

a food grade enzyme, transglutaminase. Other food processing methods have used this enzyme to crosslink proteins in the presence of calcium. The enzyme has been used to produce a curd. In our study, three replicate trials with unfortified skim milk and direct set cottage cheese manufacturing were completed. Experimental vats were manufactured using 10 units of transglutaminase enzyme per gram of total protein in the skim added immediately after the glucono delta lactone acidogen. Three washes of the cooked curd were completed. Samples of the skim milk, whey, wash waters, and curd were collected for a mass balance. All trials resulted in more protein recovery in the experimental cheese compared with the control cheese. The magnitude of the increased recovery was not significant. All experimental vats contained less protein in the whey than the corresponding control; however the magnitude of decreased protein was not significant.

Key Words: Cottage Cheese, Yield, Transglutaminase

960 Analysis of financial measures comparing 3 management styles. W. T. Wencil* and G. Hadley, *University of Wisconsin, River Falls.*

The objective of this research was to determine if management style influenced profitability. The management options compared included: Management Intensive Rotational Grazing (MIRG), a stored feed group, and a mixed feeding group. Survey results were used to define management style. MIRG was defined as a producer who used pasture as the major forage source of feed. The stored feed group was defined as farms that had no pasture access for animals. Finally the mixed feeding group was defined as farms that provide minimal grass for grazing, but pastures are not managed intensively. The number of farms whose survey results indicated the different management styles were: MIRG-30 farms, stored feed-226 farms, and mixed feeding-26 farms. There were nineteen different financial ratios used in this research; they dealt with issues of: liquidity, solvency, profitability, repayment capacity, and financial efficiency. Dupont analysis was performed on the financial ratio measures calculated from the Agricultural Financial Advisor (AgFA) database. This database contains the financial information of 600 Wisconsin dairy farms. The results were analyzed using a statistics program to test for statistical significance between results. Based on the results, MIRG is at least a competitive option for dairy producers.

Key Words: Financial, Grazing

Dairy Production Undergraduate Paper Presentations

962 Leptin: What is its role in the dairy cow? D. C. Barbour* and E. H. Jaster, *California Polytechnic State University, San Luis Obispo.*

Dairy cows in early lactation experience a negative energy balance that often pre-disposes them to metabolic disorders. Ketosis, periparturient paresis, and displaced abomasum are examples of these disorders that arise from insufficient energy levels at parturition and freshening. Negative energy balance occurs in the dairy cow because the amount of energy expended for body maintenance and production exceeds the amount of energy available from dietary sources. Leptin is a peptide hormone produced by white adipose tissue that acts on the hypothalamus as its primary target organ. Leptin has been demonstrated to be closely associated with metabolic traits that maintain homeostasis despite negative energy balances in early lactation. Leptin is also thought to regulate processes that are highly dependent on positive energy supply. Some of these are developmental processes which include the onset of puberty, ovarian function, and formation of mammary secretory tissue, as well as other processes including responses to stress and general reproductive and immune functions. Research has determined that leptin serves as a mediator of nutrition, and an indicator of nutritional status and body conditioning in dairy cattle. Recent discoveries in nutritional biochemistry and DNA technology indicate that leptin has been shown to contribute to fat deposition, nutritional status, reproductive function, and immune response in dairy cattle.

Key Words: Leptin, Dairy Cattle

961 Wastewater treatment to reduce phosphorus losses from dairy farms. L. D. Hughes*, K. F. Knowlton, N. G. Love, A. M. Gamboni, and C. M. Parsons, *Virginia Polytechnic Institute and State University, Blacksburg.*

