Ta 10 x C min
348	0.08	2.00	0.045	.030	1.00	17.00-19.00	9.00-13.00	—	Cb-Ta 10 x C min; Ta 0.10 max; Co 0.20 max

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The Use of the DHI-SCC Program to Select Cows for Bacteriological Milk Culture and Subsequent Treatment, Early Dry-off or Culling

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As yet, it is not known whether or not the DHI-SCC program is useful in decision making regarding management and treatment of individual cows. It is possible that such use might further reduce the prevalence and incidence of mastitis in a herd.

Mastitis control programs are designed to reduce the prevalence of subclinical infection and clinical episodes of mastitis in an economic way. Post milking teat dipping and treatment of all cows with antibiotics at the time of drying off (end of lactation period), are the two practices which are most effective in reducing the prevalence of subclinical infections. Studies have shown that within one to three years following the adoption of these practices in dairy herds the prevalence of *Staphylococcus aureus*, *Streptococcus agalactiae*, *Streptococcus uberis* and *Streptococcus dysagalactiae* infections can be reduced to less than 10% of quarters (Roberts, 1969). The prevalence of clinical infections with these organisms is expected to be reduced to 2% or less. Dairy Herd Improvement (DHI) programs offer the opportunity for monthly electronic cell counts on composite milk samples. This is an aid to the dairyman in evaluating the effectiveness of mastitis control practices and products in use in a herd (Eberhart *et al.*, 1979).

As yet, it is not known whether or not the DHI-SCC program is useful in decision making regarding management and treatment of individual cows. It is possible that such use might further reduce the prevalence and incidence of mastitis in a herd.

This study is designed to measure the effect of lactation treatment, the effect of early dry off and dry treatment, and of culling, based on culture of milk with high SCC on infection prevalence in a herd. The cow infection prevalence was established for the whole herd using composite milk samples for culture. A review of the history of herd over the 6 month period before beginning the project determined the number and percent of cows with SCC over 250,000, the number of clinical cases per month and the number of cows culled because of mastitis.

On a monthly basis the DHI-SCC list is reviewed. Cows above a certain level are cultured. We elected to culture cows with cell counts above 250,000/ml. We collect both quarter and composite samples for culture. The purpose is to determine the percent error in either false negative or false positive results when using composite samples. If the results are valid, composite samples are preferred to quarter samples because of lower laboratory cost. Modern therapeutic methods dictate that all four quarters be treated rather than single quarters. The reason for this is that negative quarters of cows with one or more infected quarters are at higher risk of new infection. Because of the time delay between sample collection, testing, reporting and treatment, it can be argued that all four quarters should be treated. This negates the necessity for culturing quarter samples provided accurate results can be obtained with composite samples. Another important economic consideration in this matter is the fact that even though only one quarter is treated, all milk from the treated cows must be discarded during the withholding time. For both these reasons there seems to be little advantage to quarter milk culture and individual quarter treatment.

Following the completion of the culture and susceptibility testing, treatment or disposition of infected cows is accomplished in one of the following ways.

1. Lactation therapy. Systemic and intramammary treatment, based on susceptibility tests and pharmacokinetic principles. Mercer and Sears, 1981.
2. Early dry off and dry cow treatment.
3. Culling.

Following the use of this program for six months the possible early effect of the program on herd intramammary infection prevalence was reviewed. The number and percent of cows with SCC over 250,000/ml, and culture positive is tabulated monthly. The number and percent of culls and clinical cases is also tabulated by the month.

MATERIALS AND METHODS

A one hundred and twenty four cow herd is being studied. Composite milk samples from these cows are subjected to electronic somatic cell counting through the DHI program. Cows whose composite milk contains more than 250,000 cells/ml are selected for culture and susceptibility testing. Culture positive cows are selected for mastitis therapy (dry or lactation) according to the susceptibility tests in one of the following ways:

1) Cows who anticipated date of calving is more than 100 days in the future are selected for lactation therapy.

2) Cows which are due to calve in 100 days or less (in late lactation) are dried off abruptly and dry treated by infusion of all 4 quarters with an FDA approved dry therapy product. The selection procedure is subject to approval or veto by the dairy manager. When lactation treatment is elected it is by the method of Mercer and Sears (1981) using infusion of all four quarters and systemic therapy.

3) Cows that have recurrent high SCC in spite of dry treatment or lactation therapy, are placed on the potential cull list. The ultimate decision to cull cows is made by management. Regardless of the SCC or cultural results, all cows in the herd were dry treated with a million units of penicillin plus 1 gm dihydrostreptomycin (Quartermaster)*. Dry treatment is administered immediately following the last milking and after preparation of teat ends with gauze and alcohol swabs.

Milk Samples:

Quarter and composite milk samples are collected aseptically in sterile screw-capped vials, and delivered directly to the laboratory.

Somatic Cell Count:

Electronic cell counts on composite milk samples are conducted using Automatic Milk Cell Counters** at the DHI laboratory by Ohio Ag Services, Inc.

Culture:

Selective media are inoculated for identification of the more predominant mastitis pathogens; blood agar for staphylococci and streptococci, TK/FC medium for streptococci and MacConkey agar for coliforms according to the method for the identification of mastitis pathogens by Kowalski, 1977.

Susceptibility Tests:

Susceptibilities of isolated mastitis pathogens are determined by the Kirby-Bauer method on Meuller Hinton medium (Difco) containing blood.

Antibiotics Tested are:

Penicillin, Streptomycin, Tetracycline, Erythromycin, Cloxacillin (Methicillin), Cephalosporin, Neomycin and Novobiocin. Triple sulfa discs are also used.

RESULTS

The mastitis history of the herd in the six months before the project is tabulated in Table 1. The percentage of cows with SCC greater than 250,000/ml ranged between 14.58 and 18.47 in any month. The percentage of cows with clinical mastitis ranged between zero and 7.52 in any month. There were no cows culled because of mastitis during that time.

The mastitis history of the herd from May to November 1981, by month is tabulated in Table 2. The percentage of cows with SCC greater than 250,000/ml ranged between 10.43 and 34.18. The percentage of cows with SCC greater than 250,000/ml which were culture positive ranged between 46.66 and 71.42.

The number and percentage of cows treated by either method or culled is tabulated in Table 3. The percentage of culture positive cows, treated during lactation ranged between 10.00 and 71.42. The percent of culture positive cows dried off early and dry treated ranged between zero and 40.9. Culling was minimal.

The prevalence of infection in the herd in June, 1981 at the beginning of the project, and after 6 months, in December 1981 is tabulated in Table 4. The percentage of culture positive composite samples was 37.5 in June and 42.26 in December. This figure includes organisms other than the four common gram positive mastitis pathogens. The herd has practiced teat dipping and dry treatment of all cows since about 1970. *Streptococcus agalactiae* has been eradicated from the herd and the other three Gram positive organisms occur at a very low level.

Coagulase negative staphylococcus is the organism isolated most frequently from this herd. Coagulase negative staphylococci accounted for 77.77% and 70.73% of the total isolates.

Different bacterial isolates from cows with SCC greater than 250,000/ml is shown in Table 5. Coagulase negative staphylococci are identified most frequently, followed by non-agalactiae streptococci, coagulase positive staphylococci, coliforms and others. The number of positive composite and quarter samples ranged between 5 to 18 and 10 to 42 respectively. The number of culture positive cows missed by composite sample cultures ranged from zero to 4 per month. Composite sampling missed about 19% of culture positive cows when compared to quarter sampling.

The effects of treatments on somatic cell counts is shown in Table 6. Twenty six cows were treated 34 times. Twenty were treated during lactation. Fifteen (75%) had a somatic cell count less than 250,000/ml at the monthly test following treatment. Five had an increased cell count the next month, two were culture positive with the identical organism and three had a new type infection.

In contrast 30 additional cows were selected for therapy but were not treated. This was the managers perogative. This decision to treat or not treat some cows was based on the current need for milk for calf feed for which the non salable milk containing antibiotic residue could be used. Of the 30 untreated cows 17 (57%) had cell counts above 250,000/ml at the next test. Thirteen (13) (43%) had counts below 250,000/ml. The calculated recovery due to therapy was 32%.

Twelve cows were dried up early and dry treated. Ten (83.33%) had a low SCC (250,000/ml) at the next test date after parturition. One had an increased cell count with the identical organism isolated at drying off and at the first test date following

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* *Quartermaster, West Agro, Inc.*

** *Coulter Electronics, Hialeah, Florida.*

TABLE 1. *Mastitis history of the herd for six months prior to the project.*

Month	Total No. of cows	Cows with SCC more than 250,000		Clinical Cases		Cows culled because of mastitis	
		No.	%	No.	%	No.	%
Nov. 1980	96	14	14.58	--	--	--	--
Dec.	92	17	18.47	--	--	--	--
Jan. 1981	93	14	15.05	7	7.52	--	--
Feb.	109	16	14.67	6	5.50	--	--
March	105	19	18.09	2	1.90	--	--
April	97	15	15.46	1	1.03	--	--
Average	84.57	13.57	13.76	2.28	2.27	--	--

-- = nil.

TABLE 2. *Monthly Herd History (May 1981 to Nov. 1981).*

Month	Total No. of Cows	Cows with SCC more than 250,000		Culturally Positive Cows		Clinical Cases	
		No.	%	No.	%	No.	%
May 1981	112	17	15.17	11	64.70	7	6.25
June	117	40	34.18	22	55.00	4	3.41
July	115	12	10.43	8	66.66	2	1.73
Aug.	113	14	12.38	10	71.42	1	0.88
Sept.	115	15	13.04	7	46.66	6	5.21
Oct.	107	17	15.88	10	58.82	2	1.86
Nov.	109	15	13.76	7	46.66	5	4.58
Average	112.57	18.57	16.40	10.71	58.56	3.85	3.41

TABLE 3. *Monthly Herd Treatment (May 1981 to Nov. 1981).*

Month	Total No. of cows	Culturally positive cows with more than 250,000 SCC		Treatment					
				Lactation therapy Systemic and Infusion		Early Dry-off and dry cow treatment		Culling	
		No.	%	No.	%	No.	%	No.	%
May	112	11	64.70	--	--	--	--	--	--
June	117	22	55.00	3	13.63	9	40.90	1	4.54
July	115	8	66.66	5	62.5	--	--	1	12.50
Aug.	113	10	71.42	4	40.00	2	20.00	--	--
Sept.	115	7	46.66	2	28.57	--	--	--	--
Oct.	107	10	58.82	1	10.00	1	10.00	--	--
Nov.	109	7	46.66	5	71.42	--	--	--	--
Average	112.57	10.71	58.56	2.85	32.30	1.71	10.12	0.28	2.43

-- = nil.

