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- Sizing Milking Systems — A Review
- How Much Quality Control is Enough?
- Mastitis Therapy: Effective Treatment or Double Trouble

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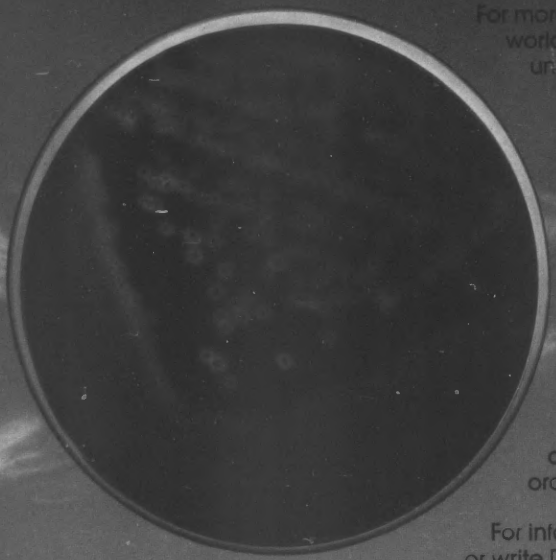

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Sizing Milking Systems — A Review

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"The role and need for balance tanks needs to be more clearly defined. The influence of system volume has been observed but the interrelationships to the total system need study and clarification."

Larger dairy herds have greatly influenced the sizing of milking systems in recent years. The number of cows being milked at one time and hence the number of units in use have a significant influence on the required size of the system and all of its components.

There are several system components that may be considered independently, however, performance will be influenced by their combined effects. This paper will attempt to review the sizing of system components and the relationship to performance of the total system.

The Vacuum Pump. The function of the vacuum pump is to remove air continuously from a closed system of pipes and tanks and maintain a partial vacuum of 30 to 50 kPa. The size of the vacuum pump has been an area of controversy over a number of years. Prior to 1950, pumps were sized for conventional bucket units on a unit basis. The advent of pipeline milkers made it necessary to use CFM (cubic feet per minute) ratings. For purposes of this paper, metric ratings will be utilized for air volume moved.

Field testing the vacuum pump for sizing appears to have begun in New South Wales, Australia, sometime prior to 1953 (9). Calder (9) indicated a basic reserve from 200-340 1/min to cope with the effect of teat-cup changing. Phillips (31) found that reserve air pumping capacity had little effect on initial fall in vacuum but had a marked effect upon recovery of vacuum once air admission was stopped. Workers in California were first in the U.S. to recognize the need for adequately sized vacuum pumps. In 1959 their recommendations were 60 liters per minute (2.5 CFM ASME) per unit (4). In 1961 they recommended 112 liters per minute (13) per unit and in 1963 this was increased to 140 1/min Noorlander (27) suggested 620 1/min for a 4 unit system plus 200 1/min to maintain stability.

The first 3A Standards for Milking Machines (1) required 57 1/min per unit plus allowances for other air consuming components plus 50 percent reserve (1968). Revised 3-A Standards suggest 210 1/min per unit plus additional requirements for controllers, couplings and other air consuming components (2) 1977.

Mein (24) observed a wide variation in recommendations which various areas of the world utilized in sizing vacuum pumps. European standards are generally much lower than in the United States with values ranging from 80 to 140 1/min in 1968.

Smith (34) reported in 1973 that numerous California installations had 280-340 1/min pump capacity per unit. More recently, California workers (35) recommended 224-280 1/min/unit. Clarke and Lascelles (10) found that the milking rate was reduced when milking machines were operated without reserve air pumping capacity. LeDu (22) observed that when vacuum reserve reached 40 1/min per unit, the advantage of further increasing vacuum reserve did not reduce somatic cell counts. Spencer (37) reported no changes in claw vacuum when reserves were increased above re-

quirements. Beckley and Smith (7) suggested inadequate vacuum pump capacity as being related to udder health and this was confirmed by Nyhan and Cowhig (29) in 1968. Nyhan (30) described two types of vacuum variation, irregular and cyclic, which in combination, increased infection rates. Irregular vacuum fluctuation is influenced by vacuum pump capacity, sensitivity and stability of the regulator, and friction losses in the piping system (42) according to Theil and Mein.

Thus, providing vacuum stability is dependent upon matching pump capacity to consumption. Akam (5) suggests that the milking unit can be expected to consume about 60 liters per minute. Rossing (32) lists the pulsator as consuming 12-30 1/min, claw air admission 4-12 1/min, leakage around the teats 5-15 1/min and controller admission as 50-70 1/min.

Ruffo and Sangiorgi (33) suggest that a system volume-vacuum pump capacity relationship exists. They report that V/Q must be 0.1-0.2 for installations with weighted regulators and 0.2-0.3 for those with servo assisted regulators. They contend that "waste" in volume should be avoided which has to be compensated for by greater pump capacity.

Spencer (36) found that unit application could consume up to 225 1/min. Unit fall-off was determined to be the event of the greatest vacuum consumption, ranging from 600 to 1200 1/min.

Cornell workers (12) recently measured air flow usage in milking parlors and found that 300 1/min pump capacity per unit far exceeded air requirements, especially in large parlors. Spencer (38) made similar measurements and concluded that a base amount per system and/or operator plus unit consumption is more realistic than a high per unit requirement.

It must be understood that the reason for the wide divergence of recommendations in the past has been due to the absence of actual air flow measurements. The "per unit" concept was developed at a time when parlors were smaller in size and herringbone types had swinging units. Thus, when units are installed at all stalls the effect is to double the pump capacity but the actual air requirement for the system is not nearly of this magnitude. In addition, the observations were developed at a time when vacuum controls were less sensitive. Vacuum control has a significant influence in maintaining vacuum stability.

The most realistic method of sizing appears to allow for a base reserve for a fall-off, then add 60-80 1/min per unit. Large commercial operations should allow additional reserve for 2 or more fall-offs. Consideration should be given to Ruffo and Sangiori's (33) work on system volume. Vacuum control sensitivity is an important element of performance to the total system.

Reserve or Balance Tanks. The reserve tank protects the vacuum pump and provides a momentary source of vacuum and a vacuum distribution point. Wittlestone (45) states that in theory, the most stable milking machine has a very small vacuum tank and relies for its stability on the sensitivity of the vacuum regulator in combination with the use of a pump of adequate capacity. LeDu (22) indicates vacuum stability influences on small systems of less than 400 1/min pump capacities. Rossing (32) states that enlargement (of the sanitary trap) makes vacuum more steady near the pump whereas the pressure progress in the milk line is negligible. Pressure progress is the vacuum drop along a horizontal pipe.

California workers (6) suggested a volume of 19 liters per milking unit in 1963. Dahl and Bautz (11) point out that there is pulsated vacuum interaction with milk line vacuum. Spencer (39) reports that vacuum drop due to pulsators is related to teat cup chamber plus pulsator tube displacement to total system volume. This vacuum drop can be reduced by staggering pulsator operation or increasing system volume. One should recall that balance tanks have a greater influence on vacuum drop than does over-sizing pulsator pipes.

The relationship of the reserve tank to pump capacity is evidenced when an air volume loss occurs which is greater than reserve pumping capacity. The relationship of recovery time to pump capacity and system volume has been correlated by Nordegren (28). Mein (25) suggests that a system recovery time of 3 seconds has merit and further investigations are warranted to consider this because of its arbitrary nature. Goldsmith (16) expressed concern about the practice of advising farmers to drop the vacuum to 30 kPa then measure the time it takes for the system to regain to 50 kPa. This type of test has inconsistent results and is unrealistic. Ruffo and Sangiorgi (33) relate

volume to pump capacity and the sensitivity of the regulator.

Recently California workers (35) have recommended a balance tank size of 7.5-19 liters per milking unit and a 150 liter maximum. Sensitive regulators located on the balance tank may cause the regulators to cycle, they add.

In summary, the role of the balance tank in milking systems is not well defined. Further studies are warranted to more precisely define its influence. Continual increase in system volume with oversize tanks and pipes may be detrimental from a control standpoint, and lead to increased reserve vacuum pump capacity needs, thus wasting energy.

The Milk Pipe. A third form of vacuum variation in milking systems is due to fluid flow. Fluid flow vacuum variations occur in dual purpose milk and air tubes and pipes when milk forms slugs or plug flow conditions. Plug flow is commonly known as flooding. Plug flow in milk lines can be initiated by air movement across the surface of milk within the pipe. Air velocities above the milk surface greater than 1 meter/second begin wave formation which is the first stage of plug formation (21).

Mein (24) reviewed milk line sizes in 1968 and found size recommendations to vary widely. For example, New Zealand suggested 12-14 units for a 35.8 mm tube while the U.S. permitted up to 5 units per slope. Current 3A Standards are 2 units per slope on 38.1 mm pipe, 4 units per slope on 50.8 mm, 6 units on 60 mm and 9 units on 75 mm pipe (2, 35).

The effect of milk line flooding is generally considered to be detrimental. Documentation of impaired udder health as a result of plug flow conditions is minimal. Brandsma and Maatje (8) found significant differences in cell counts, however, when 8 unit herringbone parlors were compared. Herds milked on 38 mm pipelines had higher cell counts than herds milked into 50 mm pipelines or recording jars. Twenty-two percent of the herds on 38 mm lines had cell counts over 500,000 vs 2.5 percent of herds on 50 mm lines or recording jars. Tolle (43) indicates increased lypolysis with flooding conditions.

Kerkhof and Rossing (19) have examined and measured the vacuum losses in milk pipelines as a mixed flow system. They suggest that pipe diameters be sufficient to limit vacuum loss to 2 cm Hg. They state, however, that increasing pump capacity or volume of milk line cannot prevent vacuum drop due to sudden air admission when putting on units.

Kerkhof (20) states that vacuum drop is proportional to the square of flow rate. The difference in specific gravity of air and milk makes the problem difficult in a mixed flow system.

Mein (26), using the Kosterin analysis determined the number of units as follows:

3 units - 38 mm milkline
5 units - 50 mm milkline
12 units - 75 mm milkline
20 units - 100 mm milkline

Gates et al. (15) studied the water handling capacity of a milk pipeline under varying flow conditions. They found that a 50.8 mm pipeline would be sufficient to handle 9 high yielding cows. They question the pipe sizes of 3A Standards which limits the number of units to the square of the diameter.

Cornell workers also found that dead-ended lines flooded more readily than looped lines. The fill-depth ratio of a dead-ended line was found to be at about 28 percent before flooding vs 60 percent for a looped system.

In conclusion with regard to milk pipe size, it would appear that some review of pipe sizing is warranted. In the opinion of the author, the 3A Standards for 38 and 50 mm pipes is reasonable while 62 and 75 mm sizing may not have been thoroughly evaluated. The Cornell study may be unrealistic since foam formation of milk influences plugging frequency. In addition, some arbitrary criteria should be established as to what constitutes plug flow limitations (ie: plugs per hour).

Supply Pipes. The desired objective in designing a milking system is to minimize vacuum drop in order to maintain a uniform vacuum level within reasonable limits throughout the system. This is relatively easy to accomplish in the supply piping side of the system since only air movement is involved. Fairbank and Eide (14) made some of the first practical tests to determine pipe size for milking systems. They suggested that the vacuum drop be limited to 13 mm of mercury across the system. Guest (17) calculated vacuum drop for various pipe sizes and lengths. Straight pipe equivalents for elbows, tees and other fittings can be found in Engineering Manuals (3).

The formula for calculating vacuum drop is (18): $V \text{ varies as } \frac{Q^2 \cdot L}{d^5}$

Q = flowrate, d = diameter, L =

length, V = vacuum. According to Lippke (23), vacuum drop in a looped system is determined by calculating the reciprocal of the sum of the reciprocals of the length of the two parallel branches in straight pipe equivalents. Lippke suggested a maximum of 25 mm vacuum drop.

Air flow in pipes can be characterized as either laminar or turbulant (11). Reynolds number (re) considers the tube diameter, vicosity and density. When Re exceeds 2200 flow is turbulant while less than 2200 flow is laminar. Vacuum drop can be expected to increase as the Reynolds number passes 2200.

Realizing that the vacuum drop concept may be difficult to understand, Spencer (39, 41) suggested using average internal velocity. The suggested maximum velocity is 12 meters/second while Welchert et al. (44) suggests design criteria at 6 meters/second. Low air velocities in this range will normally maintain laminar flow conditions with most pipe sizes.

SUMMARY

In summary, it should be recognized that adequate data is available to properly size supply piping for milking systems. Fairbank (14) and Guest (17) have provided a realistic vacuum drop limit of 13 mm of mercury. While design criteria might be as low as 6 mm of mercury vacuum drop, pipe sizes larger than this would have to be considered oversized and serve no useful purpose in milking systems layout. Air velocity may be a useful guide in designing systems but is not technically correct. Supply pipes having velocities in the 6-12 meters per second range can usually be expected to provide satisfactory performance. 3A Standards (2) do not meet the above criteria and should be upgraded.

Pulsator Pipe Size. The piping system for pulsators is the most difficult to size because of intermittent air flow. The type of pulsation (alternating vs simultaneous) has a marked influence on the vacuum drop. In addition the degree of synchronization of the pulsators is influencial. For example air operated pulsators are practically never in synchronization while electric pulsators may be in synchronization or partially offset.

The Milking Machine Manufacturer's Council suggests the following sizes:

up to 7 units - 38 mm
7 to 12 units - 50 mm
13 or more - 75 mm

No allowances for looping are mentioned. Dahl and Bautz (11) found no benefit for looping the pulsator line. Spencer (41) suggests that the air velocity concept could be used to size the pulsator line with a 4 fold allowance for intermittent flow patterns.

Further studies are warranted to correctly size this part of the system. The author (40) suggests that the vacuum drop due to pulsator operation on the system could easily be limited to 7.5 mm of mercury. The vacuum drop progress in the pulsator line, however, needs investigation and perhaps some arbitrary measuring points and methods developed.

In summary, much work has already been accomplished in sizing milking systems. In regard to vacuum pump capacity, there is general agreement that adequate size is necessary. The method of arriving at adequate size is still of some concern. In view of the close relationship of vacuum control sensitivity in the maintenance of vacuum stability, perhaps control specifications would help to clarify the issues. More industry people need to improve their objectivity with instrumentation that measures air consumption of systems and components.

The role and need for balance tanks needs to be more clearly defined. The influence of system volume has been observed but the inter-relationships to the total system need study and clarification.

In general, pipe sizes and specifications for sizing are known and documented. This knowledge needs desimination badly, especially among those who install systems. Milking systems must perform to milk *and* to clean. There is a need to "systems engineer" milking systems. The performance of a milking system is dependent upon the effect of its components in a complex relationship to its entirety.

Presented at the National Mastitis Council Meeting, Feb. '82, Louisville, KY.

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HOW MUCH QUALITY CONTROL IS ENOUGH?

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The routine practice of a total quality control/quality assurance program by many food, environmental or commercial laboratories and the determination of "how much is enough" will require more work in various areas. The increasing use of rapid methods and automated systems in the field of microbiology will modify routine quality control practices. Each microbiology laboratory will have to determine the extent of their quality control program. Recommendations for setting up and maintaining a quality control program in microbiology laboratories are given.