Dairy farms are a major source of phosphorus (P) contamination of surface water. One approach to reduce P runoff from farms is to apply biological wastewater treatment techniques to reduce the nutrient content of land-applied waste. Enhanced biological P removal (EBPR) is a system used to reduce the P content of municipal waste. EBPR involves treating waste in a reactor with alternating anaerobic and aerobic conditions. P-accumulating microorganisms in the waste sequester P, yielding a P-depleted liquid and a P-enriched biomass for export. Our objectives were to evaluate the compositional suitability of dairy manure for EBPR, and to evaluate the effects of diet and manure separation on parameters important to reactor design. Waste samples were collected from 9 cows fed a high P diet (0.47%P), a low P diet (0.32%P), or low P with exogenous phytase (0.32%P), in a Latin square design. Total collection of urine and feces was conducted, a mixed slurry was created, and slurry was separated mechanically to generate liquid effluent. Slurry and effluent samples were analyzed for P and chemical oxygen demand (COD). COD:P, reflecting energy available to drive P removal, was calculated. Phytase had no effect on waste composition, but the P content of slurry and effluent from cows fed low P (with and without phytase) was lower than from cows fed high P (224 and 242 vs. 375 mg/l), and the COD content tended to be higher (47,078 and 51,081 vs. 45,282 mg O₂/l; P < 0.09). The COD:P ratio of all wastes was sufficient to support EBPR, but waste from cows fed low P had a higher COD:P ratio than cows fed high P (310:1 and 289:1 vs. 149:1). Effluent had less COD and P than slurry, but the COD:P ratio was similar in the two wastes. These results indicate that dairy manure slurry and effluent will support EBPR, and that diet affects waste composition in a way that will affect reactor design. More work is needed to assess reactor performance and the economic feasibility of applying EBPR to dairy waste.

Key Words: Enhanced Biological Phosphorus Removal, Wastewater Treatment, Manure Composition

963 Managing an ovulation synchronization program with PCDART. J. C. Roberts*, *Louisiana State University, Baton Rouge.*

Ovulation synchronization is the use of exogenous hormones to induce the onset of ovulation in dairy cattle. Ovulation synchronization is a common practice on many US dairy farms. It can increase profitability on a dairy farm by reducing the average days to first breeding and consequently the average days open per cow on the farm. It can also improve the labor efficiency on the farm by reducing the need for heat detection. Ovulation synchronization requires that specific hormonal events be given to individual animals at specific time intervals. One disadvantage of using ovulation synchronization is the difficulty in coordinating several events associated with the protocol on a large number of animals in a dairy herd when different animals require different events on a particular day. Another disadvantage of using ovulation synchronization is the need to keep accurate records on which events were given to which animals during a given time frame. There would be no way of knowing which event an animal should receive at what time without this information. This would quickly render the program ineffective. PCDART is a computerized record keeping system for use in dairy herds. PCDART is used to manage all of the information recorded on individual animals such as milk production, breeding, calving, etc. PCDART can also be used to manage ovulation synchronization programs in a dairy herd. Dairy farmers can use default ovulation synchronization protocols that are built into the program or they can design their own protocols. After setting up an ovulation synchronization protocol the farmer wants to use, they then tell PCDART which cows are going to be synchronized. PCDART will then create daily or weekly reports telling the farmer which cows receive which hormonal treatments on a given day. This process greatly reduces the amount of time the farmer has to spend de-

termining when to give each animal a particular treatment. This allows farmers to utilize their time resources more efficiently and greatly improves the overall potential for success using ovulation synchronization.

Key Words: Ovulation Synchronization, PCDART, Dairy Management

964 Factors affecting fertility rates in embryo transfers. J. Hockney*, *North Carolina State University, Raleigh.*

Such reproductive technologies as artificial insemination and embryo transfer are becoming increasingly popular in the Dairy industry, greatly increasing the number of offspring from elite bloodlines and therefore improving the overall genetics of the industry. In this presentation, the procedure for embryo transfers will be discussed, including a variety of techniques, and the corresponding fertility rates associated with different protocols. These techniques vary from the use of fresh or frozen embryos, environmental factors, the use of bST, freezing and thawing methods, and surgical transfer. Through this data, one hopes to gain a greater understanding of the embryo transfer protocol, thus increasing success rates and therefore making a more economical procedure.

Key Words: Embryo Transfer

965 Effects of pasteurization on colostrum quality. M. L. Moody*, *Pennsylvania State University, University Park.*

Colostrum intake is essential for the development of passive immunity in the neonatal bovine because placental structure does not allow in utero transfer of antibodies from dam to fetus. For this reason calves must ingest an adequate amount of colostrum containing high levels of antibodies within hours after birth. Poor colostrum management may cause calves to consume pathogenic organisms such as *Mycoplasma* or *Mycobacterium paratuberculosis*. A large percentage of dairy producers pool colostrum from fresh cows, increasing this risk of disease spread by creating a mix of uncertain antibody contents and pathogenic bacteria. Pasteurization may present an alternative to calf raisers who pool colostrum when attempting to reduce disease transmission from dam to calf by killing pathogenic bacteria through heating colostrum to high temperatures. While pasteurization may rid colostrum of disease causing organisms, it may also reduce the concentration of Immunoglobulin G, the main antibody whose absorption leads to passive immunity in calves. Godden (2003) reported IgG concentrations were reduced by 58.5% in 95 L batches and 23.6% in 57 L batches of pasteurized colostrum.