TABLE 4. *Cow Infection Prevalence (Herd Survey, Composite Samples).*

Month of Sampling	Total No. of Composite Samples	Total Isolates											
		Culturally Positive Samples		Coagulase Positive Staph.		Coagulase Negative Staph.		Non-Agalactiae Strept.		Coliform		Others	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
June 81	96	36	37.5	4	11.11	28	77.77	4	11.11	1	2.77	--	--
Dec. 81	97	41	42.26	1	2.43	29	70.73	12	29.26	2	4.87	2	4.87

-- = nil.

TABLE 5. *Bacterial Isolates From Cows With SCC More Than 250,000.*

Month	No. Of Cows With SCC More Than 250,000	No. Of Culturally Positive Cows	Total Positive Composite Samples	Total Positive Quarter Samples	Isolated organisms									
					Coagulase Positive Staphylococci		Coagulase Negative Staphylococci		Non-Agalactiae Streptococci		Coliform		Others	
					Comp.	Quarter	Comp.	Quarter	Comp.	Quarter	Comp.	Quarter	Comp.	Quarter
May 1981	17	11	9	28	1	2	7	21	--	--	1	3	1	2
June	40	22	18	42	2	5	14	28	3	7	--	1	--	--
July	12	8	8	17	1	1	5	10	3	4	--	--	1	3
August	14	10	9	20	2	4	4	12	2	4	--	--	1	--
Sept.	15	7	5	10	1	3	1	2	2	3	--	--	1	3
Oct.	17	10	7	15	--	--	4	3	5	7	1	1	--	5
Nov.	15	7	5	15	1	1	2	8	2	7	--	--	--	--
Average	18.57	10.71	8.71	21	1.14	2.28	5.28	12	2.42	4.57	0.28	0.71	0.57	1.85

-- = nil.

TABLE 6. *Effect of Treatment on Somatic Cell Count.*

Total No. of Treated Cows with SCC more than 250,000	Total No. of Cases Treated	Treatment																	
		Lactation Therapy Systemic and Infusion								Early Dry-off and Dry Cow Treatment								Culling	
		Total		Decreased		Increased		New Inf.		Total		Decreased		Increased		New Inf.			
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
26	34	20	58.82	15	75	2	10	3	15	12	35.29	10	83.33	1	8.33	1	8.33	2	5.88

parturition. Similarly, one cow developed a new type infection. Only two cows were culled for mastitis reasons.

DISCUSSION

Currently the most cost-effective means of controlling mastitis is with the combined teat dipping and dry cow therapy program (TD-DCT). New procedures will have to be more effective or less expensive (or both) than the TD-DCT before they can be recommended. New practices could be recommended in addition to teat dipping and dry treatment if they are shown to be cost effective in controlling types of infection not controlled by TD-DCT or if they are shown to be cost effective in further reducing the incidence of clinical cases, lost quarters, deaths, treatment expense and milk loss.

As yet there is no basis for recommending the use of DHI-SCC for individual cow decisions on treatment during lactation, early dry off and dry cow therapy or in culling cows. Such information may be useful in a limited way, but use on all cows in a herd will have a large initial cost with no guarantee of return.

The possible advantage to be gained by a new program such as we've described in conjunction with the DHI-SCC program may accrue through a reduced reservoir of mastitis pathogens, reduced incidence of new infections and increased production of higher quality milk. Preliminary evidence from a 6 month trial does not reveal a benefit trend.

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NOTICE:

The Hospital, Institution, and Educational Food Service Society is giving 17 continuing education clock hours for attendance at the IAMFES Annual Meeting, August 22-26, 1982, Galt House, Louisville, Kentucky.

Committee Reports

Milk Memos

by Sidney E. Barnard

You may be interested in brief articles on preventing antibiotics and added water in milk. The following are directed to dairy farmers and were prepared as part of the Food Science Extension Dairy program. They were reviewed by the Farm Practices Committee of the PA Dairy Sanitarians Association and are used widely by the dairy industry in Pennsylvania and the northest. Provide your dairy farmers with this or similar information, so that they know why and what to do.

PREVENT ANTIBIOTICS OR GROWTH INHIBITORS IN MILK

Sidney E. Barnard

Professor of Food Science Extension
The Pennsylvania State University

The incidence of any adulterants in milk is very low. Extensive testing by industry and regulatory laboratories shows that less than 0.02% of farm samples contain detectable levels of any antibiotics. In almost every case, the milk is dumped, so that consumers do not get it. The current estimated annual loss to the dairy industry in Pennsylvania for discarded milk exceeds $2,500,000. In addition more than $1,000,000 is spent each year testing for the presence of antibiotics or growth inhibitors in milk.

Each case of antibiotics in milk is a serious problem. A number of cases have involved truck loads or storage tanks of milk valued at up to $50,000. A small percentage of the population are allergic to levels of penicillin above .05 I.U. and have reactions varying from a rash to convulsions.

Tests used to determine the presence of penicillin can redily detect less than .01 I.U. This is the equivalent of a 100,000 unit infusion in a quarter of one cow, which gets into a load of 45,000 pounds of milk. You cannot rely on dilution, as milk from one quarter can be detected in the milk from 1,000 cows.

The only source of penicillin in milk is from treatment of cows on the farm. Prevention is the only way, as no procedure will remove penicillin from milk.

Follow these practices:

1. Read the directions for all drugs and medicines used for dairy cattle. Use the prescribed dose and withhold all milk for the time indicated.
2. Identify all treated cows and show when the milk will be safe to put into the bulk tank.
3. Milk treated cows last. Milking equipment must be thoroughly washed and sanitized after milking a treated cow.
4. Discard all milk from a treated cow even though only one quarter was infused. Also, discard all milk following intravenous and intra-muscular shots. Assume that a purchased animal was treated and test her milk before putting into the bulk tank.
5. Do not save milk from a cow which was dry treated for 30 days, even though she freshens early. Following a normal 60 day dry period withold all milk for four days after freshening.
6. Whenever in doubt, have a cow or bulk tank sample tested, using a field kit or official tests. Do not take a chance, as you will probably get caught. The penalty is dumping milk from your entire herd for two days. Purchase and use your own field test kit.

PREVENT ADULTERATION OF MILK BY ADDED WATER

Sidney E. Barnard

Professor of Food Science Extension
The Pennsylvania State University

It is illegal to let added water get into milk. In addition it is a serious financial loss to processors and consumers. Minimum standards for milk are 11.5% total solids and 3.25% fat. In addition, the freezing point for milk in Pennsylvania must be -0.525°C or below. The freezing point range for normal milk is -0.530 to -0.566°C.

Solids and fat levels do not significantly change the freezing point of milk. Salts and sugars cause milk to freeze at a slightly lower temperature than the 0°C for water.

To prevent freezing points of your milk above -0.530°C follow these practices.

1. Install a microswitch on a pipeline milker to prevent rinsing or washing while the discharge pipe is in the bulk tank.
2. Be sure that the discharge pipe for the pipeline milker goes to the sink or drain before rinsing or sanitizing the pipeline.
3. In spite of what you may have been told, do not chase milk out of your pipeline milker with water.
4. Do not use a spray hose to rinse off the top of the bulk tank, when milk is in the tank. Wipe off the milk with a paper towel.
5. If you rinse teat cups in a solution between cows, close a positive valve in the milk line.

6. Thorougly wash and dry teats using a sanitizer and paper towels before attaching milker units.
7. Make sure that the bulk tank is drained after washing and sanitizing before closing the valve.
8. Any person collecting a sample from the bulk tank should agitate the milk thoroughly and use a dry sample container.
9. Dippers used for collecting samples must be carried in a sanitizer solultion. Fill the dipper with milk and empty at least twice before collecting a sample.
10. Observe your milk hauler to be sure that he is disconnecting the host from the outlet valve before rinsing your bulk tank.
11. Make sure that farm workers and milk haulers are not adding water to milk to increase volume or cover losses.

Milk contains about 87% water. Protect your product and your market. Be sure that added water and solutions do not get into milk.

AFFILIATE NEWSLETTER . . .

This page has been devoted to YOU, the IAMFES affiliates. Your input is needed on whether you feel this page should be a regular feature to serve as a communication source between the state and international office. Please respond.

FROM IOWA... The Iowa Association of Milk, Food and Environmental Sanitarians held its annual meeting in Ames, Iowa on Tuesday, March 23, 1982. The day began with the Farm Practices Committee Breakfast meeting. Previously, this meeting was held the following morning and no report was available to the members. Chairman J. H. Burkett called the meeting before so a report could be presented. We hope this practice will continue.

President Jellings welcomed all to the meeting with the outline of the program for the day.

The morning program started with the State of the International Association address given by Kathy Hathaway, Associate Executive Secretary. An update on the two journals was given, as well as the new procedures for the collection of dues. For the first time, we had the opportunity to meet the entire staff. Because of illness, Mr. Earl Wright was unable to attend.

Carl Bloomberg, Anderson Chemical Co, emphasized the importance of cleaning, because the keeping quality of dairy products is not improving. The main reason - the psychrophiles are not being controlled.

Ray Ormond, Iowa Dept. of Agriculture, told us of imitation milk products on the market and unless we improve our products, imitation will be the rule.

We adjourned for lunch and met again at the Iowa State University Veterinary College. We had a very interesting tour of the facilities. Following the tour, Dr. George Beran, DVM- spoke to us of Human and Animal Health Relations.

At 3:30 P.M. the business meeting was called to order. The Constitution was given an affirmative vote for change. Elected to the new board in the following positions were:

Eugene Peters - President
Ray Ormond - President-Elect
Derwood Hansen - 1st Vice President
Ralph Sander - 2nd Vice President
Jack Schoop - Secretary-Treasurer
Clarence Jellings - Past President
Dr. William LaGrange - Faculty Advisor
Earl Wright - Advisor

A banquet followed at 7:00 P.M. with Dr. George Beran taking us through the Phillipines by way of slides and narration.

An open mind leaves a chance for someone to drop a worthwhile thought into it.

Knowing what you want will power your drive.

Do a friend a favor...pass along a membership form to IAMFES.