Quality control and other aspects of quality assurance programs have become an accepted part of the operation of commercial and private microbiology laboratories. Many of the elements of these programs have been defined by governmental agencies, professional groups, and interested microbiologists. However, they have been directed, for the most part, to clinical laboratories. These elements include, in part the qualifications of laboratory staff; adequate laboratory facilities; preventive maintenance and monitoring of equipment and instruments; surveillance of media and reagent quality; methods of collection, preservation, and transport of specimens; provision and maintenance of procedural manuals; adequate reporting methods; and record maintenance. How about food laboratories? They should attain to similar quality assurance methods. In fact, all of the factors that assure the reliability of the final test results reported by the laboratory should be included.

Quality control programs designed to cover these elements vary with the size of the laboratory, the types of tests performed, the volume of work, the number of staff available, and the origin of the specimens received. Because of this diversity, directors and managers of commercial and private microbiology laboratories have been hampered in their efforts to develop good quality control programs. In addition, there is a lack of concrete data regarding the extent of control procedures and frequency of performance necessary to provide, in a relevant and cost-effective manner, adequate assurance of the reliability of test results.

Minimum quality control programs have been defined by governmental agencies in regulations promulgated under the Clinical Laboratory Improvement Act of 1967. Requirements established in these regulations were often arbitrary in nature, primarily because of the lack of concrete data upon which to base the requirements.

In the years since these regulations were adopted, many interested microbiologists and professional groups have published data regarding their experiences with quality control programs and have suggested methods for performing quality control procedures mainly in clinical and public health microbiology laboratories. They should also apply to food laboratories.

This experience, coupled with that of regulatory agencies and professional groups, should provide a basis for a more flexible program of regulation and lead to improved recommendations for quality control programs in microbiology. Again, however, the diversity of laboratories creates problems in establishing regulations and in recommending specific quality control programs. This diversity is more clearly seen in food and environmental testing laboratories.

Considering the cost in time, labor, and material, one might wonder whether a quality control program on the part of the laboratory is necessary and/or economically feasible. Obviously, the laboratory director and personnel must make the decision, but the following points should be considered: (1) Can accuracy, reliability, and reproducibility of performance results under routine laboratory procedures pertinent to the isolation and

identification of microorganisms be assured without a quality control program? (2) Can daily, weekly, or monthly variations or trends in performance results be recognized without a quality control program? (3) Considering today's costs associated with patient care and commercial testing, can a laboratory afford the toll in time, materials, and professional frustration associated with media that have not been tested to ensure the above?

In a commercial testing laboratory, the cost of personnel, expendable lab supplies, etc., more than justifies the cost of a quality control program. Use of faulty media in the microbiology laboratory can have two consequences. A culture may fail to grow, requiring repetition of the procedure; or the culture may yield erroneous data.

A comprehensive quality control program that entails the use of recently isolated clinical, environmental, food and/or properly maintained stock cultures, the use of positive and negative controls, and the use of valid performance standards can ensure the using laboratory that the product, once in the laboratory, can be used on a routine clinical and commercial testing basis. Therefore, quality control programs have the responsibility (1) to ensure that a given product once placed into a routine diagnostic-test situation, will produce accurate, reliable, and reproducible results in the recovery and isolation, culture, and/or identification process; (2) to ensure that products comply with professionally established standards and government regulations; and (3) to recognize and bring to the attention of the microbiologist, scientist, quality control manager variations in performance results as they deviate from the normal and/or expected results.

The amount of time spent in quality control functions of a microbiology laboratory will depend upon the workload, size of the company or laboratory and the particular product being tested (if it is a commercial laboratory). Previous publications by the author have shown the importance of quality control in all types of microbiology laboratories. Also, the problems in microbiological media formulations have also been previously discussed. However, the routine practice of significant quality control programs by many microbiology laboratories and the determination of "how much is enough" will require more work in areas such as the stability of certain reagents, the development of simpler, more accurate methods for measuring performance, and the development of more realistic standards. The increasing use of rapid methods and automated systems by food and environmental microbiologist will further complicate the answer to "how much quality control is enough." Each individual microbiology laboratory will have to determine the extent of their quality control procedures.

The following are recommendations for setting up a quality control program. The list is by no means inclusive of all possible avenues, but contains important suggestions for having a good quality program. This program is essential for the overall productivity of the laboratory.

1. Laboratory director and staff review all areas of activity and identify quality control needs in each.
2. Acquire appropriate stock cultures.
3. Establish schedules for surveillance of media, reagents, antibiotics and antibiotic disks, antisera, and equipment; develop appropriate recording forms for all monitoring.
4. Enroll in external proficiency testing program.
5. Set up internal proficiency testing program.
6. Establish schedules for a continuing education program and periodic bench review of infrequently encountered organisms.
7. Establish a schedule for periodic review of all procedures.
8. Establish liaison with at least one good reference laboratory and with state or city health department.

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Mastitis Therapy: Effective Treatment or Double Trouble?

LOUIS E. NEWMAN

In treating mastitis, use products which supply adequate evidence of safety and efficacy. Home mixed products can create a tremendous problem in treatment due to unknown factors involving residues. Some of these products may cause residues which are not eliminated over an extended period of time.

Teat Dip Problems

Herd A: A mastitis problem in a large herd supposedly using a clorox teat dip. Teat ends were severely eroded. Discussion revealed that the teat dip was actually a chlorine udder wash diluted to 4% chlorine and excessive alkalinity was burning the teats.
Conclusion: Use only products intended for use as teat dips.

Herd B: A mastitis problem in a large dairy herd which was on a clorox teat dip and dry cow therapy program. The dairyman stopped dipping and claimed he had fewer mastitis problems. Further discussion revealed that several months before he had begun using glycerin in the teat dip to improve skin condition. Unfortunately the resulting chemical reaction produces glyceraldehyde and glucose which support bacterial growth. He was therefore spreading organisms from cow to cow with the altered teat dip.
Conclusion: Never add any other chemical to a teat dip.

Herd C: A mastitis problem in a small dairy herd using a 0.5% iodine teat dip and dry cow therapy. This was one of many unfortunate dairymen who used a .5% iodine solution in a 99.5% petroleum base designed to be a good skin conditioner. Studies have shown that the product was ineffective and in fact may have increased infections.
Conclusion: Use one of the products which have been thoroughly field tested and proven efficacious.

Herd D: A mastitis problem in a small dairy herd using a 1% iodine teat dip. A bacteriologic survey indicted the problem was due to *Streptococcus agalactiae*. An analysis of the situation revealed that the dairyman was using a hand operated teat sprayer. He was not getting enough teat end coverage to get adequate disinfection. Other experience has shown that it is very difficult to do an effective job with spray bottles.
Conclusion: Do not recommend teat sprayers until a good one is designed and properly field tested.

Herd E: A mastitis problem in a large dairy herd using a chlorhexidine teat dip. In this herd the complaint was that they were not making very rapid progress in reducing mastitis. Chlorhexidine was used in several U.S. studies and has been shown to be nearly as effective as iodine and chlorine if used in the proper concentration. The solution should contain 1% chlorhexidine. Using it at this concentration makes it the most expensive teat dip on the market. The high cost encourages dairymen to overdilute the solution, greatly reducing its efficacy.
Conclusion: Teat dips must be used in the recommended concentrations.

Herd F: A mastitis problem in a large herd using a 1% iodine teat dip solution and dry cow therapy. A bacteriologic survey of the herd revealed a *Pseudomonas* problem. A check of the spray system used to wash udders and rinse inflations yielded *Pseudomonas*. Source: The quaternary ammonium compound used in the water. Others have indicated similar findings.
Conclusion: Avoid quaternary compounds in udder disinfection.

Teat Dips - A Summary

Use products on which there is adequate evidence of safety and efficacy. Most water based products can be used with a fairly high degree of confidence that they are efficacious, although efficacy will vary. This includes iodophors, all 3 forms of chlorines, chlorhexidines, hexachlorophenes, quaternary ammoniums and cetylpyridinium.

Most iodophor teat dips have emolients in them:

Lanolin .05% - 4.0%

Glycerin 3.0% - 9.0%

The addition of extra emolient will probably have an adverse affect upon the efficacy of that teat dip.

Beware of oil based teat dips unless there is conclusive evidence of the prevention of new infections under controlled conditions. To date, oil based products have performed poorly and some have actually increased the infection rate.

Mastitis Treatment Problems

Herd 1: A 270 cow herd threatened with being shut off the market because of high leucocyte counts. *Strep. ag.* infection was assumed to be the problem based on bulk tank milk cultures. The owner was advised to have composite samples from each cow cultured and then treat the infected cows. Because he did not have the cows individually identified and it would be inconvenient to separate the herd, the owner decided to "Blitz" treat the entire herd.

The veterinarian provided the owner with multiple dose vials of intramuscular penicillin-dihydrostreptomycin and directions on how to use the product (10 CC per quarter twice 12 hours apart following milking). The milk plant offered to run antibiotic tests to determine when the milk could again be shipped.

On the 4th day, after 6 milkings had been withheld, the dairyman was back on the market and shipping milk. On the 5th day he had 70 cases of acute mastitis with fevers to 107°C.

At the end of 2 weeks 140 cows had had acute mastitis. Eighty of these were improving and looked pretty good, although there was garget in the foremilk. Forty others were still in trouble with hard, caked udders, and cows late in lactation were drying up. Production had dropped from over 10,000 lbs to under 5,000 lbs.

The diagnosis: Yeast mastitis

The organism: Candida sp.

The cause: Faulty disinfection, multiple dose products and/or inadequate numbers of sterile teat cannulas resulted in the introduction of environmental pathogens.

This owner had used 300 cannulas to infuse 270 cows twice (he needed 2,160 sterile cannulas) and he had used a disinfectant which was not effective against yeast forms.

Conclusions: 1) *Don't "blitz" treat if you don't have to.* 2) *Use single dose products.* 3) *Use individual sterile cannulas.* 4) *Be sure the person infusing the udder understands the necessity of asepsis and disinfection.*

It *is* possible to initiate a *Strep. ag.* control program that will create a problem worse than the *Strep. ag.* It *is* possible to embark on a dry cow treatment program that will create a serious mastitis problem. Yeast mastitis is the result of homemade contaminated infusion products, the use of multiple dose vials with syringes and cannulas, or unsatisfactory methods of infusion.

Herd 2: A large dairy with severe, even gangrenous mastitis at parturition. Cultures yielded *Bacillus cereus* in pure culture which was resistant to penicillin and cloxacillin. It had been introduced as spores in the dry cow treatment.

Conclusion: Dry cow treatments must be pathogen free or sterile. This is very difficult to accomplish with home mixed or multiple dose products.

Herd 3: A herd with a coliform mastitis problem. A veterinarian found that he had excellent results using a mixture of gentamicin in a commercial mastitis infusion product as a treatment in early cases of coliform mastitis. He subsequently mixed a similar product in multiple dose vials and dispensed this to his client. Results were not satisfactory.

Conclusion: Gentamicin and penicillin are incompatible; some inactivation occurs within 6-8 hours and complete inactivation of both drugs occurs within 96 hours.

Herd 4: A herd of cows being moved from one farm to a second farm. All cows were treated with pen-strep in an oil base as a blitz treatment for *Strep. ag.* The dairyman expected to save money by purchasing the penicillin from a wholesaler. Antibiotic residue problems persisted for 10 days.

Conclusion: Use only products intended for use as lactation udder infusions.

Herd 5: A lactating cow in a large dairy herd was treated for mastitis. The milk was saved and went into the bulk tank; however, the dairyman realized what had happened. The entire tank of milk was dumped and the bulk tank rinsed, but it was not washed. The next day's milk was used for cheese; however, no reaction occurred when the starter culture was added to the milk. The milk had killed the starter culture.

Conclusion: Milking equipment must be thoroughly washed after it has held milk from treated cows. Antibiotic residues will persist in equipment. Time and again we see problems where the equipment used to milk the mastitic cows is not properly washed and disinfected.

Herd 6: A dairyman was dissatisfied with the relatively slow progress from a teat dip/dry cow treatment program. He looked for a quick solution to his problems and was sold on using furacin solution directly out of the jug for intramammary infusion. He filled 50 ml syringes by removing the plunger and pouring the furacin out of the jug into the syringe. He then attached a stainless steel cannula for infusion. The mastitis which resulted was not responsive to any treatment. Trichophyton was cultured from the furacin jug and this same ringworm fungal organism was recovered from the infected glands.

Conclusion: Multiple dose bottles, reusable equipment and homemade remedies can and do become contaminated with all kinds of potential mastitis-causing pathogens. There

are no shortcuts to good udder health.

Herd 7: A 140 cow dairy herd in which the owner became overly concerned about real or possible coliform infections. The dairyman sought treatments that would be more effective than the approved lactation and dry cow treatments he was using. He purchased a bulk preparation for both lactation and dry cow therapy that contained combiotic and azium plus other unknown antibacterial agents. The product was contaminated with *Prototheca*. He now superimposed *Protheca* infection on top of his perceived coliform problem. He called for help after he lost eight cows. Investigators found 80% of his cows infected with *Staph. aureus*. They also found a coliform problem that was enhanced by poor cow treatment procedures and a fat cow problem which in turn affected the immune competence of the cows.

Conclusion: An accurate diagnosis of the problem is essential to developing an effective control program. Magic quick cures do not exist and homemade products are easily contaminated.

Herd 8: A dairyman was forced to sell 35% of his 150 cows over a one year period because of a chronic fibrosing granulomatous mastitis. The cause was a mycobacteria of Runyon Group IV. This individual actually hosed down dirty udders, and with water still dripping from teat ends, infused a commercial product into the gland. The disease was precipitated by septic infusion of an oil based antibiotic. The mycobacteria associated mastitis was unresponsive, in fact was exacerbated, by further oil based antibiotic treatment.

Conclusion: Teach the dairyman how to aseptically administer infusion products and why single use proven efficacious products are essential to his economic well being.

Mastitis Therapy - A Summary

Products not intended for intrammary use, when mixed by the veterinarian and infused into the udder, may have significantly greater milk out times than intrammary infusion products.

Home mixed products create a tremendous problem because of the unknown factors involving residues. It is possible that some of these products may cause residues which are not eliminated over an extended period of time. The milk out time of these products is influenced by both the vehicle and the suspending agent.

Drugs which are effective against gram-negative organisms are even harder to milk out and eliminate residues than products which are normally used against gram-positive organisms.

A number of products used for mastitis infusion are irritating and the vehicle functions to reduce this irritation. What a veterinarian does not know about the vehicle when he is home-mixing a product can create problems. Example: penicillin is not stable in propylene glycol (furacin solution) and furacin is not compatible physically or chemically with penicillin.

What is the *responsibility* of the veterinarian who formulates his own product?

He is responsible for the *sterility* and *stability* of that product. 1) A mastitis product must be *pathogen* free. This is very difficult even under ideal conditions. 2) How does he determine the *efficacy* of his product? Will it really work? This is difficult to determine with small numbers.

Are the drugs *compatible*?
How long is the drug *active*?
How long do *residues* remain in the milk?
Is the *risk* worth the *gain*?

A major problem for the drug companies is that they must demonstrate that the products can be used within the label requirements.

When a product is not labeled for intrammary use that product may be withdrawn from the market by FDA if it is misused and residues appear with any degree of frequency.

For this reason drug companies have a great deal of concern about use by veterinarians of products not labeled for intrammary use.

FDA regulations state that the longest withdrawal period for approval of any drug for lactating animals is 96 hours.

No matter how effective a drug is against mastitis, even coliform mastitis, unless the regulations are changed the drug cannot be approved for use in lactating cows if the withdrawal period needs to be longer than 96 hours.

A prescription legend is required when: 1) Dry cow treatment withdrawal times exceed 72 hours or 2) Adequate directions cannot be written for lay use. This could be because of: antimicrobial specificity, resistance, safety.