Key Words: Pasteurization, Colostrum

966 Got Milk Insurance? L. B. Core*, *University of Kentucky, Lexington.*

Dairy producers nationwide continually struggle with the volatility of the milk market. From the record high prices of 1998 and 1999, to the devastating low prices of 2000, and the rebound of 2001, producers constantly have to strike a balance between enjoying the highs and budgeting for the lows in milk prices. However, another option is available to producers. Insuring milk prices with forward, futures, and options contracts rather than accepting the cash market is a viable option for many dairy producers. These three alternatives do not guarantee maximum profit, but instead allow producers to budget more effectively as they are better able to manage returns. Furthermore, securing long-term contracts for feed ingredients, hay, fuel, and other inputs to manage input cost will ensure the producer isn't challenged by unexpected price fluctuations. Each marketing alternative can be equally effective when ensuring prices; however, when choosing which alternative to employ, it is important to consider the individual needs of the producer. Dairy operators nationwide have enjoyed positive economic returns from the use of contracts. A Wisconsin family who milk approximately 400 Jerseys increased their profit margin by \$34,000 by using the contract method over their regular cash market method. Moreover, producers who had 200,000 lbs. of Class III milk with 3.5% butterfat contracted at \$12.00 for 2001 and 2002 made \$19,600 over the cash market value in the two year period. As impressive as these numbers are, everyone knows that nothing in life is a sure thing, including forward, futures and options contracting. However, these three alternatives do help to insure a long-term future for many dairy producers.

Key Words: Milk Prices, Futures, Profitability

967 The battle against high somatic cell counts: worth fighting – worth winning. A. R. Hazel* and J. K. Reineau, *University of Minnesota, St. Paul.*

In a world market where the BTSCC of most herds is required to be below 400,000, most major dairy production countries outside the U.S. average below 250,000. With a national average of 350,000 in 2002, the U.S. has increased its risk of losing share in this growing global market. Low somatic cell scores are important in every link of dairy product production, and has the potential to save the U.S. industry over 1 billion dollars every year. Low SCC is beneficial to the cow because it creates better overall health. For dairy producers, reducing mastitis levels will indirectly increase their milk price through quality premiums and create a higher level of productivity. Dairy product processors profit through higher product quality and increased yields during production. The marketing industry wins by being able to sell a product proven to have a longer shelf life. And the consumer wins with a high quality product that they can always trust to be wholesome, nutritious, and good tasting. Lowering SCC just makes sense for everyone! So how should producers go about lowering the SCC of their herd? The process is not as daunting as it first appears. First, producers need to understand the problem by culturing cows and developing a plan of attack against high SCC. Then, managers need to evaluate sanitation, especially protocols for milking procedures as well as stall and bedding management. Cow care is also important because animals need a healthy and stress-free environment to be highly productive. Last, but definitely not least, a producer must change his mindset about milking cows in order to lower SCC. This involves setting goals for SCC, developing effective protocols for management, and training everyone who milks to follow the process without fail. The U.S. dairy industry has a clear need to lower its SCC in order to compete on a world marketplace and remain a viable industry in the domestic sector. The time to do something about it is now.

968 The effects of presynchronization, in conjunction with Ovsynch, on pregnancy rate in dairy cattle. R. A. Stery* and S. C. Kelm, *University of Wisconsin, River Falls.*