RENEWALS... If your renewal forms are reaching you now, please take time to check the appropriate journal(s) you wish to receive and mail them back to us as soon as possible. When memberships are not renewed on time, it becomes a very costly, time consuming project, sending back issues to you. This is your organization, so lets pull together and get the renewals back in as soon as possible. Jeanine, Circulation Mgr., who mails the back issues, would really appreciate it. Thanks for your cooperation.

The Annual Meeting is fast approaching. Anyone requiring information as to registration forms, or the program itself, just contact the International Office at 515-232-6699 or write IAMFES P.O. Box 701, Ames, IA 50010. We are here to help.

Thanks for the response from state affiliate officers on their meetings and what's upcoming. It's the best way to keep everyone informed.

Members of the International Office attended IFT '82 in Las Vegas (Food Expo) the end of June. We will update you on the response your organization received in the next issue.

3-A Accepted Practices for Milk and Milk Products Spray Drying Systems

Number 607-03

Formulated by
International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee

It is the purpose of the IAMFES, USPHS, and DIC in connection with the development of the 3-A Sanitary Standards program to allow and encourage full freedom for inventive genius or new developments. Milk and milk products spray drying systems heretofore or hereafter developed which so differ in design, material, fabrication, or otherwise as not to conform with the following practices, but which in the fabricator's opinion are equivalent or better, may be submitted for the joint consideration of the IAMFES, USPHS, and DIC at any time.

A.

SCOPE

A.1

These 3-A Accepted Practices shall pertain to the sanitary aspects of equipment for spray drying milk and milk products, and includes all equipment necessary for spray drying milk and milk products beginning with the discharge of the pump which delivers the liquid product to the drying system and terminating at the point the final dried product enters either the packaging systems or storage for further processing. The drying system includes the equipment used for moving and cleaning the air, heating and/or cooling the air, atomizing the liquid, mixing the liquid in the hot air, removing the dry product from the air, additional drying of the product, cooling the product, pulverizing, sizing and conveying the product.

A.2

In order to comply to these 3-A Accepted Practices, equipment in spray drying systems shall comply with the following criteria for design, material, fabrication and air supply.

B.

DEFINITIONS

B.1

Product: Shall mean the milk or milk product and dry milk or dry milk product.

B.2

Air to be Heated: Shall mean processing air to be heated to at least 240°F.

B.3

Air not to be Heated: Shall mean processing air which either will not be heated or will be heated to a temperature less than 240°F.

B.4

Processing Air: Shall mean air prepared by filtration which is intended to be used in contact with the product for such purposes as heating, cooling, drying or conveying or will be used for sealing a bearing or similar purposes.

B.5

Product Contact Surfaces:

B.5.1

Shall mean all surfaces that are exposed to the product or from which liquids and/or solids may drain, drop or be drawn into the product.

B.6

Air Contact Surfaces:

B.6.1

Air contact surfaces, for air to be heated, shall mean all surfaces prior to coming in contact with the product, commencing at the discharge of the final air inlet filter and ending at the first down-stream product contact surface.

B.6.2

Air contact surfaces for air not to be heated shall mean all surfaces prior to coming in contact with the product, commencing at the discharge of the final air filter(s) and ending at the first downstream product contact surface.

B.6.3

Exhaust air contact surfaces shall mean the surfaces of the air ducts, plenum chamber(s) (if provided) and appurtenances from the final product contact surface through the exhaust system.

B.7

Non-Product Contact Surfaces: Shall mean all other exposed surfaces.

B.8

Mechanical Cleaning or Mechanically Cleaning: Shall denote cleaning, solely by circulation and/or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned, by mechanical means.

B.9

Engineering Plating: Shall mean plated to specific dimensions or processed to specified dimensions after

plating[1].

B.10

Moving Porous Belt: Shall mean a porous belt used to convey products through a spray drying system.

C.

MATERIALS

C.1

The materials of product contact surfaces of equipment included in the spray drying system for which there are 3-A Sanitary Standards or 3-A Accepted Practices shall comply with the material criteria of the applicable Standards or Accepted Practices.

C.2

All other product contact surfaces shall be of stainless steel of the AISI 300 series[2] or corresponding ACI[3] types. (See Appendix, Section F.1), or metal that is non-toxic and non-absorbent and which under conditions of intended use is equally corrosion resistant except that:

C.2.1

Plastic materials may be used for scraper blades, sight and/or light glasses, bearings, bushings, short pieces of transparent tubing in dry product areas for observation purposes, short flexible connectors, sealing applications, cable drums, a coating on cable drums, a coating on the edges of a moving porous belt, and moving porous belts. These materials shall conform with the applicable provisions of the "3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-11.

C.2.2

Rubber and Rubber-like materials may be used for short flexible connectors, scraper blades, sealing applications, and for cable drums or rollers or as a coating on cable drums or rollers. The materials shall conform with the applicable provisions of the "3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18-00".

C.2.3

Cotton, wool, linen, silk, or synthetic fibers may be used for filtering and/or screening surfaces or entrainment separators, and for short flexible connectors used in dry product packaging areas. These materials shall be non-toxic, relatively insoluble in water, easily cleanable, and shall not impart a flavor to the product.

C.2.4

Aluminum alloys conforming to the Aluminum Association[4] designates 5052 and 6061 and an Optional Aluminum Alloy conforming to the composition found in Appendix, Section J may be used (1) for ducts for air not to be heated and (2) as a product contact surface for dry product for star wheel rotors that are removed for cleaning, rotary air locks, diverter (flipper) valves, a supporting or reinforcing member in lightweight moving parts and in similar applications.

C.2.5

Welded areas and the deposited weld material shall be substantially as corrosion resistant as the parent materials.

C.2.6

Heat resistant glass[5] may be used in sight and/or light openings.

C.2.7

Cable pulleys may be covered with an engineering plating of chromium or nickel.

C.3

Air contact surfaces for air to be heated, except for those of flexible connectors, fans, burners and dampers, shall be of a corrosion resistant metal that maintains its original surface characteristics under the environment of intended use, or is rendered corrosion-resistant by a coating of corrosion-resistant material other than paint. If the portion of the plenum chamber at the inlet to the drying chamber is subject to washing, it shall be made of stainless steel.

C.4

Air contact surfaces for air not to be heated shall meet the materials requirements of a product contact surface.

C.5

Filter Media: Intake air filter media shall consist of one or more of the following: fiber glass with a downstream backing dense enough to prevent fiber glass break off from passing through, cotton flannel, wool flannel, spunmetal, activated carbon, activated alumina, non-woven fabric, absorbent cotton fibre, or other suitable materials which, under conditions of intended use, are non-toxic and non-shedding and which do not release toxic volatiles or other contaminants to the air, or volatiles which may impart any flavor or odor to the product. Chemical bonding materials contained in the media shall be non-toxic, non-volatile and insoluble under all conditions of use. Disposable media shall not be cleaned and re-used.

NOTE: Electronic air cleaners use electrostatic precipitation principles to collect particulate matter and therefore are not included in the preceding list of

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[1] *QQ-C-320 B* - Federal Specification for Chromium Plating (Electrodeposited). *June 17, 1974. 40¢.*
QQ-N-290 A - Federal Specification for Nickel Plating (Electrodeposited). *November 12, 1971. 20¢. Both documents available from: Business Service Center, General Services Administration, Seventh and D Streets, SW, Washington, DC.*

[2] *The data for this series are contained in the following reference: AISI Steel Products Manual Stainless & Heat Resisting Steels, April, 1963, Table 2-1, pp. 16-17. Available from: American Iron & Steel Institute, 633 Third Ave., New York, N.Y. 10017.*

[3] *Alloy Casting Institute Division, Steel Founders' Society of American 21010 Center Ridge Road, Rocky River, Ohio 44116.*

[4] *Aluminum Association, 420 Lexington Avenue, New York, N.Y. 10017.*

[5] *Glass of a borosilicate type with a coefficient of expansion between 30°C and 300°C of between 3.0 and 3.5 parts per million per degree celsius.*

acceptable filter media. This does not preclude their use in spray drying systems.

C.6

Non-product contact surfaces, shall be of corrosion-resistant material or material that is rendered corrosion-resistant. If coated, the coating used shall adhere. Non-product contact surfaces shall be relatively non-absorbent, durable and cleanable. Parts removable for cleaning having both product contact and non-product contact surfaces shall not be painted.

D.

FABRICATION

D.1

The fabrication criteria of equipment included in the spray drying system for which there are 3-A Sanitary Standards or 3-A Accepted Practices shall be those of the applicable Standards or Accepted Practices.

D.2

All other equipment shall conform to the following fabrication criteria.

D.2.1

The product contact surfaces of stainless steel sheets shall be as smooth as a No. 4 ground finish, free of imperfections such as pits, folds and crevices. Seam welds shall be smooth and pit free. Where grinding and polishing are required, such areas shall be at least as smooth as a ground finish obtained with 80 grit silicon carbide. Intricate fabricated and/or machined components shall be as smooth as a ground finish obtained with 80 grit silicon carbide, with welds pit free. If stainless steel sheets with a No. 2B finish are used, they shall be selected so as to be free of imperfections such as pits, folds, and crevices in the fabricated form. Joints shall be smooth and shall be fabricated in a manner that the product contact surface is self-draining or self-purging. Permanent joints in metallic product contact surfaces shall be continuously welded.

D.2.2

Product contact surfaces shall be easily accessible for thorough cleaning, either when in an assembled position or when removed. Parts that must be removed for cleaning shall be readily removable and easily dismantled, except (1) that high pressure liquid product lines and such parts as fan wheels, air lock valves, fluidizer valves, conveying mechanisms, and similar parts need only be readily accessible for cleaning, and (2) centrifugal atomizers and air dispenser cones need only be removable for cleaning.

D.2.3

Product contact surfaces intended for regular wet cleaning shall be self-draining or self-purging except for normal clingage, except where self-draining is not feasible other drying methods including air drying may be used.

[6] *Information on sheet metal fabricating techniques will be found in: Paull, James H.* Industrial Sheet Metal Drawing. *1938, Van Nostrand Co., Inc., New York, "Methods of Fastening," Ch. VII, p. 135.*

D.2.4

Internal angles of 135°F or less on product contact surfaces shall have minimum radii of 1/4 inch except:

D.2.4.1

Radii for fillets of welds in product contact surfaces where the thickness of one or both parts joined is 3/16 inch or less shall be not less than 1/8 inch.