Evidence of needle marks from intramuscular injection are discernible for up to 30 days. These animals are retained while tissue samples are tested for residues.

Chemists have recently developed a method to detect residues of chloramphenicol in tissues of food producing animals.

Present law holds the veterinarian equally responsible with the owner when violative residues are found and it can be established that the veterinarian administered the drug without advising the owner of the stipulated withdrawal time.

The bureau of veterinary medicine does not object to the use of human prescription legend drugs in non-food-producing animals for unapproved purposes; but *does not* sanction the use in food-producing animals of any human or animal drug for which there is no specific approval.

When we treat 1 quarter or treat intramuscularly we must remember to tell the owner he must withhold the milk from all 4 quarters.

Any time an animal is given a drug, whether it be by injection, by infusion into the uterus or mammary gland, or by mouth, that drug can only go a limited number of places. It may be deposited within the body, most commonly in the body fat; small amounts may be exhaled through the lungs; it may be excreted through the kidneys in the urine; eliminated in the feces, or secreted into the milk. Regardless of the route of administration, part of most drugs winds up in the blood stream and is therefore secreted in the milk from all 4 quarters.

The time has arrived to identify the problem and correct it. Perhaps each of us can help by taking a hard look at things such as:

1) Intramuscular injections
2) Dry cow treatment
3) Dry cow treatment in lactating cows
4) Home mixed veterinary products
5) Directions to the owner
6) Methods of identifying treated cows and
7) Complacency.

News and Events

DASI Processing Installation at a Major Holland Dairy

DASI, Inc., developer of an ultra-high temperature (UHT) System for processing fluid milk which can be safely stored and transported without refrigeration, announced that it has signed agreements with Dutch Dairyland Export (DDE), B.V. under which DASI is to supply a DASI processing system for installation in a major dairy in Holland.

DASI further granted the Dutch company an exclusive license to market DASI processed products in Saudi Arabia.

"This agreement is an important milestone for us," stated Dr. John E. Nahra, President of DASI, Inc., "for it represents the first commercial production and marketing of our shelf stable dairy product in Europe and the Middle East."

Milk sterilized by the DASI ultra-high temperature process will not spoil even when stored unrefrigerated for many weeks. The DASI process, which involves heating milk to ultra high temperatures in about 1/3 of a second without contacting any surface, introduces no chemicals or additives of any kind into the milk. The trademark name of the equipment is the DASI FreeFallingFilm System.

According to James F. Sams, Board chairman of DASI, "Milk sterilized by the DASI process has all the fresh flavor of conventionally pasteurized milk and none of the 'cooked' taste associated with UHT processes available from European manufacturers."

"After using and testing UHT milk from a variety of systems in Europe for many years, we are convinced that the new DASI System offers a superior quality product," said Mr. Hisham Al Kadi, president of Dutch Dairlyand Export. "We plan to provide our customers in Saudi Arabia and other areas the highest quality dairy products using the DASI System."

Dr. Nahra pointed out that the DASI System to be installed at Menken Dairy Food in Holland will have a production capacity of 8,000 liters of milk per hour. The fluid UHT milk will be packaged in Brik Pak and other aseptic packaging for shipment to Saudi Arabia.

Already in operation in a Canadian dairy, the DASI System can also be applied to the processing of juices and other liquids.

For more information contact: Dr. John Nahra 301-657-9020, or Barbara Pomerance 301-657-1800.

Milk Doesn't Reduce Cholesterol Level

Milk is good food, but drinking it won't reduce the level of cholesterol in your blood as some researchers have suggested, says University of Wisconsin-Madison nutritionist Judith Marlett.

Whole milk and cheese made from it contain cholesterol, a form of fat found only in animal products. Scientists believe that cholesterol from these dairy products is one source of the fats that can accumulate in deposits in arteries and lead to an increased chance of heart attacks.

But during the last decade, the milk-cholesterol debate took a surprising turn. Several researchers reported that when people supplemented their diets with 1 to 4 quarts per day of yogurt, whole milk, skim milk or 2 percent lowfat milk, the amount of cholesterol in their blood actually dropped. Thus, the researchers proposed the existence of an unknown milk factor that reduced blood cholesterol levels.

The problem with the work, says Marlett, was that the researchers didn't control the diets of the subjects. The people in the studies may have substituted large amounts of dairy products for other foods they normally ate that were higher in cholesterol. Marlett, UW-Madison nutrionist Nancy Keim and food scientist Clyde Amundson conducted the first study to look for evidence of a milk factor in subjects on a controlled diet.

The researchers conducted a 34-day study of nine men who spent successive periods on a high calcium diet, then a low calcium diet, and finally a high calcium diet where they drank two quarts of skim milk a day. The men's intake of calories, carbohydrates, protein, fat, cholesterol and dietary fiber were held constant through all periods.

The cholesterol levels of men in the study did not decrease during the period they were drinking skim milk, says Marlett. In fact, although skim milk contains no cholesterol, the levels of cholesterol in the blood increased about 5 percent during the skim milk period. Marlett feels this rise may have been only a temporary change.

However, during the high calcium period, blood cholesterol levels actually fell about 8 percent, says Marlett. The men were receiving three times the

recommended daily allowance of calcium at this time. Marlett says the finding agrees with other studies that indicate high levels of calcium tend to reduce blood cholesterol levels and the chances of heart attacks.

Marlett doesn't recommend that people take calcium in large amounts to reduce blood cholesterol. "We tend to be cautious about using nutrients in excessive amounts," she says. "Increasing the level of a nutrient makes nutritionists uneasy, because high levels of one nutrient can interfere with the proper metabolism of other important nutrients."

The study indicates that fresh skim milk dooesn't contain a milk factor that lowers cholsterol in humans eating a diet typical of people in the U.S., says Marlett. But she hasn't ruled out the possibility that eating large amounts of yogurt or fermented milk may lower blood cholesterol. Rather than a milk factor, Marlett suggests that eating large amounts of fermented milk or yogurt may change the bacterial composition of the large bowel and alter cholesterol metabolism there.

Marlett emphasizes that milk is good food, and it's cheap. It contains three of the nutrients...calcium, riboflavin and vitamin A, that Americans are most likely to consume in amounts lower than the recommended daily allowances. Although drinking skim milk won't lower your cholesterol, it is an important source of protein as well as nutrients, she says.

"Frozen Food Showboat"

With the theme "Frozen Food Showboat," the 1983 Western Frozen Food Convention, being held March 6-9 in San Diego, CA, will feature presentations by key government leaders, a seminar on topics from energy to microprocessors, and the unveiling of the newly developed cryogenic railcar.

The Convention, sponsored by the American Frozen Food Institute (AFFI) will also include traditional favorites such as the Frozen Food Showcase Luncheon, the Frozen Fruit and Vegetable Sample Display, along with excellent social and recreational activities.

Senator Pete Wilson (R-California), the Convention's keynote speaker, will address delegates at the Opening Breakfast Session at 7:45 a.m. on March 8.

A two-hour seminar beginning at 10:00 a.m., March 8, "New Frontiers in Frozen Foods," will cover several important topics. Oren Mosher, manager of engineering at Eagle Machinery Company, will adress, "The Use of Microprocessors in Production and Process Control." Ralph L. Lewis, Gulf Oil Corporation, will present a summary of "Energy: Yesterday, Today and Tomorrow." Ralph P. Hill, vice president of distribution at Lamb-Weston, Inc., will make a presentation concerning the development of the cryogenic railcar, the product of work by AFFI, the International Association of Refrigerated Warehouses and a number of railroads. Hill will also provide information on plans for sustained research operation of the car.

The cryogenic railcar, the second phase of a research project aimed at finding an alternative to mechanically refrigerated railcars, uses dry ice "snow" to replace mechanical refrigeration. The snow is produced by the injection of liquid carbon dioxide from a thermostatically controlled storage and dispensing system on board the car.

For more information contact: American Frozen Food Institute, 1700 Old Meadow Road, Suite 100, McLean, VA 22102. 703-832-0770.

Crumbine Award Applications Due

Applications are now being accepted for the Samuel J. Crumbine Consumer Protection Award for 1983. The Crumbine Award is given annually to a deserving local public health agency for the excellence of its program of food and beverage sanitation.

The competition is open to all U.S. local government units who can demonstrate outstanding qualities in the design and implementation of the public health measures they have instituted to prevent the outbreak of foodborne illness in the community.

Deadline for the 1983 Award entries is June 15, 1983.

Presentation of the Award will be made at the annual meeting of the American Public Health Association in Dallas, TX, November 15, 1983.

Applications may be obtained by writing to the Award sponsor, the Single Service Institute, Inc., 1025 Connecticut Avenue, NW, Washington, DC 20036.

83 ACDPI Meeting in Florida

Over 300 delegates from throughout the U.S., Canada, Mexico, and assorted European countries are expected to attend the 1983 American Cultured Dairy Products Institute Annual Meeting/Kultures and Kurds Klinic/Judging Contest, according to Institute Secretary Dr. C. Bronson Lane. Site for the March 20-23, 25th Anniversary Event will be the International Drive Holiday Inn, Orlando, FL.

Buttermilk, sour cream, cottage cheese, and yogurt submitted by manufacturers will be evaluated by experts during the national judging contest, and awards given for individual product excellence. Over-all products winner will receive the coveted Neil C. Angevine Superior Quality Award at the Tuesday evening (March 30) Founders' Recognition Banquet.

Additionally, the program includes a President's reception honoring Rob Mayfield, Mayfield Dairy Farms and a Monday (March 21) luncheon where the recipient of the 1983 ACDPI Research Award will be recognized.

Tours of the Publix Dairy Processing Plant in Lakeland and/or the T.G. Lee Foods Lifestyle Division Plant in Orange City are also on tap for the conferrees.

For additional information contact: Dr. C. Bronson Lane, ACDPI, PO box 7813, Orlando, FL 32854.

New Margarine Production System

The Groen Division of Dover Corporation has released a four page brochure which describes their new margarine production system. User benefits including lower initial cost; lower energy useage; smaller refrigeration system and production floor space requirements; and less maintenance, are described.

A typical Groen Margarine system is compared to existing margarine production technology to illustrate the actual savings. Technical information is provided on the three available systems with capacities ranging from 3,500 to 15,000 pounds of margarine per hour.

Full color photos of typical installations, details on the control package and basic system dimensions are included to assist the large commercial producer of stick, soft tub or bulk pack margarine to choose the system that best meets their need.

For more information or a copy of this product literature, contact: Process Equipment group of Groen, Dover Corporation, 1900 Pratt Blvd., Elk Grove Village, IL 60007. 312-439-2400.

Grain Storage Without Chemicals

A symposium devoted to new technology developed to store grain without chemicals is being organized by Australia's Co-operative Bulk Handling Ltd., one of the world's leaders in grain handling.

The symposium, scheduled from April 11-15, 1983 in Perth, Western Australia, will focus on the practical application of controlled atmosphere and fumigant disinfestation of stored grain. According to the Australian co-operative's general manager, Jim Green, the event is "a practical application sequel to a controlled atmosphere storage technical conference held in Rome in 1980 and will be of great value to all grain producing nations, particularly those with climates and storage problems similar to Australia's."

Co-operative Bulk Handling recently perfected the technology of sealing large horizontal, or warehouse style, storages to enable the use of inert gases (carbon dioxide and nirogen) and fumigants in controlled atmosphere storage conditions. The cooperative is currently employing this technology in storing about 400,000 tons of grain, Green said.

Green also noted that much attention has focused on new grain storage techniques in recent years because insect pests have developed resistance to low cost pesticides, compelling the industry to turn to more expensive acceptable chemicals. Another factor has been industry awareness of the increasing concern being expressed toward chemical residues on foodstuffs.

An optional second week of the symposium will deal with the aspects of a central grain storing and handling system and will include sampling, weighing, storing and handling, integration of quality control systems, land transportation, and export shipping.

Among the experts scheduled to participate at the symposium are Dr. H. J. Banks, Division of Entomology, Australian Commonwealth Scientific and Industrial Research Organization; Dr. E.G. Jay, Stored Products Insect Research and Development Laboratories, Savannah, GA; and Mr. M.S.O. Nicholas, Agriculture Services Division, Food and Agriculture Organization of the United Nations in Rome, Italy.

Co-operative Bulk Handling's grain terminal at Kwinana, near Perth, is the largest shipping terminal of its type in the world, with a shiploading capacity of 5,000 tons per hour. It has a totally integrated horizontal and vertical celltype storage system of 912,000 tons.

For more information contact: Co-operative Bulk Handling Limited, 22 Delhi St., West Perth 6005 Australia.

Dairy and Food Industries Supply Association Meeting in April

Dairy and Food Industries Supply Association will hold it's 64th Annual Conference, April 11-13, 1983 at the Boca Raton Hotel and Club in Boca Raton, FL.

Thomas R. Case of Reliance Electric Company, and chairman of DFISA's Annual Conference Committee said that the association's annual event's name has been changed from Annual Meeting to Annual Conference to properly reflect it's business and educational purpose.

The conference is open to all industry representatives. For more information contact: DFISA, 6245 Executive Blvd., Rockville, MD 20852. 301-984-1444.

Food Protection for the Elderly

Food protection in feeding the elderly was discussed by instructor David McSwane on the Applied Foodservice Sanitation course of the National Institute for the Foodservice Industry at the Indianapolis Convention Center. Sponsored by the Indiana Department on Aging and Community Services, in cooperation with the Indiana Restaurant Association, the program taught 441 persons from Indiana agencies, the state agency staff, and area restaurants how to apply modern sanitary techniques in food preparation and facility maintenance.

Growing out of several meetings between NIFI, the U.S. Food and Drug Administration and the Administration on Aging, U.S. Department of Health and Human Services, the classes are designed to upgrade food sanitation for the elderly in congregate feeding sites and home delivery service.

Richard J. Hauer, NIFI Executive Vice President, lauded the program, pointing out, "The elderly are more susceptible and foodborne illness is especially hazardous to them. In view of this, it is vital to maintain higher standards of food protection."

Following essentially the same pattern, Applied Foodservice Sanitation classes soon will be convened in other states to enhance the technical skills of the staffs of state and area agencies on aging and foodservice contractors.

Quality Control Internship Program

Red Lobster, America's largest dinnerhouse chain, has established an internship program for University of Florida students studying quality control, reports W.E. Hattaway, president of the seafood restaurant company.

"The program will provide a junior or senior year student foodservice industry experience and the opportunity to apply theories and practices the student has learned from instructors in the Department of Food Science and Human Nutrition at the University of Florida," Hattaway said.

The 16-week training program will be at Red Lobster corporate headquarters in Orlando, FL, with additonal field experience at restaurant locations in Flordia. Red Lobster owns and operates 350 restaurants in 36 states.

The internship syllabus will expose the student to product and facilities' sanitation and safety; laboratory microbiological testing and field sampling; physical and chemical properties of food; public health protection; water supplies and waste disposal; insect and rodent control; and organoleptic evaluations. Other areas are food packaging, processing, distribution and labeling as part of food protection practices.

Dr. James Kirk, chairman of the university's department, said, "Red Lobster is recognized as the foodservice industry leader in quality control programs. This internship program will provide the student significant knowledge and practical skills to complete the educational experience."

Hattaway said the University of Florida was selected because of its fine reputation and credible seafood technology programs. This is the first quality control internship in the foodservice industry to be established in the United States.