The U.S. dairy industry has become increasingly competitive and many producers have responded by expanding herd sizes and striving for greater production per cow. While these adjustments have led to improved efficiency, herd reproductive performance has suffered. One of the factors associated with declining reproductive performance is reduced efficiency and accuracy in estrus detection. A proactive approach to solving this problem is the use of timed A.I. protocols. An example of a widely accepted hormonal intervention protocol is Ovsynch (50µg GnRH day 0, 25mg PGF_{2α} day 7, and 50µg GnRH day 10, followed by timed A.I. 10-24 hrs later). However, one of the drawbacks of Ovsynch is that all cows enter the protocol on the same day, regardless of their estrous cycle stage. Cows in later stages of the estrous cycle face a greater risk to fail to ovulate to the first GnRH injection and ovulate before the second GnRH injection, leading to a lower pregnancy rate to subsequent A.I. To overcome this obstacle and improve uterine health two doses of PGF_{2α} (25 mg) can be administered before initiation of Ovsynch. Presynch effectively groups cows in the early luteal phase of the estrous cycle, which has been demonstrated to be the optimal stage to start Ovsynch. Moreover, Presynch may improve uterine health by increasing the ovulation rate, luteal activity, and decreases the occurrence of pyometria. Overall presynchronization has the potential to increase the number of pregnancies per first service by 11.6 ± 3.8% 32 days after A.I. and 21.2 ± 4.3% at day 74 post A.I.

Key Words: Presynchronization, Ovsynch

969 Ionophores: Friend or foe? M. C. Scott*, *Virginia Polytechnic Institute and State University, Blacksburg.*

Ionophores are carboxylic antibiotics introduced in the late 1970s to aid in control of coccidiosis. It was also discovered that ionophores, when added to feed in small amounts, increased feed efficiency and decreased methane production in ruminants. To accomplish this ionophores alter the acetate: propionate ratio in the rumen in favor of propionate. The increased level of propionate, the main precursor for glucose, results in faster growth rates. Ionophores also have potential to increase milk production and lower occurrence of postpartum metabolic diseases in lactating cows, such as ketosis. Feeding sub-therapeutic levels of carboxylic antibiotics such as ionophores, which are not used in humans,

can prevent diseases and infections, such as coccidiosis, that would normally be treated with stronger antibiotics commonly used in human treatment. Therefore, ionophores may reduce the threat of antibiotic resistance. Ionophores are approved for use in young stock, and are currently under review for approved use in lactating cattle.

Key Words: Ionophores

970 Centralized pregnancy detection: A new option for fertility evaluation. A. Barten* and L. Fox, *Washington State University, Pullman.*

Pregnancy Specific Protein B (PSPB) can be used as a centralized pregnancy detection aid. During the third week after conception, binucleate giant cells, in the ruminant placenta produce a glycoprotein called Pregnancy Specific Protein B. This protein can be detected with an enzyme-linked immunosorbent assay (ELISA) at day 30 of gestation in multiparous cows and at day 28 of gestation in primiparous heifers. The test is 92.5% accurate for identifying pregnant cows and over 99% accurate for identifying nonpregnant cows. A blood sample is collected from

each cow and delivered to a centralized laboratory, (usually at a veterinary clinic), where the test is completed. The laboratory then prepares a report for the herd manager or veterinarian. Results are available electronically to the herd manager and/or veterinarian within 27 hours after the sample was taken. The centralized pregnancy evaluation concept provides the following advantages over traditional on-site palpation for pregnancy: 1) A high degree of quality control for assay accuracy as opposed to potentially low quality control for on-farm testing; 2) Data from multiple herds can be easily summarized; 3) Increased ability of the veterinarian and management team to compare herds with regard to application of successful programs; 4) More quality time available for the veterinarian and management team to evaluate and make improvements; 5) Reduced probability of embryonic death due to palpation and erroneous hormone use and 6) Elimination of error prone steps with data recording and transfer. PSPB can be used as a tool to improve reproductive efficiency by minimizing days open, reducing the calving interval and maintaining adequate days in milk. This approach is currently in use in the states of Washington and Idaho and will provide new options for evaluating pregnancy status in dairy cattle.

Key Words: Pregnancy Specific Protein B, Testing

Dairy Foods Undergraduate Paper Presentations

971 An industry approach to increasing the consumption of dairy products. B. Lyons*, *Louisiana State University, Baton Rouge.*