D.2.4.1.1

Lap joints may be used on (1) sloped sidewalls where the angle from the vertical is not less than 15° or more than 45°, (2) horizontal seams around the top where the joint is cleaned by mechanical means. The material joined shall not exceed .075 inches (1/64 inch) 14 guage in thickness and the resultant weld shall comply with D.2.1

D.2.4.2

Where smaller radii are required for essential functional reasons such as those on internal parts of mechanical collectors, collector systems, air lock blades, air distribution devices, and conveying mechanisms, the radii shall not be less than 1/32 inch.

D.2.4.3

Radii on atomizing devices.

D.2.4.4

When the radius is 1/32 inch or less this internal angle must be readily available for cleaning and inspection.

D.2.4.5

All the internal product contact surfaces must be readily available for cleaning and inspection.

D.2.5

There shall be no exposed threads or crevices on product contact surfaces except where required for functional and safety reasons such as high pressure liquid product lines, atomizing devices, air distribution devices, fire extinguishing nozzles, fan wheels, air lock valves, fluidizer valves, cables and conveying mechanisms. The parts for which an exception is made that have exposed threads or crevices on product contact surfaces shall be designed to be mechanically cleaned or shall be readily accessible for cleaning.

D.2.6

Flexible connections having product contact surfaces shall have straight sides without corrugations.

D.3

Air contact surfaces shall be accessible and readily cleanable. If no other means of easy access for cleaning is available, panels or doors shall be provided. They shall be constructed in a manner that will prevent the entrance of unfiltered air, and shall use hinges, wing nuts, latches and similar easy opening devices to allow easy access without special tools.

D.4

Sheet metal work constructed in accordance with

conventional fabrication techniques[6] may be used for portions of the drier having air contact surfaces.

D.5

Air contact surfaces for air not to be heated shall have continuous welds, smooth and pit-free. All surfaces shall be designed to be mechanically cleaned or shall be readily accessible for cleaning.

D.6

The construction of the portions of the spray drying system having air contact surfaces such as sheet metal work, air heating equipment, filtering equipment, pneumatic conveying equipment and exhaust systems shall be so constructed as to prevent the entrance of unfiltered air.

D.7

Non-product contact surfaces to be coated shall be effectively prepared for coating.

D.8

Sanitary tubing and fittings except those used (1) in high pressure liquid product lines and (2) in dry product conveying piping and equipment shall conform with the design and construction provisions of the "3-A Sanitary Standards for Fittings used on Milk and Milk Products Equipments and Used on Sanitary Lines Conducting Milk and Milk Products, Number 08-17," and Supplements thereto, as amended, and/or "3-A Accepted Practices for Permanently Installed Sanitary Product-Pipelines and Cleaning Systems, Number 605-02.

D.9

Non-product contact surfaces shall have a finish that can be readily cleaned and be free of cracks and crevices. Insulation, if provided, shall be covered with a material conforming to the criteria in C.6. External lap joints for sheathing over insulated areas shall be overlapped downward. Overlapped joints shall be sealed with a suitable sealant. (See Appendix K.) Supporting structures, braces, catwalks, stairs, handrails and guards are not considered as non-product contact surfaces of the equipment and are considered as part of the building structure i.e. walls, floors, ceiling. Panels or doors shall be provided to allow easy access for cleaning of non-product areas of the equipment. They shall be constructed in a manner that will prevent air entrance. Use of hinges, wing nuts, latches, and similar easy-opening fastening devices are recommended to allow easy access without special tools.

D.10

Gaskets and Gasket Grooves on Product Contact Surfaces: Gaskets shall be removable or permanently bonded. Gasket retaining grooves for removable gaskets, if provided, shall be no deeper than their width. The minimum radius of any internal angle in a gasket retaining groove for a removable gasket shall be not less than 1/8 inch, except that a 3/32 inch radius is permissible where a standard 1/4 inch O-Ring is to be used. Use of gasket positioning grooves or pins, premolded fitted gaskets or gaskets cut from sheet material are recommended.

D.11

When a fan is installed on the downstream side of the intake air filter, it shall be designed and installed in a manner to preclude entrance of contaminants to processing air.

D.12

Fans of the air foil type shall be constructed with blade cavities sealed.

D.13

Any bearing having a product contact surface shall be of a non-lubricated type. Lubricated bearings shall be located outside the product contact surface with at least 1 inch clearance between the bearing and any product contact surface to assure (*1*) that the product does not contact the bearing or lubricant and (2) lubricants and/or product do not build up between the bearing and any product contact surface. When a shaft or cable passes through a product contact surface, the portion of the opening surrounding the shaft or cable shall be protected to prevent the entrance of contaminants.

D.14

When the exhausts of collectors are connected to the bottom of a plenum whose entire construction does not conform to the criteria for product contact surfaces, (1) the top of the plenum shall be constructed so as to conform to product contact surface criteria and (2) the collector exhaust connections shall extend upward into the plenum at least 6 inches. This provision does not apply to cloth collector bags.

D.15

A self-closing head shall be installed at the terminal end of all exhaust to atmosphere ducts.

D.16

The minumum thickness of engineering plating shall be 0.0002 inch for product contact surfaces except that when these surfaces are other than stainless steel, the minimum thickness of the engineering plating shall be 0.002 inch.

D.17

Rubber or rubber-like materials and plastic materials having product contact surfaces that are a coating or covering shall be bonded in such a manner that the bond is continuous and mechanically sound, and so that when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment, the rubber and rubber-like material or the plastic material does not separate from the base material. The final bond and residual adhesive, if used, shall conform to the criteria in C.2.1 or C.2.2.

D.18

Product contact surfaces of moving porous belt conveyors shall comply with D.2.2 and the following:

D.18.1

Belts shall be continuous. A belt is considered

meeting this criterion, provided the ends of the belt are connected with a pin made of a material complying with the criteria in C.2 or in C.2.1 or in C.2.3.

D.18.2

To facilitate cleaning, the construction shall be such that belts, guides, guards, rollers, and all other parts be easily removable for cleaning and inspection.

D.19

The opening in the top of a dryer for a centrifugal atomizer that is removed for cleaning shall have a permanently installed flange or ring around the opening that extends upward at least 1/2 inch above the opening for the centrifugal atomizer. A close fitting, overlapping cover for this opening having a downward flange of a least 3/8 inch shall be provided.

E.

AIR SUPPLY FOR DRYING SYSTEMS

E.1

The location and nature of adjacent structures and the variations of wind and weather shall be considered in selecting the location of the air supply intake opening whether inside or outside a building. It shall be so located that it will reasonably insure that the character of the intake air will be suitable for its intended use.

E.2

Outside intake openings shall be suitably protected against the admission of all foreign objects. Openings should be provided with louvers which can be closed when processing equipment is not in use. Hoods should be used over these openings to minimize the intake of rain, snow, dust or other foreign material. Openings shall be equipped with sturdy screens having openings not larger than 3/4 inch in any dimension.

E.3

The air supply system and/or ducting shall be such that all of the air is caused to pass through air filters properly installed before coming in contact with product contact surfaces of the drying system.

E.3.1

Processing air which will be heated before product contact shall be passed through a properly installed and maintained filter(s), selected to have a minimum average efficiency of 90% when tested in accordance with the ASHRAE Synthetic Duct Arrestance Test[7] when operated at its design face velocity.

E.3.2

Processing air which will not be heated before product contact shall be passed through a properly installed and maintained filter(s), selected to have a minimum average efficiency of 85% when tested in accordance with the ASHRAE Atmospheric Dust Spot Method[7] when operated at its design face velocity.

APPENDIX

F.

PRODUCT CONTACT SURFACE MATERIALS

F.1

Stainless steel conforming to the applicable composition ranges established by AISI[2] for wrought products, or by ACI[3] for cast products, should be considered in compliance with the requirements of Section C.2 herein. Where welding is involved the content of the stainless steel should not exceed 0.08%. The first reference cited in C.2 sets forth the chemical ranges and limits of acceptable stainless steels of the 300 series. Cast grades of stainless steel corresponding to types 303, 304, and 316 are designated CF-16F, CF-8 and CF-8M, respectively. These cast grades are covered by ASTM[7] Specifications A-296-68 and A351-70.

G.

CLEANING AND SANITIZING PROCEDURES

A cleaning and sanitizing regimen which is effective shall be employed. A description of this regimen shall be available at the drying plant. Because of the possibilities of corrosion, the recommendations of the cleaning compound manufacturer shall be followed with respect to the time, temperature, and the concentration of specific detergents and sanitizing agents. To insure proper strength of solution and to avoid corrosion, the detergent or sanitizer shall be completely dissolved or dispersed prior to use.

The following is adapted from "Special Sanitation Suggestions for Dry Milk Manufacturers" available from American Dry Milk Institute, 130 N. Franklin Street, Chicago, Ill. 60606, ADMI Handbook No. 917.

G.1.1

High Pressure Supply Pump, Milk Lines and Spray Devices

G.1.1

As soon as possible after the drier is shut down, remove the spray nozzles from chamber and place the nozzles in the solution tank. Direct the high pressure lines and/or nozzle pipes to the solution tank.

G.1.2

Remove and manually clean the line through which product is conducted from the high pressure regulating valve at the outlet of the high pressure pump to the inlet of the pump. Hook up the lines for the complete recirculating circuit including the preheater, high pressure or supply pump and high pressure lines. Do not put operating pressure on high pressure pump during rinsing and cleaning.

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[7] *The method of making these tests will be found in the following reference: Method of Testing Air Cleaning Devices. ASHRAE Standard 52-68. Available from The American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 345 E. 47th Street, New York, New York 10017.*

[8] *Available from American Society for Testing & Materials, 1916 Race St., Philadelphia, Pa. 19103.*

G.1.3

Using clear water at 110-115°F flush the entire circuit until rinse water is clear. Rinse water should go directly to the drain.

G.1.4

After rinsing, add enough water to the solution tank to avoid sucking air into lines during circulation. Slowly add an alkaline cleaning compound in the amount specified by the supplier. Circulate this solution for the length of time and the temperature recommended by the cleaning compound manufacturer. To assure full flow through a multiple spray pipe system it may be necessary to circulate groups of pipes, valves and nozzle pipes alternately.

G.1.5

Rinse the alkaline cleaning solution thoroughly from the system and refill circuit with warm water.