"We are celebrating the 15th anniversary of the founding of Red Lobster and this is one way of reinforcing our commitment to quality that we have provided our guests every day for 15 years," said Hattaway.

The intership will be available to one student during one semester each academic year, with three credit hours awarded upon completion.

"Becoming familiar with state and local variances in public health ordinances and laws will add to the student's knowledge," Dr. Kirk added. "The student will observe the actions of quality control professionals, managers and subordinates, and government enforcement officials.

Reducing Salt Intake

Scientists, concerned with the excessive salt content in the average human diet, say consumers can do much to help cut down on salt consumption.

"The most obvious way to reduce salt intake is to remove the salt shaker from the dining room table and the cooking area," according to Dr. Robert Terrell, meats scientist at Texas A & M University, involved in research on meat preservation for the Texas Agricultural Experiment Station.

"This is called discretionary intake and can cut the excessive use of salt by 25 to 30 percent, but it does require a change in behavior and taste."

Another discretionary source of salt is in the water used for drinking and cooking. If the salt content of water is high where you live, you can cut salt intake by using distilled-bottled water for drinking and cooking.

Reduction of excessive intake of sodium, primarily from table salt (sodium chloride) has been made a national health policy by the U.S. Food and Drug Administration (FDA) and other health-related agencies.

About 20 percent of the U.S. population is believed to be genetically susceptible to high blood pressure (hypertension) and the lowering of excessive intakes of sodium will decrease high blood pressure.

Concern for high blood pressure is associated with the incidence of stroke, kidney failure and heart attacks which are affecting younger people in their most productive years.

Excessive intake of sodium is not easily defined, Terrell said, but it is estimated that current intakes range from 10 to 12 grams of salt per person per day and that liberal and sufficient intake may be as low as 2 to 3 grams per day.

A non-discretionary way to reduce excessive intake of salt that represents 40 to 60 percent of intake, is associated with dietary habits of using processed foods.

Federal policy is currently directed toward this non-discretionary source of sodium by encouraging food processors to voluntarily label the sodium content of their products.

Experiment Station research is seeking alternatives to sodium chloride and the effects of reducing the amount of ordinary salt in formulated meat products.

Terrell and other scientists in the meats lab at Texas A & M have reduced or substituted the sodium chloride in frankfurters, hams, pork sausage and formulated pork roasts to study the effects on processing and sensory properties.

When sodium chloride was replaced or reduced 35 percent by using potassium chloride, the only FDA-approved salt-substitute, flavor was decreased.

A trained taste panel did not like the off-flavor (bitter) taste of products made with potassium chloride but found the 35 percent replacement of sodium chloride with potassium chloride to be more acceptable than the 100 percent replacement.

Processing properties, such as cooking shrinkage, were not affected with either of these substitution rates, but keeping qualities were affected adversely.

Additional studies with pork sausage links and patties (pan sausage) revealed that rancidity increased faster with the addition of sodium chloride than when potassium chloride was used at the same level.

Also, Terrell says, a 50 percent reduction in sodium chloride was reflected by slightly higher counts of certain spoilage bacteria but growth of other types of spoilage bacteria was not affected by reductions in sodium chloride or by use of potassium chloride.

Since off-flavors may result when potassium chloride is used to replace all or part of the sodium chloride in various processed meat products, its use as a salt substitute is limited because it is not as desireable and because it is much more expensive, Terrell said.

However, commercial salt-substitutes for home use on cooked food are available at retail stores and contain primarily potassium chloride, along with other ingredients.

"It's not clear to what extent sodium chloride can be reduced in meat products," Terrell said.

"Major effects on growth of spoilage and harmful bacteria which may affect human health or product shelf-life or both is of concern to all involved with this problem.

"There appears to be no easy, single answer but control of sodium intake is a personal and individual-case by case-issue.

"If you are one of those people with a need to reduce your salt intake, why not work with your doctor on this problem? There's much you can do to reduce the problem on an individual basis, by 1) stopping the showering of all food with salt, often before it's even tasted 2) stop cooking with so much salt, and 3) where salt content of local water is high, substitute salt-free, bottled water for drinking and cooking," Terrell concluded.

For more information contact: Science Writer, Department of Agricultural Communications, Texas A & M University, College Station, TX 77843.

Processed Dairy Product Sales Will Increase

Domestic sales of processed dairy products will advance 45% during the 1980's while the market for fluid milk products declines 4%, according to Frost & Sullivan, Inc.

Measured in constant 1981 dollars, the market for processed items will build from $8.3 billion in 1981 to $12.0 billion by 1990, the research organization forecasts in a new study, New Dairy Products Markets in the U.S. Over the same timeframe, however, sales of fluid milk products are seen steadily slipping from $8.16 billion to $7.87 billion.

Cheese, the largest segment in the processed area, is expected to continue its strong growth, as sales climb 53% from $6.19 billion in 1981 to $9.48 billion, the report says. Sales of cheddar and American type cheeses, the two most important categories, are seen increasing about 2.5 fold in the decade. Blue mold and hard Italian cheeses are the only categories on the downside, Frost & Sullivan notes, citing price and a consumer trend toward blander tasting foods.

Competition from cheese substitutes is expected to continue, with sales forecast to jump 78% from $135 million to $239.9 million over the decade. Substitutes captured about 5% of the markets for cheese in 1981, and optimistic estimates contend that share could reach 50% by the year 2000, the report relates. Figuring behind this growth are significant improvements in quality and favorable price comparisons with natural and processed cheeses--the latter enhancing their value as an ingredient. Indeed, about 90% of substitutes are used as ingredients in processed food products.

Yogurt is seen continuing its upward climb, although at a slower pace than in the mid and late 1970's. Sales are projected to mount 31% from $485.4 million in 1981 to $633.3 million by 1990. The study points out that per capita consumption in the U.S. was 2.67 pounds in 1981, up sharply from 0.26 pounds in 1960. It adds that plain unflavored yogurt is the most important product, capturing 18% of the market, followed by strawberry flavored with a 14% share. Among newer products, soft and hard frozen yogurt have generally been well accepted by consumers, but have failed to live up to their potential, the report states, blaming inadequate promotion by manufacturers.

The market for ice cream and frozen desserts is expected to expand at the same pace as the overall population, with sales increasing 2% from $1.26 billion in 1980 to $1.29 billion by 1990. Frost & Sullivan notes that the premium-quality portion of this market has been growing, as manufacturers turning to the high end report significant gains in sales and operating margins.

Sales of cheese whey products continue to build in the face of expanding applications, the report says. The market is forecast to grow 62% over the decade, from $224.5 million to $363.9 million. Current research and development has yielded processes for producing beverage alcohol, wine and brandy from whey, among other things. It is claimed that cost of producing wine is reduced by about 50% when whey is substituted for grapes.

Among fluid milk products, the market for whole milk is forecast to drop 25% from $4.34 billion in 1981 to $3.28 billion in 1990. The study notes that consumption of whole milk and butter have declined steadily in recent years in the wake of unsubstantiated claims linking the high saturated fat content of these products to the development of cardiovascular diseases. They've also been shunned by weight-conscious consumers.

Among smaller fluid milk product categories, sales of skim milk and butter milk are seen slipping 4% from $665.6 million in 1981 to $632.2 million by 1991, while light cream falls 28% from $52.2 to $37.8 million, heavy cream rises 25% from $141.9 million to $177.3 million, sour cream increases 25% from $338.7 million to $422.9 million, and half & half grows 9% from $273.9 million to $299.6 million.

A record 74.1 billion pounds of milk were used in the manufacture of dairy products in 1981, Frost & Sullivan adds. More than 40% of that total was utilized as fluid milk, with cheese accounting for better than 20%, butter just under 20% and ice cream and frozen desserts taking about 10%.

Assessing the impact of imports on the U.S. market, the study notes that some $401.8 million worth of imported cheeses were sold in the U.S. in 1981--equivalent to 6% of domestic production. "The competition for the U.S. cheese market is vigorous," Frost & Sullivan observes. "Most foreign companies compete on the basis of quality. However, there have been some cases of price undercutting."

Casein is essentially an important product, with little produced domestically. Imports amounted to $185.3 million in 1981. Cheese substitute production is listed as the only growth market for casein. In most other food applications, manufacturers are reformulating from casein to whey or soy protein in the wake of recent sharp price increases.

For additional information contact: Customer Service, Frost & Sullivan, Inc., 106 Fulton St., New York NY 10038 212-233-1080.

Bread and Cereal Products . . . A Good Source of Nutrients

Bread is good for you. In fact, it's better than most people think. That's the theme commonly expressed by nutritionists and health professionals today.

But that concept has not always been true. Since the turn of the century, the U.S. has shown a 50 percent decline in per capita consumption of flour. There has been a 20 percent decline of fiber in the diet.

In a 1977-78 survey, 46 percent of the total caloric content of U.S. diets was made up of carbohydrates. Of this total, 22 percent were complex carbohydrates and 24 percent sugars.

Current dietary goals suggest that this should shift to 58 percent at the expense of fat. Of this 58 percent, it is recommended that 48 percent be complex carbohydrates and only 10 percent sugars. In view of their favorable economic aspect, bread and other cereal grain products could play an important role in reaching this goal.

"Most health professionals feel our current dietary practices need this modification," Dr. Gur Ranhotra, AIB director of nutrition research comments. "Complex carbohydrates appear to be a valuable adjunct in the management of many diseases. They also probably have a value in improving physical endurance and mental alertness, and in controlling obesity." It's no wonder that nutritonists today are looking again at the increased role of bread and cereal products in planning a well balanced diet.

The September 1982 issue of Consumer Reports confirmed these findings. "Bread is what nutritionists call 'nutrient-dense'--it provides a lot of desirable nutrients for the number of calories it contains. Bread is a good source of complex carbohydrates, plant protein, and several vitamins and minerals. Whole-grain bread is also a good source of dietary fiber.

The article reports that "on the whole, the white breads outscored the wheats and ryes in relative nutritional quality." The traditional belief that whole grain breads are more nutritious doesn't hold up.

The Wheat Industry Council recently announced a nutrition education program. Two of their key objectives were the need to educate the public on the nutritional and economical value of wheat foods and to increase sales and per capita consumption of wheat based foods through a sound nutrition education program.

At a luncheon in Washington, D.C. in the fall of 1982, Surgeon General C. Everett Koop, M.D. strongly endorsed the Wheat Industry Council's program:

"Your plan is a good one. I believe it is giving the American people a working knowlege of good nutrition with special emphasis on the role of wheat-based foods. I hope the wheat food industry will support this work so we may see the American diet make a stronger contribution to the improvement of the health status of all Americans.

"The staff at the American Insitute of Baking continues to spread this message," commented Dr. James Vetter, vice president-technical services. "But even more importantly, they are carrying on research and educational activities within the industry to guarantee that the bread and cereal products maintain the highest possible nutritional standards."

Not only should these products be good, but they must be recognized and accepted by the consumer.

Westpack 83

WESTPACK 83, the Western Packaging Exposition, will occupy both existing halls of the Anaheim Convention Center, as well as the third hall which had been under construction. The show takes place November 1-3, 1983.

WESTPACK is produced in odd-numbered years. The show was launched in 1948 as a small, regional exposition, and has grown rapidly since the 1970's.

An analysis of the 1981 visitors by job title and function showed that 30 percent of the audience was composed of chief executives, including presidents, owners, partners, etc., and members of corporate management, such as vice-presidents, general managers, treasurers,etc.

For more information contact: Clapp & Poliak, Inc., 708 Third Ave., New York,NY 10017 212-661-8410.

Careers in Foodservice

250,000 new foodservice employees will be needed each year for the next several years, according to Richard J. Hauer, Executive Vice President of the National Insitute for the Foodservice Industry, who was interviewed on "Objective: Jobs," broadcast on WBBM-TV, Chicago in December, 1982.

Hauer was interviewed by host Bill Lowry in December in the first of a series devoted to the foodservice industry.

For more information on careers in foodservice, write for NIFI's Careers in Foodservice guide. 20 North Wacker Dr., Suite 2620, Chicago, IL 60606. NIFI is the not-for-profit educational foundation established to advance foodservice professionalism through education.

Dairy and Food Sanitation — Instructions for Authors

Nature of the Magazine

Dairy and Food Sanitation is a monthly publication of the International Association of Milk, Food and Environmental Sanitarians, Inc. (IAMFES). It is targeted for persons working in industry, regulatory agencies, or teaching in milk, food and environmental protection.

The major emphases include: 1) practical articles in milk, food and environmental protection, 2) new product information, 3) news of activities and individuals in the field, 4) news of IAMFES affiliate groups and their members, 5) 3-A and E-3A Sanitary Standards, amendments, and lists of symbol holders, 6) excerpts of articles and information from other publications of interest to the readership.

Prospective authors who have questions about the suitability of their material for publication should contact the editor.

Submitting Articles and Information

All manuscripts and letters should be submitted in duplicate to the editor, Kathy Hathaway, IAMFES, Box 701, Ames, Iowa 50010. Revised manuscripts should also be submitted in duplicate to the editor.

Subjects suitable for inclusion in the "News and Events" section include: meeting announcements, short courses, notices of position changes and promotions, announcements of new products or advancements in the field which are of interest to the readership, death notices of members of the Association.

Correspondence regarding membership in IAMFES, subscriptions, and advertising should be sent to the above address, also.

Manuscripts are accepted for publication, subject to editorial review. Most articles are reviewed by two members of the editorial board or by other specialists when in the opinion of the editor the paper is outside of the specializations represented by editorial board members. After review, a manuscript is generally returned to the author for revision in accordance with reviewer's suggestions. Authors can hasten publication of their articles by revising and returning them promptly. With authors' cooperation articles are usually published within three to six months after they are received and may appear sooner.

The author is notified when a manuscript is received and also when it is sent to the printer for preparation of proofs.

Membership in IAMFES is not a prerequisite for acceptance of an article.

Articles, when accepted, become the copyright property of *Dairy and Food Sanitation* and its sponsoring association. Reprinting of any material from *Dairy and Food Sanitation* or republishing of any papers or portions of them is prohibited unless permission to do so is granted by the editor.

Reprints

Reprints of an article may be ordered by the author when proofs are returned. An order form for this purpose is attached to the proofs when they are returned to the author. Reprints may be ordered with or without covers, in multiples of 100. Reprint costs vary according to the number of printed pages in the article. Reprints cannot be provided free of charge.

Reprints may also be ordered after a paper has been published. The IAMFES office can supply reprints of any paper published in *Dairy and Food Sanitation*. Arrangements to obtain such reprints should be made with the editor.

Types of Articles

Dairy and Food Sanitation readers include persons working as sanitarians, fieldmen or quality control persons for industry, regulatory agencies, or in education. *Dairy and Food Sanitation* serves this readership by publishing a variety of papers of interest and usefulness to these persons. The following types of articles and information are acceptable for publication in *Dairy and Food Sanitation.*

General Interest

Dairy and Food Sanitation regularly publishes nontechnical articles as a service to those readers who are not involved in the technical aspects of milk, food and environmental protection. These articles deal with such topics as the organization and application of a milk or food control program or quality control program, ways of solving a particular problem in the field, organization of a regulatory agency or department, organization and application of an educational program, management skills, use of visual aids, and similar subjects. Often talks and presentations given at meetings of affiliate groups and other gatherings can be modified sufficiently to make them appropriate for publication. Authors planning to prepare general interest nontechnical articles are invited to correspond with the editor if they have questions about the suitability of their material.