According to USDA, consumption of soft drinks has steadily increased over the past 40 years while milk consumption has decreased. The incidence of bone fractures has increased by 42%, especially among children and young adults, over the past 30 years. Researchers are concerned that many children and teenagers are not getting proper amounts of calcium in their diets. In time, the trend of less milk and more soda could lead to increased occurrences of osteoporosis. These data show that consumption of dairy foods is important to our nutritional well-being. The Food Guide Pyramid recommends consumption of 2-3 servings of dairy products/d. Milk and dairy products offer a range of well-known health benefits, the best known being calcium for proper bone health. In 1984, the Dairy Check-Off Program was implemented to provide funding for marketing, research, and educational programs. Through this program, the industry is working to increase dairy product demand and strengthen dairys image. Since the program began, dairy consumption per capita has increased 11%. Researchers across the country are finding new ways to make dairy products more appealing to young consumers through checkoff funds. Education is important to keep the importance of nutrition at the top of everyones priorities and with the help of the Dairy checkoff, the dairy industry is able to offer nutritional information to consumers of all ages. The checkoff funds 3-A-Day of Dairy, a nutrition-based marketing and education campaign to promote healthy diets and increase demand for dairy products. The Got Milk? ads are still a big hit with consumers, and checkoff funds are continually used to feature new celebrities for promotion. Fast food restaurants are beginning to offer milk with childrens meals, and this is receiving positive responses from parents. With the consumption of dairy products continuing to decline, the dairy industry must persist in efforts to promote their products. The research, marketing, and educational programs funded by the checkoff are steps in the right direction for increasing consumer awareness of the importance of dairy products for health and well-being.

Key Words: Dairy Products, Consumption, Industry Programs

972 Probiotics in dairy products- Beyond nutrition. S. Phetsomphou*, *North Carolina A&T State University, Raleigh.*

Microbial cultures have been used for thousands of years in food and food fermentations. Since the past century, there is strong evidence that the microbial cultures have the ability to prevent and cure a variety of human diseases. Probiotics are one group of these microbial cultures that are becoming increasingly popular in the United States and Europe. Although there are many different types of probiotics, the most common are *Lactobacillus bulgaricus*, *L. acidophilus*, *L. reuteri* and bifidobacteria. Dairy products such as fluid milk and yogurt are the popular food products that contain probiotic cultures. Probiotics are defined as viable microbial cultures that have positive impact on human health. A number of studies have found probiotic consumption to be useful in

the treatment of many types of diarrhea, including antibiotic-associated diarrhea in adults and young children. Several studies have shown that certain strains of probiotics, such as *L. bulgaricus* and bifidobacteria, can alleviate symptoms of lactose intolerance by providing bacterial lactase to the intestine and stomach. Probiotic consumption may also be a means for primary prevention of allergy in susceptible individuals. Studies have shown that regular consumption of probiotic could have a positive impact on cancer prevention. Animal and in vitro studies indicated that probiotic bacteria may reduce colon cancer risk by reducing the incidence and number of tumors. Functional foods including dairy food products have been known as a mean for disease prevention and the quest for optimal health at all ages. Therefore, probiotics cultures could play a big role in the human diet beyond nutritional aspects.

Key Words: Probiotics, Bifidobacteria, Dairy Products

973 On-farm milk processing. A. R Nelkie*, *North Carolina State University, Raleigh.*

On-farm milk processing plants are becoming increasingly popular as an enterprise option for dairy producers as they try to add value to their commodity of raw fluid milk. Lemajru Dairy Farm, a 100% registered, 100 cow milking herd located near West Branch, MI is being used as the experimental farm in this research model to determine if an on-farm milk processing plant is profitable. The cost of the equipment, the construction of the plant, the increased labor in the form of new employees, and the cost of operating it will be calculated. Figurative prices fabricated from local grocery stores and current on-farm processing plant are used to calculate the profit. Last year's gross income for the farm sale of raw fluid milk was around \$300,000. To build an on-farm processing plant, the income will have to cover the \$300,000 plus enough to pay for employees, loans and the cost of extra utilities needed to operate the machinery. The farm is capable of producing approximately 5000 gallons of milk each week. An estimated cost for the building and purchasing of equipment is around \$700,000 upwards to \$800,000. The endeavor has the ability to produce \$750,000 per year, making this an equitable project if family help can be obtained to work the plant thus keeping start up costs down.

974 Farmstead cheese production. K. E. Harwick*, *Pennsylvania State University, University Park.*

The farmer's share of the consumer food dollar has dropped from 46% in 1913 to 20% in 2000. A natural result has been to increase farm size, but not all producers can or want to expand. Alternatively some dairy producers have opted to produce and market value-added products such as cheese. These products produce a higher return, can open new markets, and provide brand recognition while adding variety to a farms normal operation. Consumers are willing to pay more for a value-added product, allowing for a higher quality of farm life. When deciding