G.1.6

Add an acid cleaning solution to the solution tank according to the cleaning compound manufacturer's direction. Circulate for the time and at the temperature recommended by the manufacturer of the cleaning compound. After completion of cleaning, completely rinse the acid cleaning solution from the system.

G.1.7

Disassemble the high pressure pump and check the entire system for effectiveness of cleaning. Allow the high pressure pump to dry before reassembly.

G.1.8

When paper gaskets are used in the preheater or anywhere in the circuit they must be changed daily.

G.1.9

Immediately prior to reuse of equipment, circulate a sanitizing solution through system for 5 minutes and then discharge it to the drain.

G.1.10

Circulation time, temperature and strength of cleaning solutions may vary according to amount of milk processed, temperatures used and water conditions in a particular plant.

G.1.11

Be sure to check spray nozzles daily for cleanliness and wear of cores, orifices, spinning devices, etc.

H.

GAS BURNER MAINTENANCE

It is essential that burners and their controls operate properly to produce a good quality product, and for the prevention of fires. It is suggested that burners be cleaned at least three times a year. If burners are extremely dirty, it is suggested that burners be removed and cleaned in the shop or other area away from the drier.

If in doubt about the operation of the burner, the drier manufacturer or a qualified service man recommended by him should be consulted.

At least once a year the burner and controls should be serviced by the manufacturer or a service man recommended by him.

I.

SANITARY ATTIRE AND CLEANING APPLIANCES

I.1

When it is necessary to enter the drier for cleaning:

I.1.1

The cleanup crew should be furnished with freshly laundered outer clothing and cleaned and sanitized multiple use or single service boots to wear while in the drier.

I.1.2

A suitable place should be provided for the storage of laundered outer clothing, cleaned and sanitized boots, unused single service items and cleaning tools and appliances.

I.1.3

A clean place should be provided adjacent to the point of entry to the drier which provides (1) an area to which the clean outer clothing, can be carried, (2) an area in which, if required, outer clothing can be removed and stored, (3) an area in which the clean outer clothing and boots for use in the drier can be donned and (4) a clean floor (for example, a covering of clean paper) to maintain the cleanliness of the boots.

I.1.4

Garments and boots worn for interior drier cleaning should be worn only while cleaning the drier and not while performing other tasks. Boots that have been worn while walking outside the drier should be replaced with other suitable boots before re-entering the drier.

I.2

Cleaning tools and appliances that are used in the drier should be kept clean and used for no other purpose than cleaning the interior of the drier.

J.

OPTIONAL ALUMINUM ALLOY

J.1

An acceptable alloy is covered by Danish Standard DS #3002, and is designated #4261. Equivalent U.S. standards are designated ASTM B179 S12C, and Aluminum Association # C 413.

K.

Non Product Contact Surfaces: An acceptable sealant for joints in non product contact surfaces, such as coverings for insulation, is room temperature vulcanizing silicone rubber. The area to be sealed should be effectively prepared for sealing.

These Practices shall become effective September 3, 1982, at which time 3A Accepted Practices for Milk and Milk Products Spray Drying Systems, Number 607-02 are superseded and become null and void.

News and Events

Home-canning Precautions

The tasty flavor of "Mom's" home-canned fruits and vegetables could be spoiled by improper storing and preparation techniques, warns Mary K. Sweeten, a food and nutrition specialist, Texas Agriculture Extension Service, Texas A&M.

Recommended storage time for home-canned vegetables is up to one year in a cool, dry cupboard, she says.

Never taste or eat canned foods that have evidence of spoilage -- it may be your last meal, Sweeten warns.

Prior to using canned foods, check lids to see that they are concave and that no bulges are present, she suggests.

In addition, if any off odors or colors are evident, throw the product out.

As an extra safety precaution, the USDA recommends that all home-canned low-acid products (vegetables except tomatoes) be boiled for 10-15 minutes over an electric or gas stove-top burner before serving, she point out.

A product such as green beans containing liquid wouldn't need to boil as long as a thicker food like cream style or creamed corn, the specialist says.

For example, boil green beans 10 minutes and the creamed corn 15 minutes.

Foods most often involved in botulism poisoning (often called food poisoning) are corn, spinach, green beans, peppers and asparagus, she notes.

Heat, during boiling will destroy the clostridium botulinum toxin which may have formed if canning failed, Sweeten notes.

Vegetables should be able to withstand this heat treatment without the loss of quality.

As of today, the USDA doesn't recommend that home-canned vegetables be placed in the microwave for safety precautions as explained above, according to Milton Baldauf, Home Economics and Human Nutrition Unit, Extension Service, Washington, D.C.

It is difficult to know when the entire mass of the product has reached its boiling point in the microwave oven in order to begin timing.

Amount and density of food, type, size and shape of container used, whether the container absorbs microwaves or not and the location of cold spots in the oven will all be variables when trying to determine timing of the microwave, Sweeten notes.

Such variables make it impossible to recommend a time period to cook vegetables and destroy any toxins present, the specialist points out.

Hence, you should avoid heating your home-canned foods by this unproven method, Sweeten encourages.

Probe Detects Stress-affected Meat

A fiber-optic probe from Britain can detect stress-affected meat in uncut carcasses more rapidly and reliably than visual inspection.

Up to 200 carcasses an hour were screened without damage or delay during abattoir trials of the MEAT QUALITY FOP, which was developed by Britain's Meat Research Institute. It is calibrated to cover every meat type from PSE, (pale, soft and exudative) pork to excessively DC (dark cutting) beef.

The probe transmits light from a source in its handle, along a fiber bundle and into the meat, producing a halo of scattered illumination. The amount of scattering depends on the extent of post-mortem structural change, and the light which is returned by the fiber bundle is measured and indicated on a digital display. Only red light is detected, thus minimizing the effect of pigment (myoglobin) absorption.

The recommended technique for inspection is to insert the tip of the probe between the ribs and into the eye muscle on the day after slaughter. Stops ensure constant insertion depth, and allowance is made for beef's greater depth. A small incision is needed if insertion is through skin.

Inquiries from potential U.S. customers, agents and distributors are welcomed by the company or may be sent to B.I.S. British co.: TBL Fibres (Contact: T. Clayforth, Director), Torbay Works, Hunslet Road, Leeds LS10 England. Telephone: Leeds (0532) 44066. Telex: 556350.

Litsky Honored

University of Massachusetts Commonwealth Professor Warren Litsky, chairman of the Department of Environmental Sciences, was awarded an honorary degree from Clark University in Worcester Sunday, May 16, at its 1982 commencement.

Litsky, a microbiologist who has taught at UMass for 31 years, is a 1945 Clark graduate.

In 1975 he was awarded the Outstanding Professor Award by the Stockbridge School of Agriculture and in 1979 he was awarded the Distinguished Teacher Award by UMass. In 1977 he received the Difco Award, Lab Section, American Public Health Association. He was given the 1980 Carski Foundation Distinguished Teaching Award by the American Society of Microbiology.

Old-fashioned Apple Juice

An innovative apple juice, "...so fresh it's kept in the dairy case...", was introduced in California by Yakima Valley Apple Juice, a new California company and it's the only 100% pure Washington State unfiltered apple juice on the market not made from concentrate available in markets outside of the State of Washington.

According to Mr. Marty Van Diest, Yakima Valley's managing director, "We believe we have the finest product available. Our unique processing methods will enable us to provide the consumer the highest quality juice year-round without concentrates used by so many of our competitors".

"Our way of making apple juice...the old-fashioned way...". stated Van Diest, "assures the richness and goodness of a fresh apple taste, and", he concluded, "we retain the natural sweetness of the fruit without adding sugar".

Following its West Coast debut, Yakima Valley Apple Juice will expand to other states using as its theme, "A crunch in every sip." Packaged in long-neck plastic bottles, sporting a "back to nature" look with its red and tan lable, the new product will soon appear in the dairy cases of supermarkets and retail stores.

For product information, contact: Yakima Valley Juice Company, 630 South Indian Hill, Suite 6, Claremont, California 91711.

New Material Quality Control Testing Available

The Analytical Laboratory Division of YWC, Inc. offers a new material quality-control test service to producers of glass, casting, animal feeds, fertilizers, food products, beverages, chemical compounds and other products formulated from bulk materials such as sand, ores, grains and chemicals.

Raw materials will be analyzed qualitatively and quantatively for their chemical composition and for mositure content to determine whether or not they comply with ingredient specifications. Analyses may be made on either a scheduled or random basis. Analysis reports are submitted within a few days of receiving test samples.

YWC analytical equipment includes state-of-the-art chromatographs, spectrometers and spectrophotometers.

For additional information, contact Analytical Laboratory Division, YWC, Inc., One Research Drive, Stanford, CT 06906.

Nelson-Jameson Celebrates 35 Years

Nelson-Jameson Company of Marshfield, Wisconsin, is celebrating 35 years as a distributor of small equipment and supplies used in the dairy industry with the distribution of a new and even more complete catalog of standard needs and hard-to-find specialties used by food processors. Because of the wide range of products and the factual information included, the Buyers' Guide is useful as a purchasing aid for busy managers. Most of the products included are in stock for prompt shipping from one of Nelson-Jameson's three warehouses.

Nelson-Jameson has built its line through the years in response to the specific needs of dairy and cheese plants, and more recently, the needs of other food processors. Catalog sections include: Laboratory and quality control; Sanitation and cleaning; Material handling and maintenance; Boiler room, plumbing and heating; Food plant machinery and parts; Manufacturing tools, accessories and supplies; Clothing and personnel products; and Packaging equipment and supplies.

Tollfree telephone numbers are listed in the Buyer's Guide for the convenience of customers, who can call in orders or consult with the product specialist in any catalog area. The use of a catalog helps increase accuracy in telephone ordering.

To obtain the Buyers' Guide write to: Catalog Department, Nelson-Jameson Inc., P.O. Box 647, Marshfield, WI 54449, 715-387-1151.

AACC's Upcoming Annual Meeting

The American Association of Cereal Chemists announces the technical program for its upcoming Annual Meeting, October 24-28, 1982 in San Antonio, Texas.

Symposia include *New Approaches to Insect Control--Frontiers In Food Microstructure--Protein Ingredients For The Cereal Foods Industry: Needs and Availability--Baking As A Science: Back to the Basics--Science And Chemistry: Applications To Baking--Experimental Baking: Methods and Applications--Flavor Formulation And Evaluation In Cereal Products--Nutrient Contents And Bioavailability of Cereals And Legumes--Food Allergies.*

In addition to these symposia and technical sessions, the Annual Meeting will offer a variety of poster sessions, paper sessions, exhibits and social programs for meeting attendees and their spouses.