Letters to the Editor

Readers are invited to submit letters to the editor to express their opinion on articles published in *Dairy and*

Food Sanitation, or on other matters of concern or interest to the entire readership. The letter to the editor may also be used to report limited observations made in the field or in a laboratory which cannot be published in another form. A letter to the editor must be signed by its author.

Book Reviews

Authors and publishers of books in the fields covered by *Dairy and Food Sanitation* are invited to submit their books to the editor. Books will then be reviewed by a specialist in the field and a review will be published in an issue of *Dairy and Food Sanitation.*

Preparation of Articles

All manuscripts should be typed, double-spaced, on 8½ by 11 inch bond paper. Side margins should be one inch wide and pages should not be stapled together.

The editor assumes that the senior author has received proper clearance from his/her organization for publication of the article. An author should be aware of procedures for approval within his/her organization.

A manuscript should be read by someone other than the author before it is submitted. This will help to eliminate errors and to clarify statements, all of which speeds publication of the article.

The title of the article should appear at the top of the first page. It should be as brief as possible, contain no abbreviations.

Names of authors and their professions should follow under the title. If an author has changed location since the article was completed, his new address should be given in a footnote.

An abstract should be included at the beginning of the article. It should be brief, factual, not exceeding 200 words. The abstract should give an overview of the article and should be understandable without reading the rest of the paper, as abstracts are reprinted by abstracting journals and are distributed beyond the readership of *Dairy and Food Sanitation,* to persons who may not have access to the entire article. Therefore, abstracts should be complete but concise.

The remainder of the article should begin with an introductory statement, then should be subdivided into appropriate sections, each with a subheading descriptive of the material in that section. Review papers, by their nature, include numerous references. Citation of references in the text and listing of references at the end of the paper should be done as mentioned at the end of these instructions.

Illustrations, Photographs, Figures

Wherever possible, submission of photos, graphics, or drawings to illustrate the article will help the article. The nature of *Dairy and Food Sanitation* allows liberal use of such illustrations, and interesting photographs or drawings often increase the number of persons who are attracted to and read the article.

Photographs which are submitted should have sharp images, with good contrast and a minimum of distracting items.

Drawings, diagrams, charts and similar material should be submitted in India ink on 8½ by 11 inch paper, either white or light blue. Don't use paper with green, red, or yellow lines since they will appear in the final copy. A lettering guide should be used to prepare letters on figures. Titles for figures should be submitted on separate sheets rather than on the figures. Arabic numbers should be used for numbering. Glossy prints of figures are suitable for use and should be at least 4 by 5 inches in size.

Tables should be submitted on separate sheets of 8½ by 11 inch paper. They should not be included in the text of the paper. Use Arabic numbers for numbering of tables. Titles should be brief but descriptive. Headings and subheadings should be concise with columns or rows of data centered below them. Use only horizontal lines to separate sections of tables. When possible, use figures instead of tables as the latter are more costly to prepare for publication.

Examples of Proper Bibliographic Citations:

Paper in a journal

Alderman, G. G. and E. H. Marth. 1974. Experimental production of aflatoxin in citrus juice and peel. J. Milk Food Technol. 37:308-313.

Paper in a book

Marth E. H. 1974. Fermentations. pp. 771-882. In B. H. Webb, A. H. Johnson, and J. A. Alford (eds.) Fundamentals of dairy chemistry (2nd ed.), Avi Publishing Co., Westport, CT.

Book

Fennema, O. R., W. D. Powrie, and E. H. Marth. 1973. Low-temperature preservation of foods and living matter. Marcel Dekker, Inc., New York. 598 p.

Patent

Hussong, R. V., E. H. Marth, and D. G. Vakaleris. 1964. Manufacture of cottage cheese. U.S. Pat. 3,117,870. Jan. 14.

SPOTLIGHT ON IAMFES SPEAKERS

Have you wondered about cleaning and sanitizing all those tiny holes in the membranes now used to concentrate or to modify foods? Can you conceive how the industry can make sanitary the very large number of square feet of membrane surface inside an ultrafilter processor or a reverse osmosis unit?

Dr. Gerold Luss, an industry research chemist, will be addressing this subject at the 1983 Annual Meeting of IAMFES in St. Louis, August 7-11. Dr. Luss has 5 years of direct experience in this area.

Book Reviews

QUALITY ASSURANCE: MANAGEMENT AND TECHNOLOGY. Glenn E. Hayes. Charger Productions, Inc., Capistrano Beach CA 92624, Fifth Printing, 1982; 452 pages.

In the 1980's consumers will continue to demand and expect food companies to produce and distribute high quality and safe products. Professor Hayes delivers to us in one cover a comprehensive, yet in simple language and terms, coverage of necessary quality assurance functions and activities in order to produce quality products. The book provides the reader with an insight into the problems encountered in achieving established quality levels and an understanding of the methods and techniques available to solve problems of product quality. The book is aimed to all qualtiy personnel and students of quality assurance practices. The author suggests that the book will be of use to: 1) quality assurance and reliability personnel; 2) other industry personnel including designers, purchasing agents, production, sales, marketing and training officers; 3) industry managers; 4) educate students in vocational schools, colleges, and universities.

The book is composed of seventeen chapters. The language and style is very simple and instructional in its delivery form. Some of the chapters with direct relevance to the food industry include: Development of Quality Organizations, Planning for Product Effectiveness, Organizing to Ensure Product Quality, Engineering a Quality Product, Reliability and Maintainability Assurance, Productivity and Quality, Quality Circles, The Materials Controls System, Industrial Inspection, Statistics for Quality Control, Control Charts: Theory and Applications, Quality Costs and Implications, consumerism and Liability and Managment Concepts in Quality Assurance. Consequently, the book covers most of the areas of importance for an acceptable systematic quality assurance program. Because the book is intended to all manufacturing industries, not directly intended to the food industry, subjects like microbiological hazards, sanitation, pest control, food regulations, crtical control points, GMP's and others are either not mentioned or briefly discussed. Also, the auditing practices and methods section could have been expanded and perhaps more emphasis should have been placed in this important quality assurance tool.

Each chapter in the book includes a set of questions for discussion and review of the material presented in the chapter. Also, for an additional $4.00 a "QA: Problem Set" booklet is available for use with this book from the same author and publishing company. Typical questions that confront quality personnel and engineers are included in the problem set booklet. Seventeen chapters are included and they parallel the chapters in the book. Also, a glossary with quality assurance terminology and selected statistical tables is included.

This book clearly shows the importance of quality assurance practices by industry in today's competitive markets. Professor Hayes communicates the importance of a quality assurance system aimed at the prevention, rather than the detection, of errors. This book is an excellent teaching tool to students in quality assurance/control courses. However, becuse it was not intended only to food quality problems, I do not recommend this book as a textbook in food quality courses. But, this book should be used to complement the existing food quality control textbooks and as an important reference book in food quality control courses. Also, this book should be a part of the library of quality assurance departments of food companies and individuals involved in food quality assurance and quality control. It's relatively low price ($19.95), makes this book a worthwhile investment.

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Boerne, TX 78006

CONTACT: TOPICS GUIDE TO SPECIALISTS ON TOXIC SUBSTANCES; edited by Richard L. Penberthy; World Environmental Center, New York; 174 pages.

Contact: Topics Guide to Specialists on Toxic Substances, edited by Richard Penberthy, is a reference guide of specialists or scientists knowledgeable in the various fields related to toxic substances and their hazards. The Guide was edited at the World Environmental Center where the names of toxic substance specialists in the United States were compiled and organized into a handy quick reference listing.

The publishers acknowledge that the text was designed to be a handbook or reference guide for scientists and other reporters to use when they needed to quickly find the name of someone with special knowlege on toxic substances causing local or national concerns. The World Environment Center staff believed a national listing of peer recognized toxic substance specialists was needed so that news reporters could call upon experts to help them better and more accurately report news stories involving toxic chemicals in the environment.

Contact: Toxics is arranged in three parts. The first part is simply an index of the topics covered in the book. These major heading topics are alphabetized and have subheadings under them. A page number is listed beside the major heading. These page numbers direct the reader to part two of the text which parrallels part one (concerning major heading topics and sub-topics) and also includes the names of specialists and their area of expertise. Part three is an al-

phabetical listing of the scientists and includes their work title, address, phone number and a brief professional profile.

The text also has several appendices which include a list of commonly occuring toxic substances and their usual associated industries, a list of acronyms associated with toxic substances, a chronological listing of federal regulations related to toxic substance control, and a list of the specialists by state of residence.

The text would not be a practical investment for the local sanitarian who knows his local and state contact person concerning toxic substances. However, for those who want a listing of nationally recognized specialists in the toxic or hazardous substance area, this text would be a good investment.

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BIOMEDICAL ASPECTS OF BOTULISM; Edited by Goerge E. Lewis, Jr.; Academic Press, New York and London, 365 pages.

Biomedical Aspects of Botulism, edited by George Lewis, Jr. is a collection of twenty-nine papers presented at the international conference on the Biomedical Aspects of Botulism which was held at Fort Detrick, Frederick, Maryland, on March 16-18, 1981. This conference was sponsored by the U.S. Army Medical Research Institute of Infectious Diseases. Fifty scientists from eight nations contributed to the research and writing of these papers.

The editor has divided the papers into eight subject areas. The first subject area involves the papers concerning the structure-function relationship of Botulism Neurotoxins. The second set of papers deals with the effects of Neurotoxin. The third group of related papers reviews the characterization of toxin production. The fourth set of papers discusses some new concepts concerning Botulinum toxins. The fifth group of papers discuss findings concerning detection, isolation, and identification of Botulism. A sixth group of papers discusses the prophylaxis and toxoid production of Botulism. The seventh set of papers discusses the epidemiology of Botulism. One paper in this section discusses the Epidemiology of Botulism in the United States from 1950-1979 which is a very interesting study. Finally the eighth set of papers discusses the clinical aspects and treatment of Botulism.

Each of these twenty-nine papers was well written and presents new information about Botulism. Because eight different nations were represented, the text brings together world wide authority concerning current research about Botulism. The editor grouped these papers into general section areas. The text would be of little value to the Field Sanitarian, because it is not a comprehensive review of Botulism but rather, a group of individual papers discussing and presenting current research involving Botulims. I believe its greatest value would be as a reference book in a university or research center library. This book may be of assistance to a researcher studying Botulism because of the many references listed in each paper.

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St. Louis — in the heart of it all

You are invited to attend the 70th Annual Meeting of IAMFES, August 7-11, 1983 at the Marriott Pavillion in beautiful St. Louis, MO. Educational meetings, interminglings with fellow professionals and entertainment has been planned for this yearly event. You'll also enjoy the Ralston Purina Farm outing and dinner. Spouse's entertainment is once again an outstanding attraction. Don't miss it!

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- ☐ Speaker
- ☐ 30 year Member
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*Arrangements have been made for a flat rate of $48 per room with a maximum of 4 people to the room. These rooms will have 2 double beds. $5.00 parking charge per day, includes in and out privileges.

Dairy Quality

TABLE 1. *Incidence of oxidized flavor during 1970.*

Type of Container	Number	Oxidized	Distribution (%)
Plastic Coated Paper	339	43	12.7
Blow-Molded Plastic	36	31	86.1
Glass	56	26	46.4
Plastic Bag	12	6	50.0

Table from: Our Industry Today: Importance of Shelf-life for Consumers of Milk, Sidney E. Barnard, J. Dairy Science 55(1):134.

Light induced off-flavors are developed by direct sunlight, florescent light, or diffused daylight. Research has shown that light induced off-flavors are developed by two mechanisms (5,6). One mechanism is lipid oxidation which produces the same volatile compounds that produce a typical oxidized off-flavor. The second mechanism results in a "burnt, activated, or sunlight flavor" which has been attributed to the degradation of milk protein. The burnt, activated or sunlight flavor can be produced in milk when exposed to direct sunlight for as little as 10 minutes (4). This flavor may also develop in indirect light with an exposure time as little as 45 minutes (4). With extended light exposure the more characteristic oxidized off-flavors develop, and with continued light exposure, the activated or sunlight flavor is dominated by the oxidized off-flavor.

Packaging and handling of milk are the main considerations in controlling light induced off-flavors. The entire dairy industry recognizes the risk of leaving clear glass bottles of milk exposed to direct sunlight. The same considerations should be given to milk packaged in plastic bags or other types of packaging. Sunlight flavor will develop regardless of package type with extended exposure to sunlight.

In addition to sunlight, florescent light or diffused daylight can also be responsible for oxidized off-flavors in milk. Factors contributing to the intensity of burnt, activated or oxidized off-flavors in milk are wavelength, intensity of light, exposure time, translucence of container, and levels of ascorbic acid and riboflavin in the milk (4). In the retail dairy case, light intensities of less than 50 foot candles will restrict light penetration and reduce the incidences of oxidized off-flavors (1). Also, the use of yellow, pink, or colored florescent tubes lessen the problem of oxidized off-flavors in milk (1,3). Also, closed cases with vertical light tubes seem to reduce the light intensity.

In 1962, Dunkley, et. al (2) studied the effects of florescent light on flavor. It was found that the type of container was very important. Light flavor was detected after 20 minutes exposure in clear glass bottles, 5 hours in an amber bottle, and 1-14 hours in various fiberboard cartons. Recent increases in the use of blow-molded plastic containers increased the incidences of light induced off-flavors in milk. Blow-molded plastic containers offer little protection against light. For example, Table 1 shows data generated by Sid Barnard of Pennsylvania State University which indicates the incidence of oxidized off-flavors compared to type of container. This data shows that the blow-molded plastic container showed a very high incidence of oxidized off-flavor. However, many dairy people argue that the consumer is willing to accept the oxidized off-flavor for the convenience of blow-molded plastic containers. Certainly no one can argue with the popularity of blow-molded plastic containers, however, it is the responsibility of the dairy industry to take every precaution to reduce the exposure of blow-molded plastic containers filled with milk to light.

In addition to the development of light induced off-flavors, milk exposed to sunlight or artificial light will undergo a loss in nutrients. Research (2,3) has shown that Vitamin B, Vitamin A, and Vitamin C are reduced or completely destroyed when milk is exposed to light.

(1) Barnard, S.E. 1971. Our Industry Today, Importance of Shelf-Life for Consumers of Milk. J. Dairy Science 55: 134-136.
(2) Dunkley, W.L. J.D. Franklin, and R.M. Panghorn. 1962. Effects of florescent light on flavor, ascorbic acid, and riboflavin in milk. Food Technol. 16:112.
(3) Hansen, A.P. L.G. Turner, and L.W. Aurand. 1975. Florescent light-activated flavor in milk. J. Milk Food Technol. 38:388.
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(5) Jenness, R. and S. Patton. 1959. Principles of Dairy Chemistry. John Wiley & Son., Inc. New York.
(6) Shipee, W.F. et. al., 1978. Off-flavors of milk: Nomenclature, standards, and bibliography. J. Dairy Sci., 61(7)855-869.

Dairy Quality

RAW MILK MICROBIOLOGICAL QUALITY AND ITS EFFECT ON PASTEURIZED FLUID MILK

Several factors influence the overall quality of raw milk including: (1) its microbiological quality, (2) absence of absored off-flavors, (3) absence of transmitted off-flavors such as weed, feed, and other, (4) freedom from oxidized and rancid off-flavors, (5) freedom from foreign materials, (6) safe from a public health standpoint, and (7) good nutritional quality.

Raw milk microbiological quality is determined by the types and numbers of microorganisms in that product. With prolonged storage, gross contamination, or when raw milk is exposed to temperature abuse the following factors will contribute to poor quality of the finished product:

(1) When microbial off-flavors are present prior to pasteurization, these flavors will remain after pasteurization.

(2) Psychrotrophic organisms may produce heat stable proteolytic and lipolytic enzymes which will cause product quality defects after pasteurization.

(3) The presence of psychrotrophic thermoduric microorganisms (especially spore-formers) will lead to quality defects.

(4) Psychrotrophic microorganisms that are normally inactivated during pasteurization may not be totally inactivated when raw milk contains a very high population of psychrotrophic microorganisms.

If raw milk contains a fruity, bitter, unclean, malty, or other microbial induced off-flavor prior to pasteurization, the off-flavor will remain in the product until it is consumed or discarded. Generally, these off-flavors will not develop in raw milk until the populations have reached 5,000,000 or greater (4). Fruity, bitter, and unclean flavor defects are normally caused by Gram Negative psychrotrophic bacteria which originate from unclean equipment, water, and condensation. Malty off-flavors can originate when raw milk is exposed to excessive temperature abuse. To safeguard against these possible quality defects, the following precautions should be taken: (1) use an effective taste-testing program, (2) develop effective temperature control monitoring procedures, (3) reduce or eliminate prolonged storage of raw milk and (4) use effective cleaning and sanitizing programs both on the farm and in the dairy plant.

When microbial spoilage of the product occurs it is due to the metabolic activity of bacteria. Metabolic activity is carried out by bacterial enzymes that break down protein, fat, and other nutrients so that they can be utilized by the microorganisms. Unfortunately, the enzymes that break down fat and protein will produce volatile compounds that result in off-flavors. Equally as unfortunate is the fact that these enzymes are often heat stable (survive pasteurization) and produce off-flvors during storage of the pasteurized product. In general, with an increase in the bacterial populations of raw milk (especially psychrotrophic bacteria), the risk of heat stable enzymes in pasteurized products increases.

Several researchers (1,2,5) have demonstrated the presence and effect of heat stable (bacterial) proteolytic enzymes in raw milk. For example, Patel and Blankenagel (3) have studied the effect of high counts in raw milk and flavor or pasteurized product during storage. The research was conducted by collecting 216 raw milk samples of various Standard Plate Counts and Psychrotrophic Counts and storing the samples for 4 days. The samples were then lab pasteurized and taste-tested after one week and again after two weeks. The results of this study indicated that: (1) the bacterial population in the raw milk increased significantly in 4 days, and (2) while no detectable off-flavors were present at the time of lab pasteurization, off-flavors developed after subsequent storage at 45F in the following manner---counts greater than 1,000,000 per ml developed various off-flavors in as little as one week. These off-flavors developed in spite of small numbers of organisms in the pasteurized product at one week and two weeks, and in the absence of post-pasteurization contamination.

While microbiological spoilage of milk by post-pasteurization contaminants may be the leading cause of quality defects in the fluid milk industry, the microbiological quality of raw milk is also extremely important. Off-flavor development due to heat stable bacterial enzymes, presence of off-flavors in raw milk, and the presence of thermoduric psychrotrophic bacteria in raw milk can all lead to poor quality finished products.

(1) Adams, D.M., J.T. Barach, and M.L. Speck. 1974. Heat resistant proteases produced in milk by psychrotrophic bacteria of dairy origin. J. Dairy Sci., 58:828-834.

(2) Cogan, T.M. 1977. A review of heat resistant lipases and proteinases and the quality of dairy products. Ir. J. Fd. Sci. Technol. 1: 95-105.

(3) Patel, G.B. and G. Blankenagel. 1972. Bacterial counts of raw milk and flavor of the milk after pasteurization and storage. J. Milk Food Technol., 35:203-206.

(4) Punch, J.D., J.D. Olson, Jr., and E.L. Thomas 1965. Psychrophilic Bacteria. III. Population levels associated with flavor or physical change in milk. J. Dairy Sci. 48:1179-1183.

(5) White, C.H. and R.T. Marshall. 1972. Reduction of shelf-life of dairy products by a heat-stable protease from Pseudomonas fluorescens P26. J. Dairy Sci., 56:849-853.

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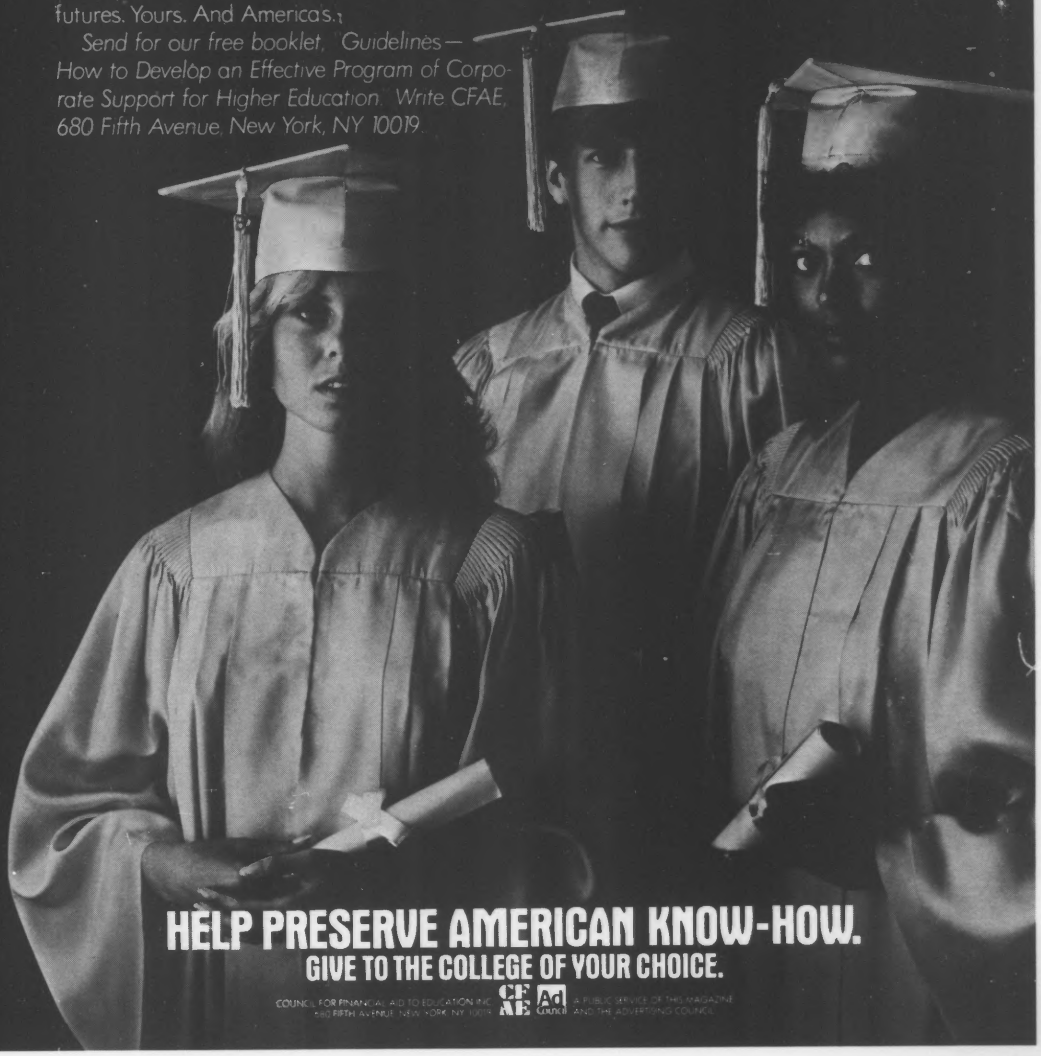

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AFFILIATE NEWSLETTER . . .

ILLINOIS AFFILIATE PLANS SPRING SEMINAR
New Packaging Concept to be Addressed

Packaging pasteurized, fresh milk and dairy products under environmentally sterile conditions will be one of the papers highlighted at the Association of Illinois Milk, Food, and Environmental Sanitarians' spring seminar to be held on April 26 in Elgin, IL.

This rapidly growing concept, which borrows its technology from UHT-aseptic packaging research, already has attracted the interest of sanitarians and quality assurance personnel in both pasteurized fluid milk operations and in cultured dairy product packaging.

In both operations, post pasteurization and processing recontamination with air-borne yeast, mold, and psychrotrophic bacteria during packaging is eliminated. Furthermore, adding a chilled-sterile laminant air flow to the packaging chamber eliminates the normal product temperature increase that is common in conventional filling operations.

The discussion will include a slide presentation of do-it all equipment that thermoforms containers from sheet stock material and prints, fills, and seals the container all under sterile-air conditions. The equipment also sterilized the container with the heat of formation.

Ken Garrett of Continental Can Company's conofast research center will present the paper.

"Yersiniosis in Food Poisoning" will be discussed by Dr. Ray Speckman, Food Technology Department, University of Illinois.

Ernie Hutto, Klenzade Division of Economics Laboratories will discuss psychrotrophs in dairy plants.

The role of good milking practices and proper care of milking equipment in controlling mastitis will be discussed by a practicing veterinarian, Dr. David Reed. His title: "Milk Management is More Than Technique."

Another highlight will be an address by Dr. Robert Marshall, IAMFES President.

He will address environmental concerns involved with food processing, food handling, and foodborne disease. He will discuss the changing roles for water and wastewater environmentalists as well as projected changes needed in food analytical laboratories.

Dr. Marshall will also present news from the International during a luncheon address.

For more information contact: Clem Honer, 1 S 760 Kenilworth Avenue, Glen Ellyn, IL 60137.

THE ANNUAL MEETING...will be held August 7-11, 1983 in St. Louis, MO. A registration form is included in this issue for your convenience.

Save $$$$ by registering early. Those of you who attended the Annual Meeting in Louisville, KY in 1982 recall the terrific cruise on the Belle of Louisville. This year in St. Louis we will enjoy an outing at the Ralston Purina Farm, complete with dinner. Local residents claim you won't want to miss the Ralston Purina Farm. See you there!

CHANGING... Things are really busy and exciting at the International Office this year. Here is an update.

An Apple III Computer was purchased to better serve the members of the association. Instead of relying on an outside service for updating and pulling of computer listings of your members, we're now independent. With the addition of the Apple III we can more efficiently take care of your needs and be assured of accurate data input.

BUZY...signals are frequent when calling the International Office. A second line was installed recently so that your calls can get through. You may still hear a buzy signal, but hopefully with less frequency.

The staff of the International Office looks forward to serving you in 1983.

IAMFES Certificate of Merit Award

Nominations of local affiliate members of the IAMFES Merit Award are due by May 1, 1983. Please submit nominations to Mr. William Arledge, Chairman, IAMFES Recognition and Awards Committee, Dairymen, Inc. 10140 Linn Station Road, Louisville, KY 40223.

Nominations may only be made by the affiliate and not by an individual.

Criteria for the Merit Award is listed below.

CERTIFICATE OF MERIT

1. Candidates nominated shall be submitted by state affiliates as an organization and not from individual members.
2. State affiliates may submit no more than two candidates per year. A brief summary of the candidates' achievements must accompany the nominations.
3. Deadlines for nominations shall correspond with deadlines set for other IAMFES awards.
4. All nominees shall at the time of their nominations, be a member of the state affiliate making the nomination and also be a member of IAMFES.
5. Nominees shall not previously have received one of the other awards given by IAMFES.
6. Criteria for making nominations shall include:
   a. Years active service to the affiliate
   b. Years active service to IAMFES
   c. Specify outstanding service rendered at the state or IAMFES level. This may be serveral activities over a period of time or one outstanding contribution made.
7. Final determinations shall be made by the IAMFES Awards Committee.
8. Nominations shall be submitted to the IAMFES Awards Committee.

Calendar

1983

April 11-13---DAIRY AND FOOD INDUSTRIES SUPPLY ASSOCIATION, 64th ANNUAL MEETING, Boca Raton Hotel and Club, Baco Raton, FL. For more information: Dairy and Food Industries Supply Association, 6245 Executive Blvd., Rockville, MD 20852, 301-984-1444.

April 11-14---UCD/FDA BETTER PROCESS CONTROL SCHOOL, University of California. For more information contact: R.C. Pearl, Department of Food Science & Technology, University of California, Davis, CA 95616.

April 13-14, 1983---FOOD MICROBIOLOGY UPDATE. Orange County Cooperative Extension Office, Anaheim, CA. Topics covered include sampling, new trends and methods for detection, enumeration, and identification of microorganisms, microbial aspects of food processing methods, pathogens, and the significance of microorganisms in food. Contact Paulette De Jong, Food Science and Technology, University of California, Davis, CA 95616, 916 752-1478.

May 29-June 1---Canadian Institute of Food Science and Technology-Annual Conference and Exhibition. Chateau Laurier Hotel, Ottawa, Canada. For more information contact: Alex Hunt, Food Branch Industry Trade and Commerce 235 Queen Street, Ottawa, Ont. Canada K1A 0H5, 613-995-8107.

June 8, 1983 Nebraska Dairy Industries Association Annual Spring Dairy Outing, Beemer, NE. For more information contact: T.A. Evans, Executive Secretary, 134 Filley Hall, East Campus, UN-L, Lincoln, NE 68583.

July 16-23, Microbiology Workshop, Kansas State Univ. For more information contact: Dr. Daniel Fung, Call Hall, KSU, Manhatten, KS 66506, 913-532-5654.

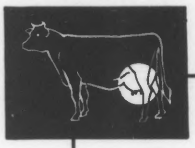
Aug. 7-11, 1983---70th ANNUAL MEETING OF IAMFES. Marriott Pavilion, St. Louis, MO. For more information contact: Kathy R. Hathaway, IAMFES, PO Box 701, Ames, IA 50010, 515-232-6699.

Sept. 7-9---SYMPOSIUM ON LACTIC ACID BACTERIA IN FOODS: GENETICS, METABOLISM AND APPLICATIONS. Wageningen, The Netherlands. Organized by The Netherlands Society for Microbiology. For more information contact: Dr. P. M. Klapwijk, Unilever Research Laboratory, P. O. Box 114 3130 AC Vlaardingen, The Netherlands.

November 2-4, 1983 9th Annual Food Microbiology Research Conference, Chicago, IL. For more information contact: Dr. J.M. Goepfert, Canada Packers, Ltd., 2211 St. Clair Avenue West, Toronto, Ontario, CN M6N 1K4.

1984

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



N.M.C.

NATIONAL MASTITIS COUNCIL

The National Mastitis Council is a non-profit organization that continues to bring together dairymen, processors, extension professionals, veterinarians, researchers, educators, and related agri-business to solve the problems caused by bovine mastitis. The purpose of this column will be to bring the readers current activity of the council as well as technical information from foremost professionals involved with this problem.

The purpose of NMC is:

* To bring together the most knowledgeable professionals in the world of mastitis at the annual meeting in February and a regional meeting held each summer.
* To make available from one source all that is known about mastitis.
* Correlate and coordinate all control and regulatory activities.
* Help enforcement agencies to develop uniform and workable control procedures.
* Develop and disseminate factual information on mastitis control through the NMC newsletter on a regular basis.

Membership dues contribute to the educational and research efforts, seminars, on-sight training and committee work of the organization.

Al Bringe, University of Wisconsin Extension Dairyman, is curently serving as President of National Mastitis and urges all interested dairymen and agri-business to take an active part in our national plan of action to control mastitis. If you would like a list of our NMC publication and audio visual materials, please contact phone number below.