For more information about the AACC 67th Annual Meeting contact AACC, 3340 Pilot Knob Road, St. Paul, MN 55121; phone 612-454-7250.

JFP Abstracts

Abstracts of papers in the July Journal of Food Protection

To receive the Journal of Food Protection in its entirety each month call 515-232-6699, ext. A.

Growth of Selected Bacteria in Processed Human Milks, N. Shewakramani, M. O. Hanna, E. S. Alford, C. Vanderzant, C. W. Dill and C. Garza, Animal Science Department, Texas A&M University, College Station, Texas 77843 and Department of Pediatrics, Baylor College of Medicine, Houston, Texas 77030

J. Food Prot. 45:788-791

Survival and/or growth of *Pseudomonas fluorescens, Micrococcus luteus, Micrococcus* sp. 102 and *Staphylococcus aureus* was studied in raw, frozen, pasteurized or heat-sterilized pooled human skim milks. Growth response of *P. fluorescens* at 25°C was essentially the same in the untreated and treated milks with an increase in count/ml of 4 log cycles during a 24-h incubation period. Counts (per ml) of *S. aureus* in raw, pasteurized and frozen milks increased approximately 3 log cycles. Growth of *S. aureus* in heat-sterilized milk was somewhat less. *Micrococcus* sp. 102 could not be recovered from raw and frozen milk after incubation at 37°C for 14 and 24 h, respectively. The count (per ml) of this organism in pasteurized milk decreased approximately 2 log cycles during the 24-h incubation period, whereas counts in sterilized milk increased approximately 2 log cycles.In no instance did *M. luteus* survive in raw, pasteurized or frozen milks at 37°C even for short periods after inoculation. The organism survived in heat-sterilized milk for 14 h at 37°C, but then decreased in numbers until the organism could be recovered from only 1 of 5 pools after 48 h of incubation.

Changes in the Natural Microflora During Incubation of Fresh and Processed Human Milks, N. Shewakramani, M. O. Hanna, E. S. Alford, C. Vanderzant, C. W. Dill and C. Garza, Animal Science Department, Texas A&M University, College Station, Texas 77843 and Department of Pediatrics, Baylor College of Medicine, Houston, Texas 77030

J. Food Prot. 45:792-794

Seven pooled human milks, each from at least 6 different breast-feeding mothers (4 weeks post-partum) were studied for microbial population and flora changes during storage at 37°C. Coagulase-negative *Staphylococcus* spp. constituted a considerable part (39-100%) of the microflora in 6 of 7 pools of fresh milk, with coryneform bacteria, *Lactobacillus, Micrococcus* and *Streptococcus* spp. isolated less frequently. Storage of raw milk for 8 h caused a shift in flora favoring the *Lactobacillus* spp. After 24 h, coagulase-negative *Staphylococcus* were dominant in 4 of 7 pools, coryneform bacteria in 2 of 7, and *Lactobacillus* and *Micrococcus* spp. each in 1 of 7 pools. Low levels of bacteria were detected in 2 of 7 pasteurized pools, consisting of *Staphylococcus* spp. or yeasts. Freezing of the milk before storage at 37°C had little effect on the aerobic plate counts.

Production of Stable *Bacillus stearothermophilus* Spores, Ajay Kaul and R. S. Singh, Division of Dairy Microbiology, National Dairy Research Institute, Karnal-132001, India

J. Food Prot. 45:795-796

A technique has been developed for production of a stable suspension of spores of *Bacillus stearothermophilus* var. *calidolactis*. The organism was grown in a sporulating medium on a rotary shaker at 55°C. After 4-5 d, spores were centrifuged and washed to obtain a clear spore suspension, which was able to detect as low as 0.008 I.U./ml of penicillin in 2 h. The spore suspension retained its viability up to 5 months.

Bacteriological Evaluation of Alkali-Extracted Protein from Poultry Residues, E. D. Jackson, F. I. Consolacion and P. Jelen, Department of Food Science, University of Alberta, Edmonton, Alberta, Canada T6G 2P5

J. Food Prot. 45:797-800

The effect of alkaline conditions (pH 10.5 for 30-60 min at 23°C) on the extraction of protein from mechanically deboned poultry residues (MDPR) was examined with respect to the general bacterial flora, coliforms and salmonellae. Standard plate counts decreased from 1.5×10^3 CFU/g in the MDPR to 2.0×10^2 CFU/g in the freshly extracted protein curd; coliform counts decreased from 4.9×10^1 MPN/g to 0. Coliforms survived only when the MDPR was mishandled for 5 h at 23°C before alkaline extraction whereas salmonellae appeared to be eliminated entirely, irrespective of preincubation abuse of the MDPR or introduction of increased levels of *Salmonella infantis*. Spoilage of the protein curds occurred in 14 days at 3°C but there was no increase in coliform numbers. Reappearance of salmonellae following storage was seen only in the protein extracted from MDPR inoculated with *S. infantis*. The destruction of salmonellae by pH 10 was confirmed in a tryptic soy broth model system, but only under ambient temperature exposure; neither growth nor destruction occurred at 3 or 10°C. It was concluded that alkaline extraction of protein from MDPR using the suggested operating conditions does not exaggerate any public health hazard involving salmonellae.

Influence of Package Construction on Stability of Potato Chips Exposed to Fluorescent Lighting, C. L. Kubiak, J. A. Austin and R. C. Lindsay, Department of Food Science, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 45:801-805

Potato chips packaged in oriented polypropylene/low-density polyethylene/polyvinylidine chloride, high-density polyethylene/ethylene vinyl acetate plus a UV-light-absorbing compound, or high-density polyethylene/ethylene vinyl acetate plus a titanium dioxide "light-barrier constructions developed distinct oxidized flavors within 7 d when stored at 21°C, 55% relative humidity, and under 140-230 ft candles of continuous fluorescent lighting. Potato chips stored under the same conditions that were packaged in a high-density polyethylene plus titanium dioxide and a brown light-absorbing pigment construction or an aluminum foil/polyethylene construction were stable throughout 10 weeks of storage. Oxygen-barrier film characteristics did not influence the oxidative stability of the air-packaged potato chips.

Growth of Thermoresistant Streptococci and Deposition of Milk Constituents on Plates of Heat Exchangers During

Long Operating Times, Sander Bouman, Daryl B. Lund, Frans M. Driessen and Daniel G. Schmidt, Netherlands Institute for Dairy Research Ede, The Netherlands, and Department of Food Science, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 45:806-812

Adhesion of the thermoresistant bacterium *Streptococcus thermophilus* to the surface of a heat exchanger and deposition of milk constituents during long operating times were investigated. Experiments were carried out on a pilot plant pasteurizer with raw whole and preheated skim milk. Adsorption of calcium, phosphorus and proteins was studied using chemical analysis, scanning electron microscopy and X-ray microanalysis. With increasing operating times the amount of deposits increased gradually on the raw milk side of the regenerative section and in the heating section, whereas on the pasteurized side of the regenerative section no detectable deposits were formed. The bacteria adhering to the plates of the heat exchanger were sampled with a swab technique. The bacteria adhered mainly to the plates in the pasteurized section. Electron micrographs of sample plates showed that the bacteria seemed to adhere directly to the metal surface, without calcium phosphate acting as an intermediary.

Influence of Oily Bird Syndrome on the Shelf-Life of Fresh Ice-Packed Broilers, D. L. Fletcher, D. M. Thomason, J. O. Reagan and D. D. Smith, Poultry Science, Extension Poultry Science and Food Science Departments, University of Georgia, Athens, Georgia 30602

J. Food Prot. 45:813-815

Processed ready-to-cook broiler carcasses were obtained from a commercial poultry processing plant on three separate occasions. The birds were identified at the plant as being either normal or as exhibiting the appearance and feel of birds exhibiting the phenomena collectively termed as "oily bird syndrome" (OBS). The carcasses were packed in ice, transported to the Food Science Department, University of Georgia, held on ice for 24 h and individually bagged and stored under retail conditions at 2°C. At 2, 8, 14 and 20 days postmortem, the birds were examined microbiologically for total plate counts and observed for evidence of spoilage. No consistent trends could be ascertained to indicate that birds exhibiting OBS would have higher total bacterial numbers or shorter shelf-life. Thus, it would appear that birds exhibiting OBS would pose no problems regarding initial microbial loads, microbial growth rates or reduced fresh shelf-life as compared to carcasses not exhibiting OBS.

Effect of Sodium Chloride Concentration, Water Activity, Fermentation Method and Drying Time on the Viability of *Trichinella spiralis* in Genoa Salami, A. B. Childers, R. N. Terrell, T. M. Craig, T. J. Kayfus and G. C. Smith, Departments of Veterinary Public Health, Veterinary Microbiology and Parasitology and Animal Science, Texas A&M University, College Station, Texas 77843

J. Food Prot. 45:816-819

Pork from pigs experimentally infected with *Trichinella spiralis* was used to manufacture Genoa salami. In Experiment I, Genoa salami was formulated to include: (a) in-going sodium chloride of 2.00 or 3.33% based on raw meat weight; (b) either commercial starter culture or no starter culture and held for fermentation at either 35°C (95°F) or 46.1°C (115°F). Lower water activity (a_w) was found ($P<0.0001$) in salami manufactured either with 3.33% salt or processed by high fermentation temperature. Lower pH values resulted from use of a starter culture. An interaction between salt concentration and fermentation temperature was seen after 20 days of drying. Salt concentration appeared to exert a definite effect of trichina viability. In Experiment II, Genoa salami was formulated to include: (a) in-going sodium chloride of 0.00, 1.67 or 3.33% based on raw meat weight; (b) all salami contained starter culture and held for fermentation at 46.1°C. Salami made with 3.33% salt had higher pH and lower a_w values than did that made with no or 1.67% salt. The salt content and drying time interaction was greatest in salami made with 3.33% salt. The 3.33% salt content also appeared to exert a definite effect on trichina viability.