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JFP Abstracts

Abstracts of papers in March Journal of Food Protection

Recovery of Fecal Coliforms and of *Escherichia coli* at 44.5, 45.0 and 45.5°C, K. F. Weiss, N. Chopra, P. Stotland, G. W. Riedel and S. Malcolm, Food Directorate and Field Operations Directorate, Health Protection Branch, Health and Welfare Canada, Ottawa, Ontario K1A 0L2, Canada

J. Food Prot. 46:172-177

Recovery rates of fecal coliforms and of *Escherichia coli* were determined at 44.5, 45.0 and 45.5°C in raw milk, ground meat and raw sewage. MPN values based on gas production (Standard MPNs) and on gas production and/or growth only (Total MPNs) were calculated for both fecal coliforms and for *E. coli*. The expected trend towards lower MPN values with increasing incubation temperature was more pronounced for the Standard MPNs than for the Total MPNs. The temperature effect was also strongly product - specific in that the Total and Standard MPNs for the fecal coliforms and the Standard MPNs for *E. coli* for sewage only differed significantly from one another within each determination at the three different incubation temperatures. The effect of length of incubation time on the ratios of *E. coli* to fecal coliforms was most pronounced at 45.5°C. Product specificity was again observed. The greatest increase in the recovery rate of aerogenic *E. coli* between 24 and 48 h of incubation time occurred in sewage (66%). For meat, the increase was 57% and for milk 46%. In terms of combined (aerogenic and anaerogenic) *E. coli* (expressed as Total MPNs), the increases were considerably less, but highest for the meat (33%), followed by sewage (29%) and by milk (21%). A breakdown of the *E. coli* isolates recovered from both gas-positive and gas-negative primary (fecal coliform) EC broth tubes showed that for the three products combined there were eight times as many false-positives at 44.5°C as at the other two incubation temperatures. In contrast, there were 12% false-negatives at 45.5°C compared to 3% at 45.0°C and 2% at 44.5°C. Since the high incidence of false-negatives (loss of *E. coli*) at 45.5°C is not counter-balanced by an enhanced specificity (fewer false-positives) over 45.0°C, the latter temperature is to be preferred. Meat yielded the lowest rate for false-positives at any of the three incubation temperatures. In contrast, at 45.5°C, it gave 21% false-negatives compared to only 9% for sewage and 10% for milk. On the other hand, milk contributed the most false-positives at 44.5°C (20%), compared to only 1% for meat and 3% for sewage. A potential loss of 21% of *E. coli* - containing EC broth tubes is hardly tolerable, reinforcing the contention that gas formation at evaluated temperatures is not a valid criterion of fecal origin.

Effects of Substrate and Temperature on Aflatoxin Production by *Aspergillus parasiticus* and *Aspergillus flavus*, Kun-Young Park and Lloyd B. Bullerman, Department of Food Science and Technology, University of Nebraska, Lincoln, Nebraska 68583

J. Food Prot. 46:178-184

The effects of substrates (synthetic and semisynthetic broths and several foods) on aflatoxin production by *Aspergillus parasiticus* and *Aspergillus flavus* were studied at different temperatures. The addition of calcium lactate as a carbon source to synthetic and semisynthetic broth media was evaluated for its effect on mycelial growth and aflatoxin production. At temperatures of 15 and 25°C, lactate did not support either mycelial growth or aflatoxin production in a basal salts broth, but did support mycelial growth, though not aflatoxin production, by both molds in a semisynthetic (YEL) broth. No growth of either mold or aflatoxin production was observed at 5°C on any of the liquid media employed. Little or no aflatoxin was detected on high protein/low carbohydrate foods such as Cheddar cheese, cottage cheese, yogurt and summer sausage inoculated with *A. parasiticus* and held at 15°C, but substantial quantities of aflatoxins were produced on yogurt and summer sausage by *A. flavus* at 15°C. Cheddar and cottage cheeses were poor substrates for aflatoxin production by *A. flavus* at 15°C. Cheddar cheese was a favorable substrate for aflatoxin production by both molds at 25°C. Cottage cheese was a poor substrate for aflatoxin production by both organisms at 25°C. Yogurt and summer sausage were poor substrates for *A. parasiticus*, but favorable substrates for *A. flavus* for aflatoxin production at 15 and 25°C. Trace levels of aflatoxins were produced on whole soybeans by *A. parasiticus*, whereas high levels of aflatoxins were produced by *A. flavus* on soybeans at 15 and 25°C. No growth or aflatoxin production occurred on soybean blocks (Meju) at 15°C, but high levels of aflatoxins were produced at 25°C by both molds. Aflatoxins did not diffuse into the second 1-cm layer of process cheese at 15°C; however, diffusion occurred at 25°C. Process cheese appeared to be a poor substrate for aflatoxin production by both molds at 15 and 25°C. Trace levels of aflatoxins (10 to 60 ppb of aflatoxin B_1) were detected on some samples of yogurt and summer sausage at 5°C, although no growth of either mold was observed.

Antimicrobial Activity of Compounds from *Artemisia compestris*, Salem M. Tharib, Said O. Gnan and G. Bryan A Veitch, Department of Pharmacognosy, Faculty of Pharmacy and Department of Food Science, Faculty of Agriculture, Al-Fateh University, P.O. Box 13645, Tripoli, Libya and Department of Pharmacy, University of Aston in Birmingham, Gosta Green, Birmingham B4 7ET, England

J. Food Prot. 46:185-187

The antimicrobial activities of several compounds isolated from *Artemisia campestris* were studied using an agar diffusion technique. At a concentration of 125 µg/ml, six of the extracted compounds inhibited growth of *Staphylococcus aureus*, three of the compounds inhibited *Escherichia coli* and two inhibited growth of *Proteus vulgaris*. *Pseudomonas pyocyanea* was resistant to all extracted compounds.

Effects of Temperature, Light and Storage Time on the Physicochemical and Sensory Characteristics of Vacuum- or Nitrogen-Packed Frankfurters, R. E. Simard, B. H. Lee, C. L. Laleye and R. A. Holley, Département de Sciences et Technologie des Aliments and Centre de Recherche en Nutrition, Université Laval, Ste-Foy, Québec, G1K 7P4; Station de Recherches, Agriculture Canada, St-Jean-sur Richelieu, Québec, J3B 6Z8 and Food Research Institute, Agriculture Canada, Ottawa, Ontario, K1A 0C6, Canada

J. Food Prot. 46:188-195

Frankfurters prepacked in vacuum or nitrogen gas were stored for 49 d at -4, 0, 3 and 7°C under dark and light conditions. Effects of temperature, light and storage duration on physiocochemical (gas composition, TBA, pH, ERV, nitroso-hematin) and sensory (color and off-odor) characteristics of both package samples were then examined. The relative volume of nitrogen decreased gradually but the change was not significant ($P>0.05$) during the 49-d study. No significant increases in CO_2 concentration were observed between both package treatments at -4 and 0°C, whereas the largest increase in CO_2 content (4.8-16.8%) occurred at 7°C

after 21 d of storage. TBA, pH, ERV and nitroso-hematin values were not differently affected by either modified atmosphere types, regardless of storage temperature and illumination used. With respect to surface discoloration and off-odor, nitrogen-packed frankfurters exhibited a lower incidence of discoloration and off-odor and were of satisfactory appearance, even after 35 d of storage at 7°C. Vacuum-packed samples, however, could not be effectively stored longer than 21 d due to formation of brown and green discolorations. Light generally had a significant effect on surface discoloration of vacuum-packed frankfurters. Data indicate that color and odor changes were not related to the values of TBA, ERV and nitroso-pigment but significant relationships were noted between pH, CO_2 and microflora counts at 7°C.

Effect of Temperature and Media on Adenosine Triphosphate Cell Content in *Enterobacter aerogenes*, D. P. Theron, B. A. Prior and P. M. Lategan, Department of Microbiology, University of the Orange Free State, Bloemfontein, 9300, South Africa

J. Food Prot. 46:196-198

During cold storage (2°C) of *Enterobacter aerogenes* for 15 min, 2, 4, 6 and 8 d in glucose mineral salts medium (GMS) and skim milk (SM), substantial differences were noticed in ATP/cell levels. At the appropriate interval, ATP was determined with the firefly bioluminescent method on a portion of the culture, while another portion was activated at 30°C for 40 min and ATP determined at 10-min intervals. Initial ATP content after 15 min of storage in SM was 0.55 femtogram (fg)/cell as compared to 0.84 fg/cell in GMS. Upon cold storage for longer periods (2, 4, 6 and 8 d), the ATP/cell concentrations were relatively stable (0.82, 0.73, 0.62 and 0.72 fg) in GMS, while they declined to levels below 0.2 fg in SM. However, activation of only 30 min increased cell ATP concentration in SM to 1.06, 0.92, 0.77, 0.66 and 0.72 fg, and narrowed the difference between ATP/cell levels in the two media. As a realistic ATP concentration/cell value is necessary to calculate bacterial numbers in milk by the bioluminescent technique, a 30-min activation period at 30°C is recommended to replenish the ATP lost during refrigerated storage.

Effects of Temperature, Light and Storage Time on the Microflora of Vacuum- or Nitrogen-Packed Frankfurters, R. E. Simard, B. H. Lee, C. L. Laleye and R. A. Holley, Département de Sciences et Technologie des Aliments and Centre de Recherche en Nutrition, Université Laval, Ste-Foy, Québec, G1K 7P4; Station de Recherches, Agriculture Canada, St-Jean, Québec, J3B 6Z8; and Food Research Institute, Agriculture Canada, Ottawa, Ontario, K1A 0C6

J. Food Prot. 46:199-205

Frankfurters were vacuum- or nitrogen- packaged and stored at -4, 0, 3 and 7°C for 49 d under light or dark display conditions. Effects of temperature, light and storage duration on microflora in vacuum- and nitrogen-packed sausages were then examined. Differences in number of lactobacilli, psychrotrophic and anaerobic bacteria in vacuum- or nitrogen-packed samples were not statistically significant during storage tests. Lactobacillus development was slightly higher in nitrogen gas compared to vacuum packages, but was also not significantly different. The effectiveness of nitrogen packaging on yeast and mold inhibition was significant, particularly at higher temperatures (3 and 7°C). Nitrogen gas packaging thus offers little advantage over vacuum to promote lactobacillus development, but it is particularly effective against growth of mold and yeast. Initially, the dominant flora of both package samples consisted of *Pseudomonas* and *Microbacterium* sp. but *Lactobacillus* sp. became the predominant psychrotrophs (85.2-96.3%) after 49 d of storage, regardless of different treatments. Temperature was the most important factor which influenced growth of the microflora on frankfurters; freezing temperatures of -4 and 0°C were an effective insurance against development of spoilage microflora in frankfurters for up to 49 d, regardless of packaging atmosphere. With an initial level of 10 to 10^3 coliforms per gram, there was no significant change in the number of coliforms during storage. Light had no important influence on microbial growth in frankfurters, irrespective of packaging atmosphere.

Effect of Butylated Hydroxyanisole on the Cytoplasmic Membrane of *Staphylococcus aureus* Wood 46, Richard Degré and Michel Sylvestre, Bacteriology Research Center, Institut Armand-Frappier, Université du Québec, Laval-des-Rapides, Laval, Québec, Canada H7N 4Z3

J. Food Prot. 46:206-209

The antimicrobial mode of action of the phenolic antioxidant butylated hydroxyanisole (BHA) against *Staphylococcus aureus* Wood 46 was examined. The compound was taken up very rapidly by the cells and adsorption was completed within 15 min. Exposure of a growing suspension to 50 μg of BHA/ml was bactericidal, but this concentration had no significant effect on the viability of a non-growing suspension. However, concentrations over 100 μg/ml were lethal to the latter and this bactericidal activity was related to leakage of nucleotides. Protoplasts produced by lysostaphin treatment undergo lysis when exposed to concentrations as low as 25 μg/ml. A mutant resistant to 50 μg of BHA/ml adsorbed the same amount of BHA but protoplasts from this strain were less susceptible to lysis. It was concluded that BHA is a member-active agent.

Growth and Synthesis of Aflatoxin by *Aspergillus parasiticus* in the Presence of Ginseng Products, Jaerim Bahk and Elmer H. Marth, Department of Food Science and the Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 46:210-215

Red ginseng saponin (0.36%) inhibited mycelial growth, sporulation and aflatoxin production by *Aspergillus parasiticus* during 9 d at 28°C. The mold caused no change in pH of the medium when it contained red ginseng saponin or ginseng tea (9%). Most ginseng products permitted mycelial growth and production of aflatoxin B_1, but inhibited production of aflatoxin G_1. However, when compared to the control, aflatoxin production by *A. parasiticus* was reduced by the presence in the medium of most of the ginseng products that were tested. Ginseng tea (9%) resulted in a higher index of maximum accumulation of aflatoxins per interval of mold growth than occurred in the control. Red ginseng was more effective than white ginseng for inhibiting mold growth and aflatoxin production.

Effect of Growth of Individual Meat Bacteria on pH, Color and Odor of Aseptically Prepared Vacuum-Packaged Round Steaks, M. O. Hanna, J. W. Savell, G. C. Smith, D. E. Purser, F. A. Gardner and C. Vanderzant, Department of Animal Science, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas 77843

J. Food Prot. 46:216-221

Large increases in counts of *Leuconostoc* spp., *Lactobacillus coryneformis, Lactobacillus plantarum, Lactobacillus viridescens* and *Lactobacillus curvatus* occurred over a 28-d display period when aseptically fabricated steaks were inoculated with 10^3 to 10^4 cells/cm^2 of these species and then were vacuum-packaged. With *Lactobacillus cellobiosus* 2, *Serratia liquefaciens* or *Hafnia alvei* as inoculum, increases in count were much smaller. Counts of *L. cellobiosus* 1, *Brochothrix thermosphacta,* a *Moraxella* sp. and *Alteromonas putrefaciens* of inoculated steaks decreased during display. With a higher inoculum (10^6 cells/cm^2), increases in counts of lactic acid bacteria usually were smaller. Some lactic acid bacteria caused marked decreases (0.2 to 0.5) in the pH of the meat surface. Changes in surface discoloration of uninoculated and inoculated steaks over a 28-d display period were not significant ($P>0.05$). Off-odor scores of both uninoculated and inoculated steaks were lower (more off-odor) after display but few of the differences were significant. Off-odors of steaks inoculated with lactic acid bacteria were described as "sour", "buttermilk", "sulfur-like" and "H_2S".

Preliminary Studies on Antimicrobial Activity of *Streptococcus lactis* subsp. *diacetylactis*, N. S. Reddy and B. Ranganathan, Southern Regional Station of the National Dairy Research Institute, Adugodi, Bangalore - 560 030, India

J. Food Prot. 46:22-225

Streptococcus lactis subsp. *diacetylactis* is well-known for its ability to inhibit pathogenic and milk spoilage microorganisms. In this study, an attempt was made to standardize the method for estimation of antimicrobial activity of the organism. Fourteen strains of *S. lactis* subsp. *diacetylactis* were examined for production of antimicrobial substances and all strains were found to produce antimicrobial substances. Of the strains, strain DRC_1 produced maximum amounts of antimicrobial substances followed by strains DRC_2 and S_1. Mutants of S_1 (S_1-67/C and S_1-195) produced higher amounts of antimicrobial substances than all other strains tested. The antimicrobial properties of strains S_1-67/C were assessed against 28 bacterial and mold cultures. Cell-free filtrates of S_1-67/C strain were more inhibitory to gram-negative than gram-positive bacteria. This organism also inhibited the growth of *Geotrichum candidum* but failed to inhibit other molds tested in this study.