Radicidation for Elimination of Salmonellae in Frog Legs, D. P. Nerkar and N. F. Lewis, Biochemistry and Food Technology Division, Bhabha Atomic Research Centre, Bombay-400 085, India

J. Food Prot. 45:820-823

The D_{10} values of three *Salmonella* spp. often encountered in frog legs, i.e., *S. typhimurium, S. enteritidis* and *S. newport*, were found to be between 18 to 30 krad when cells were irradiated at 0-2°C in 0.1 M phosphate buffer, pH 7.0. The radiation sensitivities of these *Salmonella* spp. increased only marginally when cells were irradiated in frog leg homogenate. The doses of radiation required for eradication of this pathogen in fresh and frozen frog legs were 300 and 400 krad, respectively.

Effects of Potassium Sorbate on Normal Flora and on *Staphylococcus aureus* Added to Minced Cod, Donald J. Lynch and Norman N. Potter, Department of Food Science, Cornell University, Ithaca, New York 14853

J. Food Prot. 45:824-828

Minced cod and pasteurized minced cod, with and without 0.5% potassium sorbate, were subjected to abusive storage temperatures of 7 and 15°C. *Staphylococcus aureus* FRI 100 was inoculated into the cod before storage. Total aerobic plate counts (20 and 35°C), pH changes, *S. aureus* counts and the presence of thermonuclease were monitored throughout the studies. With the unpasteurized minced cod, potassium sorbate caused slightly lower aerobic plate counts (at 20 and 35°C) in the 7°C study over an 11-day storage period. Psychrotrophic organisms were inhibited to a slightly greater extent than were mesophilic organisms. Inoculated *S. aureus* was quickly outgrown by the normal microflora without or with sorbate. Similar results were obtained at the still more abusive temperature of 15°C over a storage period of 5 d, but the inhibitory effect of sorbate was less evident. Pasteurized minced cod, inoculated with *S. aureus* and stored at 15°C, showed a considerable difference in growth of *S. aureus* with and without sorbate. Potassium sorbate resulted in a markedly slower rate of growth of the pathogen and a substantial delay of several days in production of detectable levels of thermonuclease. This delay in nuclease production is indicative of a similar delay in enterotoxin production.

Metabiosis and pH of Moldy Fresh Tomatoes, J. Orvin Mundt and John N. Norman, Department of Microbiology, University of Tennessee, Knoxville, Tennessee 37916

J. Food Prot. 45:829-832

Two hundred twenty eight locally grown, garden variety, moldy tomatoes were examined. The dominant molds were *Alternaria, Fusarium* and *Cephalosporium. Geotrichum, Epicoccum* and *Mucor* were seen in a small number of tomatoes. Seventy eight per cent of the tomatoes were infected with a single mold, and mixed infections were seen in 21% of tomatoes. The pH at the site of infection varied from 4.4 to 8.1, with pH less than 4.8 observed in only 21 moldy tomatoes. The pH of sound tissue increased as pH at the site of the lesion increased. Bacteria were seen in wet mounts from the site of the lesion of 26% of the tomatoes. Bacteria were cultured from an additional 38% of the tomatoes at the site of the lesion and from 13% of the juice cavities at the site across from the infection. Most bacteria were members of the acid tolerant genera *Erwinia* and *Enterobacter.* Members of the genera *Pseudomonas, Flavobacterium* and *Alcaligenes* were also isolated. *Leuconostoc mesenteroides,* rennin-proteolytic *Streptococcus faecalis* and yeasts were obtained in culture, but were not seen in wet mounts. Gram-negative bacteria were seen in two of 13, and recovered in culture from 6 of 13 severely bruised, non-molded tomatoes. The bacteria appear to be present in a metabiotic relationship in which the molds created a favorable pH for bacterial growth.

Inhibition of *Clostridium botulinum* Types A and E Toxin Formation by Sodium Nitrite and Sodium Chloride in Hot-Process (Smoked) Salmon, G. A. Pelroy, M. W. Eklund, R. N. Paranjpye, E. M. Suzuki and M. E. Peterson, U.S. Department of Commerce, NOAA, National Marine Fisheries Service, Northwest and Alaska Fisheries Center, Utilization Research Division, 2725 Montlake Boulevard East, Seattle, Washington 98112

J. Food Prot. 833-841

Sodium nitrite and NaCl were evaluated as inhibitors of outgrowth and toxin production by *Clostridium botulinum* types A and E in abuse-stored (25°C) hot-process salmon. Salmon steaks were brined in NaCl or NaCl plus $NaNO_2$ and inoculated intramuscularly with spores. Steaks were then heated in a simulated hot-smoke process to internal temperatures of 62.8 to 76.7°C (145 to 170°F) for the final 30 min of a 3- to 4-h process, packaged in oxygen-impermeable film and stored at 25°C. During 7 days of storage, toxin production in steaks inoculated with 10^2 spores per g was inhibited by more than 3.8% water-phase NaCl for type E and 6.1% for type A. Presence of nitrite substantially reduced the salt level required to prevent toxin production. When steaks had more than 100 ppm $NaNO_2$, only 2.5% NaCl inhibited type E toxin production; 150 ppm $NaNO_2$ and 3.5% NaCl inhibited production of type A toxin. When storage time was lengthened to 14 days or the spore inoculum increased to 10^4 spores per g, more salt and nitrite were required for inhibition. Residual nitrite in samples stored under refrigeration (3.3°C) did not change during 22 days of storage. Under abuse temperature (25°C), residual nitrite decreased to less than 6 ppm by the 14th day in all samples tested regardless of the original nitrite concentration.

Fungi Associated with Dates in Saudi Arabia, A. H. Abu-Zinada and M. I. Ali, Botany Department, King Saud University, P.O. Box 2445, Riyadh, Saudi Arabia

J. Food Prot. 45:842-844

The fungal counts per gram of air-dried dates, of eight local date-palm varieties, varied markedly on different synthetic media. Seri and Shakra varieties had highest fungal counts whereas Medina had the lowest. *Aspergilus flavus, A. niger, Penicillium rubrum, P. oxalicum, Rhizopus stolonifer, Stemphylium verruculosum* and *Fusarium* sp. were generally associated with various date varieties. Apparent colonization of the fungi was obtained by increasing the relative humidity to 90% at 30 and 40°C. Best growth of the isolated fungi in artificial media was obtained at 60% glucose concentration.

***In Vivo* Immunologic Alterations by a Food Antioxidant Butylated Hydroxyanisole (BHA) in Male Swiss-Webster Mice,** K. Kangsadalampai, R. P. Sharma and D. K. Salunkhe, Interdepartmental Toxicology Program, Utah State University, Logan, Utah 84322

J. Food Prot. 45:845-849

Butylated hydroxyanisole (BHA) is considered to be an anticarcinogenic substance in experimental animals, and has been shown to have immunosuppressive activity in vitro. Male Swiss-Webster mice were fed semisynthetic powder diets containing 0.02% or 0.2% BHA. Splenic lymphocytes from mice exposed for 9 or 30 days were cultured in vitro with or without mitogens, namely phytohemagglutinin (PHA), pokeweed mitogen (PWM) or bacterial lipopolysaccharide (LPS). At the level of 0.02% BHA in the diet, ^{3}H-thymidine uptake by PHA-stimulated splenic cells from the 9-day feeding group was elevated. The uptake of ^{3}H-thymidine of the splenic cells of the 30-day treatment was reduced with all mitogens used at both BHA levels, but not significantly. After a 23-day exposure, splenic lymphocytes from animals inoculated with sheep erythrocytes were tested for plaque formation. No significant differences were apparent among treatment groups. Delayed hypersensitivity in mice, as measured by the incorporation of ^{3}H-thymidine after repeated sensitization and challenge with oxazolone, was not significantly affected by a 28-day exposure at either level of BHA. Significant differences of organ weights were obtained; however, these differences may not have been associated with the effect of BHA on the immune system. The effects of the low (0.02%) and high (0.2%) doses on BHA on immunomodulation in mice were not clearly shown to be either suppressive or stimulative.

Effects of Sodium Nitrite, Sodium Chloride, Heating and Freezing on Survival of Trichinae in Hams, T. J. Kayfus, R. N. Terrell, A. B. Childers, G. C. Smith and H. K. Johnson, Meats and Muscle Biology Section, Department of Animal Science, Texas Agricultural Experiment Station and Department of Veterinary Public Health, College of Veterinary Medicine, Texas A & M University, College Station, Texas 77843

J. Food Prot. 45:850-853

Two experiments were conducted to determine the effects of sodium chloride, sodium nitrite, heating and/or freezing on viability of trichinae in hams. The most effective treatment for destroying trichinae consisted of pumping hams with a curing solution containing 2.6% sodium chloride and 156 ppm sodium nitrite followed by heating of hams to 43.3°C. Six days of storage at -29°C were required to achieve 100% destruction of trichinae for control (not pumped, not heated) hams. Seven, 8 and 8 d, respectively, were required to achieve 100% destruction of trichinae for those hams that were not heated but

pumped without sodium chloride or sodium nitrite, or those that were pumped with solutions containing either 1.6% sodium chloride and 120 ppm sodium nitrite or 2.6% sodium chloride and 156 ppm sodium nitrite.

Effect of Different Packaging Films and Vacuum on the Microbiology of Bacon Cured with or without Potassium Sorbate, M. K. Wagner, A. A. Kraft, J. G. Sebranek, R. E. Rust and C. M. Amundson, Departments of Food Technology and Animal Science, Iowa State University, Ames, Iowa 50011

J. Food Protection 45:854-858

Studies were done to determine the effects of packaging films and vacuum levels on the microbiology of bacon cured with nitrite or a combination of nitrite and sorbate in the curing salt mixture. High and low oxygen barrier films were used along with high and low vacuum levels for packaging systems. Growth of mesophilic, psychrotrophic and lipolytic organisms was restricted most with the combination of high barrier-high vacuum treatment. Vacuum level was more important than type of film in retarding bacterial growth as storage time progressed up to 28 d at 5°C. Sorbate combined with nitrite was more inhibitory than nitrite with no sorbate in the cure.

Nutritional Consequences of Technology, F. M. Clydesdale, Department of Food Science & Nutrition, University of Massachusetts, Amherst, Massachusetts 01003

J. Food Prot. 45:859-864

If one wished to gain a rapid insight into consumer attitudes about processing and technology, one would only have to consider that the title of this paper would immediately imply to many people that the negative consequences of technology are going to be emphasized. This simply means that technology has developed a perjorative connotation in the U.S., although its positive contribution to nutrition has been almost incalculable and one of the major negative consequences might simply be that fear of technology and modern food processing causes the consumer to make poor judgements. Unfortunately the consumer now expects food to act as a national eraser and wipe out disease. However, the facts must be considered rather than the expectations. If faced with an "all natural diet" (actually an undefinable term), the consumers would quickly realize some of the reasons why food is eaten. They would learn that their food choices are made on the basis of such things as: acceptability, availability, quality, cost, convenience and safety. Features which would be difficult to obtain in an "all natural diet". Further, such a diet might create nutritional deficiencies which are simply unheard of today. Perhaps it might be well to remember the Biblical story of Joseph who placed grain in storage for 7 fat years to prevent famine against 7 lean years. In a very literal sense, this should be the aim of technology and processing - to ward off death due to starvation by lengthening the functional life span of foods so that they may be used, rather than rotting in the fields, or spoiling on the shelves.