Yersiniosis Associated with Tofu Consumption: Serological, Biochemical and Pathogenicity Studies of *Yersinia enterocolitica* Isolates, Calvin C. G. Aulisio, John T. Stanfield, Stephen D. Weagant and Walter E. Hill, Division of Microbiology, Food and Drug Administration, Washington, D.C. 20204, and Food and Drug Administration, Seattle, Washington 98174

J. Food Prot. 46:226-230

From December 1981 to February 1982, 87 individuals (ages two months to 74 years) in the Seattle, WA, area developed the clinical symptoms of yersiniosis. Illness was related to consumption of commercial tofu (soybean curd) contaminated with *Yersinia enterocolitica*. The six *Y. enterocolitica* strains recovered from the hospitalized patients indicated that two antigenically distinct strains, 0:8 and 0:Tacoma, were involved. At the manufacturing site of the incriminated tofu, 112 *Y. enterocolitica* strains were recovered, of which two were serotype 0:8. The reactions of these strains were similar to those of clinical 0:8 strains in biochemical tests and in eight virulence factor tests. The LD_{50} for suckling mice was identical for all strains which killed mice. Although the causative organism(s) was not recovered from other samples of packaged tofu, our findings incriminated water used in the processing of tofu as the source of infection. The source of the second *Y. enterocolitica* strain (0:Tacoma) in this outbreak was not identified.

Effects of Washing and Sanitizing on the Bacterial Flora of Vacuum-Packaged Pork Loins, M. A. Cacciarelli, W. C. Stringer, M. E. Anderson and H. D. Naumann, Department of Food Science and Nutrition and U.S. Department of Agriculture, Agricultural Research Service, Eckles Hall, University of Missouri, Columbia, Missouri 65211

J. Food Prot. 46:231-234

The bacteriology of boneless pork loins that were either spray-washed (SW) with water, spray-washed and sanitized with a 200 ppm sodium hypochlorite solution (SSCL) or spray-washed with water and sanitized with a 2% acetic acid solution (SSAA) before being vacuum packaged and stored for up to 28 d at 4.0°C was studied. Aerobic, anaerobic and lactobacilli bacterial counts immediately after treatment and at 14, 21 and 28 d were significantly lower on loins receiving the SSAA treatment than loins receiving the SW and SSCL treatment. SSCL loins had lower bacterial counts than untreated controls during 14 d of storage. SW loins had significantly lower bacterial counts than control loins only immediately after treatment. The SSAA treatment resulted in some discoloration. If this discoloration can be prevented, this treatment should be useful in extending the storage life of fresh pork.

Growth and Enterotoxin Production by *Staphylococcus aureus* in Whey from the Manufacture of Domiati Cheese, Ahmed A-H. Ahmed, Moustafa K. Moustafa and Elmer H. Marth, Department of Food Science and the Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 46:235-237

Staphylococcus aureus able to produce enterotoxin A was inoculated into Domiati cheese whey treated four different ways. Included were raw and pasteurized whey with 15% salt and unsalted raw and pasteurized whey. All wheys and their controls were kept at 30°C, and tested after 6, 12, 24, 48 and 72 h. There was a substantial loss in viability of *S. aureus* after 6 h of incubation in unsalted raw whey. Substantial loss of viability by *S. aureus* occurred in unsalted heat-treated whey after 24 h of incubation. *S. aureus* decreased in number slowly after 24 and 48 h of incubation in both salted raw and salted pasteurized whey. Thermonuclease and enterotoxin A were detected in unsalted heat-treated whey at and after 24 h when the number of *S. aureus* was 1.6×10^8/ml. Thermonuclease could not be detected after 6 h of incubation of unsalted or salted raw whey and after 48 h of incubation of salted whey.

Extraction of Staphylococcal Enterotoxins (SE) From Minced Meat and Subsequent Detection of SE with Enzyme-Linked Immunosorbent Assay (ELISA), S. Notermans, R. Boot, P. D. Tips and M. P. De Nooij, Laboratory for Zoonoses and Food Microbiology, National Institute of Public Health, P.O. Box 1, 3720 BA Bilthoven, The Netherlands

J. Food Prot. 46:238-241

ELISA (enzyme-linked immunosorbent assay) was employed to demonstrate staphylococcal enterotoxins A, B, C and E (SEA, SEB, SEC and SEE) in minced meat (50% beef/50% pork). For unheated minced meat, extraction of the sample with an equal amount of distilled water at pH 4.5 and a subsequent concentration (10-fold) of the extract, readjusted to pH 7.2, was sufficient to detect less than 0.5 μg of SE per 100 g of product. The extraction procedure gave 40-80% recovery of the toxin, and using the ELISA system neither false-positive nor false-negative results were obeserved. Using the just mentioned extraction procedure, recovery of SE that had been heated in minced meat was low (0.14% for SEB). It was demonstrated that components extracted by heating (among others, gelatin) present in minced meat caused immunological inactivation of SEB, SEC and SEE during heating. From monkey-feeding tests it became clear that the immunological inactivation of SEB in gelatin by heating was accompanied by biological inactivation.

Prevalence of *Clostridium botulinum* in Commercial Liver Sausage, A. H. W. Hauschild and R. Hilsheimer, Microbiology Research Division, Health Protection Branch, Health and Welfare Canada, Tunney's pasture Ottawa, Ontario, Canada K 1 A 0L2

J. Food Prot. 46:242-244

Samples of 75 g of commercial liver sausage were cultured, with and without prior heating, for the presence of viable *Clostridium botulinum*. Three of 276 heated cultures and 2 of 276 unheated cultures produced botulinal toxin, all of type A. The most probable number of botulinal spores was estimated at 0.15/kg. The estimate for "total" *C. botulinum*, based on 5 toxic cultures in 276 heated and unheated pairs, was 0.24/kg. The 99% confidence limits were 0.02 to 0.53 per kg and 0.05 to 0.69 per kg, respectively.

Microbiological and Sensory Evaluation of Fresh Fish Packaged in Carbon Dioxide for Retail Outlets in the Midwest, E. R. Richter and G. J. Banwart, Department of Microbiology, The Ohio State University, Columbus, Ohio 43210

J. Food Prot. 46:245-247

Fresh fish obtained from a commercial packaging plant were evaluated for microbial content and sensory changes during 3 weeks of storage. Fish were packaged in (*a*) nylon-Surlyn bags and backflushed with approximately 80% CO_2, (*b*) in nylon-Surlyn bags with no alternation of gaseous environment, or (*c*) overwrapped with polyvinyl chloride film. After packaging, fish were stored at 1°C. Two types of fish (ocean perch and sea trout) were analyzed. The data indicate that fish packaged in the nylon-Surlyn bag with CO_2 had the smallest increase in microbial numbers followed by the fish packaged without CO_2. An increase in the bacterial lag phase was observed for the fish packaged in CO_2 when compared with fish packaged without CO_2 or overwrapped. The fish packaged in CO_2 maintained a lower pH during storage compared with fish packaged without CO_2. The highest microbial load was found in fish packaged with the polyvinyl chloride overwrap.

Methods for Detecting Viruses in Foods: Background and General Principles, D. O. Cliver, R. D. Ellender and M. D. Sobsey, Food Research Institute, W.H.O. Collaborating Centre on Food Virology, and Department of Bacteriology, University of Wisconsin, Madison, Wisconsin 53706; Department of Microbiology, Institute of Genetics, University of Southern Mississippi, Hattiesburg, Mississippi 39401; and Department of Environmental Science and Engineering, University of North Carolina, Chapel Hill, North Carolina 27514

J. Food Prot. 46:248-259

Viruses are sometimes transmitted through foods. Hepatitis A (HA) and some viral gastroenteritides are the diseases now known to be spread most frequently in this way, but any virus from the human intestines probably could be. Bacterial indicators of fecal contamination show limited correlation with the incidence of viruses in foods, so tests to detect the viruses themselves are needed. The epidemiologic record has led to selection of shellfish (bivalve molluscs) and vegetables and fruits as foods for which test methods should be described, and ground beef and raw milk are also considered here because of the great interest they have attracted among research workers. Viruses in foods are presently detected on the basis of the infections they cause in cultured primate cells, but these cells culture methods do not permit detection of the HA virus nor the most important of the foodborne gastroenteritis viruses. Current methods of virus detection entail liquefaction of the food sample, clarification of the sample suspension, possibly concentration of the clarified food extract, and inoculation of cell cultures; a certain amount of specialized equipment is required for some of these procedures. The inclusion of the proper controls is critical to interpretation of results that are obtained.

Regulation of Mycotoxins in Food, Theodore P. Labuza, Department of Food Science and Nutrition, University of Minnesota, 1334 Eckles Avenue, St. Paul, Minnesota 55108

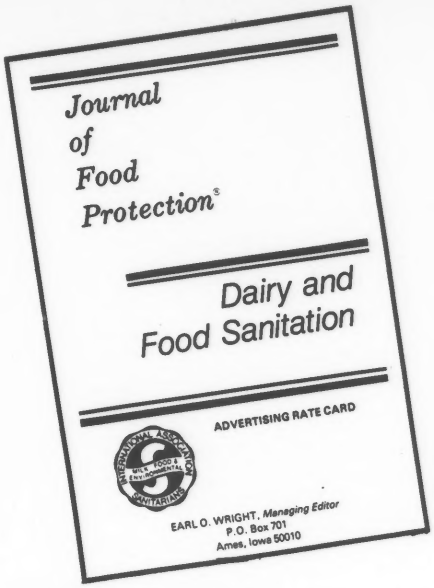
J. Food Prot. 46:260-265

This paper reviews federal laws and regulations with respect adulteration of foods with mycotoxins. Toxins present in foods are generally handled as added poisonous and deleterious substances and generally if unsafe at any level to animals would imply that they may render injuriousness to humans. Aflatoxin is the only mycotoxin for which the FDA has set an action level, i.e., that level of adulteration below which the agency will generally not prosecute. However, due to environmental conditions, the FDA has repeatedly given exceptions for contaminated grain above the action level if it is to be used for animal feed. It should be noted that even though aflatoxin is a known animal carcinogen, the Delaney Clause does not apply and thus it can be present in foods. Action levels have not been established as yet for other mycotoxins.

Microwave Cooking: An Overview, Ruth E. Baldwin, Department of Food Science and Nutrition, University of Missouri, Columbia, Missouri 65211

J. Food Prot. 46:266-269

Microwave ovens can be expected to continue as a method of cooking and reheating foods, and versatility will improve as needs become evident. Microwaves cause heating when polar materials absorb them, but confer no special qualities on the food. Lethal effects on microorganisms and trichinae are due to heat. Speed and evenness of heating are influenced by composition and mass of food as well as features of the appliance. Although there is variability depending on these factors, microwave ovens have considerable potential for energy saving. Foods cooked by microwaves are as nutritious and, in some instances, more nutritious than those cooked conventionally. Safety to the users of microwave ovens is assured by strict Government regulations.



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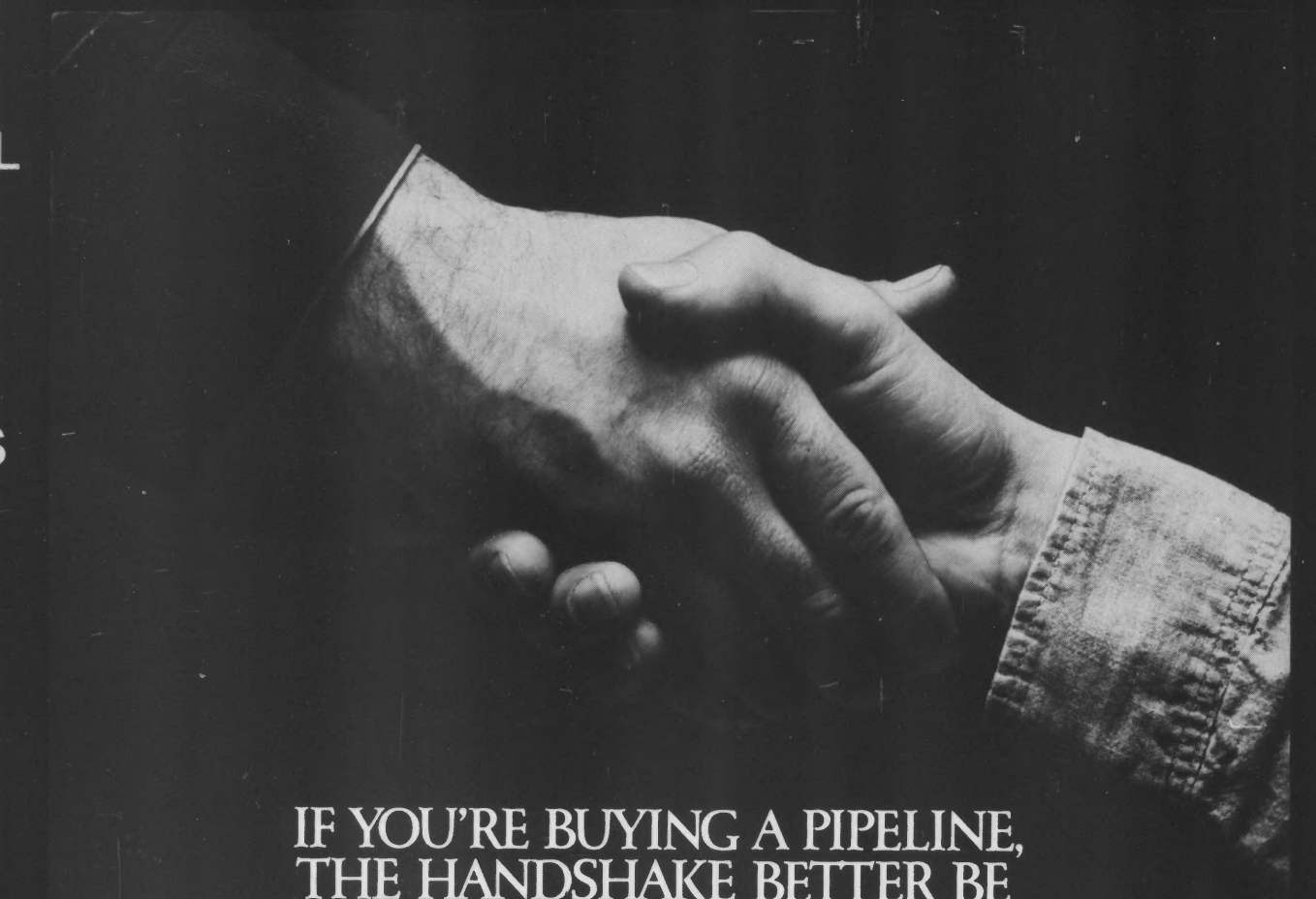

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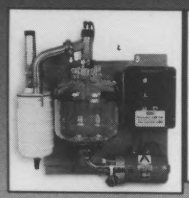

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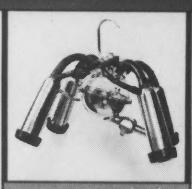

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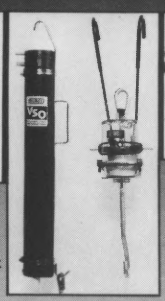

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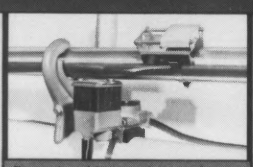

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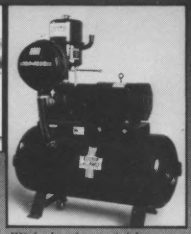

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