Foodborne and Waterborne Disease in Canada - 1977 Annual Summary, E. C. D. Todd, Bureau of Microbial Hazards, Food Directorate, Health Protection Branch, Health and Welfare Canada, Ottawa, Ontario, K1A 0L2, Canada

J. Food Prot. 45:865-873

Data on foodborne disease in Canada in 1977 were compared with data for 1976. A total of 777 incidents, comprising 660 outbreaks and 117 single cases, causing illness in 4810 persons was reported for 1977. The number of incidents and cases decreased by 9.7% and 10.4%, respectively, from 1976 to 1977. Unlike previous years, *Salmonella* spp. were responsible for more incidents (32) and cases (763) than any other agent. Other incidents were caused by *Staphylococcus aureus* (23), *Clostridium perfringens* (14), suspect mold and yeast (13), *Bacillus* spp. (11), *Clostridium botulinum* (5), *Shigella sonnei* (1) and suspect *Pseudomonas aeruginosa* (1). Three incidents of trichinosis, and two each of mushroom and paralytic shellfish poisoning occurred. Chemicals implicated in causing illness included tin, rancid compounds and extraneous matter. The deaths of two persons were attributed to foodborne disease. About 32% of incidents and 48% of cases were associated with meat and poultry. Bakery products, vegetables, fruits and Chinese food continued to play a prominent role in the spread of foodborne disease, as in previous years. Mishandling of food took place mainly in foodservice establishments (31.0% of incidents, 60.2% of cases) and homes (15.1% of incidents, 9.2% of cases). However, mishandling by the manufacturer caused some problems, including salmonellosis from cakes made with cracked eggs and staphylococcal intoxication from cheese prepared from a contaminated starter culture. More than 61% of reported foodborne disease incidents occurred in Ontario and over 16% in British Columbia, but the number of incidents per 100,000 population was highest in Northwest Territories and the Yukon. Relatively few illnesses resulted from the ingestion of water and none through contact with water with a total of 9 incidents and 305 cases. Narrative reports of foodborne and waterborne incidents are presented.

Microorganisms Involved in the Spoilage of Fermented Fruit Juices, D. F. Splittstoesser, Cornell University, New York State Agricultural Experiment Station, Geneva, New York 14456

J. Food Prot. 45:874-877

Bottled wines, ciders and perries that contain sugar are susceptible to refermentation by yeasts and the growth of lactic acid bacteria. The yeasts are strongly fermentative strains, often species of *Saccharomyces*, while the lactics are acid and ethanol tolerant species that grow slowly and are fastidious in their nutrient requirements. Spoilage is manifested by gas, haze and various flavor changes. Control procedures include filtration, pasteurization and the use of the preservatives sulfur dioxide and sorbic acid.

Experience with Direct and Indirect UHT Processing of Milk - A Canadian Viewpoint, P. Jelen, Department of Food Science, University of Alberta, Edmonton, Alberta, Canada T6G 2P5

J. Food Prot. 45:878-883

This brief overview includes some of the Canadian industrial experience gained recently with UHT processing of milk and other dairy products. Emphasis is placed on the differences between direct and indirect heating systems in terms of process engineering, product quality, consumer acceptance, public health aspects and economy. Documented advantages include less fouling, better heat transfer and less heat damage to the final product for direct systems, and less elaborate requirements for ancillary equipment and lower costs for indirect technology. Market performance data from some of the four industrial Canadian producers of 2% and chocolate milk indicate better than expected consumer acceptance due to product quality and other market-related aspects of the UHT process.

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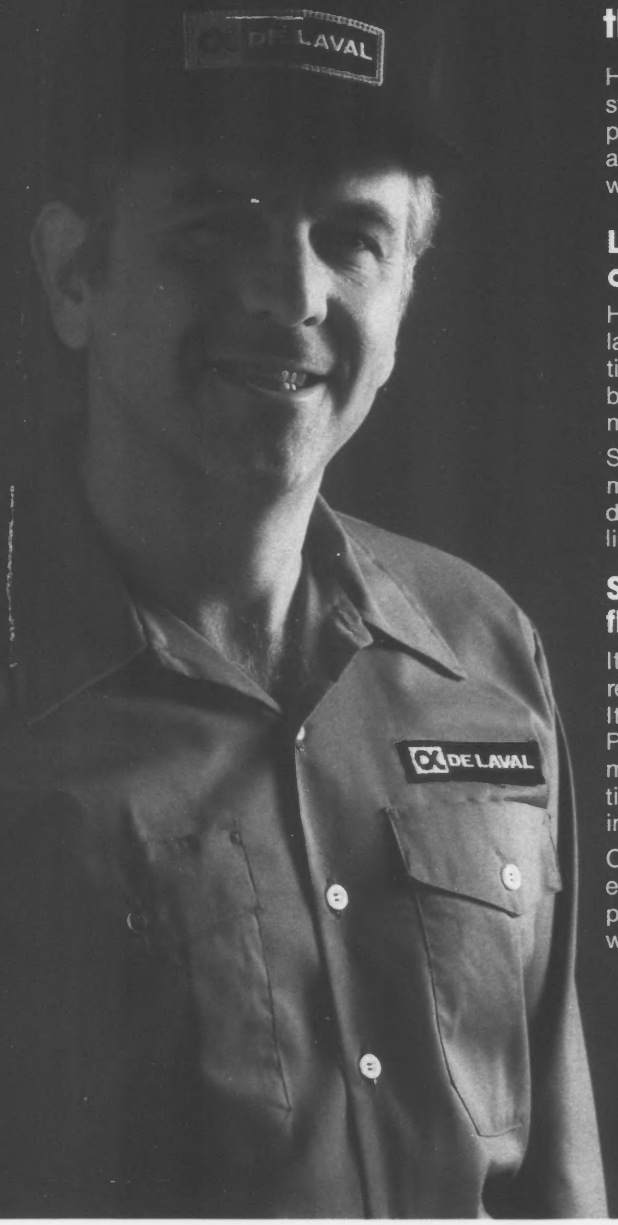

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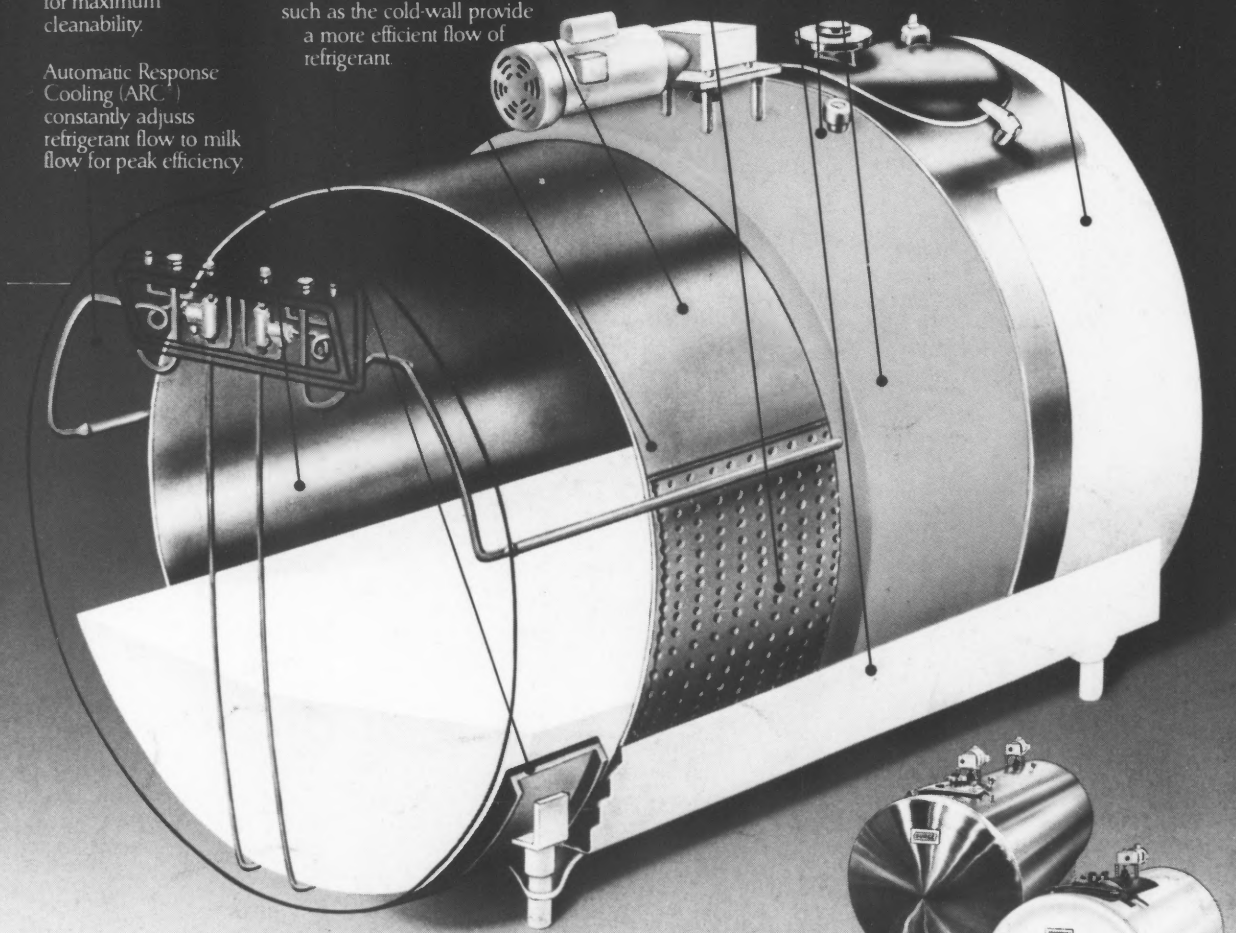

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