were willing to pay more for products containing increased CLA. Future research may lead to the development of a variety of designer dairy products with enhanced, natural, anti-carcinogenic activity for humans.

Key Words: CLA, Cancer, Conjugated linoleic acid

1997 Biotechnology as a means of modifying milk composition. A.E. Iager*[1], [1]*Virginia Polytechnic Institute*.

The dairy industry is reaching a point where the advertising of calcium-laden milk may not be enough to sustain a profitable market for dairy products. Over the past decade, consumers have flocked toward alternative foods, other than milk products, to fulfill their nutritional requirements. Consequently, the time is now for our industry to look for new, improved, and more accelerated ways to modify the composition of milk and provide alternative uses for milk that increase sales. Traditional methods of dairy cattle breeding do not allow for rapid genetic change to significantly change milk composition. Milk component modifications can provide for health benefits for the consumer. Researchers have been investigating ways to develop transgenic animals that would produce milk with modified components. Proposed modifications presently being investigated for the benefit of humans include altering protein and fat content, increasing production efficiency, improving food safety, and "humanizing" milk where human proteins would be substituted for bovine proteins in bovine milk. There are several factors currently delaying product availability. These include costliness and inefficiency of transgenic animal production, lack of understanding of mammary gland physiology, and the possibility of milk component interactions. Industry leaders will also have to plan for specialized, separate processing plants for these novel products and be prepared to face potential problems with consumer acceptance of genetically modified products. However, the anticipated benefits will outweigh the current hurdles when the development and follow through of this technology are complete.

Key Words: Biotechnology, Milk, Composition

Dairy Production Undergraduate Paper Presentations

1998 The importance of biosecurity measures in dairy herds. D.D. Leuty*[1], *Washington State University, Pullman, WA*.

Biosecurity is preventing the introduction of new diseases into a herd by taking some basic precautionary measures. The importance of biosecurity to the dairy industry rises with the increasing prevalence of herds purchasing cattle. Cattle entering the herd can carry contagious diseases from several outside sources. Johne's disease, Bovine Viral Diarrhea (BVD), and Leptospirosis are just a few of the diseases that can be controlled through proper biosecurity. An outbreak of Johne's will decrease the herds production at least five percent and BVD will result in an estimated loss of $500.00 per cow. One component of biosecurity is isolation of all potential carriers. Such a program includes quarantining all new animals for at least 21 days, testing for highly contagious diseases such as BVD and Johne's, and establishing an aggressive vaccination program. Other measures include increasing herd resistance to disease by reducing stressors, using aggressive colostrum management and limiting access to dairy facilities from outside visitors. The use of biosecurity measures will prevent the spread of disease, decreases the loss of animals, and increase production of the herd.

Key Words: Biosecurity, contagious

1999 Increasing cow milkability. Jana Edwards*[1], [1]*Virginia Tech*.

Milking parlor efficiency is a limiting factor for many dairies. If a parlor is being fully utilized, increasing the amount of milk produced per hour is one alternative to building new facilities or expanding the existing parlor in order to become more profitable. The principle behind good milking technique is that the milking machine should remove the available milk from the udder gently, quickly, and completely with little irritation to the udder. This definition can be used to describe the essential characteristics of good milkability. Good milkability is when the unit is attached and milk flow is apparent immediately after the last teat cup is attached. The cow milks out quickly and completely with a steady milk flow. When the cow is finished milking, milk flow suddenly slows down and the unit is promptly removed from the cow. One way to increase good milkability on a dairy herd is through the implementation of automatic take-off settings. This can be done with an automatic recording system. In order to increase the amount of milk being produced per hour, dairymen must limit the maximum unit-on-time of the milking machine. The typical cow should yield twenty-five pounds in the first three minutes and then eight pounds per minute after that. Once a dairy has no cows milking longer than seven to eight minutes, parlor flow is dramatically more consistent, and the time spent in the holding area is decreased. However, an automatic milking machine is not all automatic. Cows must be properly prepped in order to increase milkability. Cows, with poor preparation, have a longer unit-on-time, which results in a decrease in cows per hour. Cows also tend to have a slower milk let down and a decrease in average flow rates. In conclusion, the time a cow takes to milk out is very important for total time spent in the milking parlor, udder health, and parlor flow. However, proper preparation before milking and properly functional takeoffs must be in place for these results to take place. Once the cows are accustomed to being milked properly and efficiently, they will respond by standing quietly, have healthier teat ends, and milk out faster.

2000 The effects of heat stress on conception rates and early embryonic development. I. A. Norris*[1], [1]*Louisiana State University*.

In today's intense dairy industry, the time between freshening and conception is of ever-growing concern. Management during this time plays a role not only in milk production but also in farm efficiency. Simply stated, the sooner dairymen can get heifers and high producing cows pregnant, the more profitable they are as milking units on the dairy. Heat stress in dairy cattle has been associated with negative effects on cyclicity, conception, embryonic development, maternal recognition, and gestation. As the spring and summer rapidly approaches, dairymen in the southern United States must make the decision whether or not to breed heifers and cows during the months of May through September. In studies conducted at the University of Florida, conception rates during summer months commonly drop below 15%. As seasonal temperatures rise, maternal hyperthermia may potentially contribute to uterine heat load. The decreased availability of water and nutrients, along with a decline in metabolic activity needed for proper uterine function and embryonic development, places embryos at higher risk of inadequate growth and potential death. The manner in which dairy cattle are managed during summer months (and other periods of heat stress) may significantly influence reproductive performance. The use of fans, sprinklers, cooling ponds, and shades has been shown to potentially increase conception rates and aid in maintaining pregnancy throughout periods of elevated heat stress.

Key Words: heat stress, conception rates, embryonic development

2001 Agroterrorism: is it a possibility? J.L. Flinchbaugh*[1], [1]*Pennsylvania State University*.

Agricultural biological warfare, or "agroterrorism" as it is known, poses an alarming threat to our society. Agroterrorism may include any activity intended to introduce pathogens into livestock, crops, or directly into processed food products. Currently, the British Ministry of Agriculture is probing the idea that a terrorist group may have planted hoof and mouth disease in an attempt to discredit farming practices. If agroterrorism were truly the cause of this devastating disease outbreak, this act could foreshadow a similar shock to the US dairy and beef industries. The motivation behind most acts of agricultural terrorism is the allure of economic or political gains, with the ease and relatively risk-free nature of agroterrorism serving as added incentives. The ramifications of an act of agroterrorism would be far-reaching, extending beyond the immediate agricultural community to the rest of society. The consequences of agroterrorism are not about food per se, but about the effects on the economic and socio-political infrastructure. Economic destabilization of the agriculture sector would be one of the more immediate effects, followed by a degree of social instability and a loss of confidence in the government. The USDA is taking an active role in the fight against

agroterrorism through such actions as the establishment of the Counterterrorism Policy Council and the Plum Island Animal Disease Center. The development of a national defense strategy against agroterrorism is a necessity if the safety and stability of American agriculture are to be ensured.

Key Words: Agroterrorism

2002 The Advantages and Disadvantages of Accelerated Heifer Growth. M.H. London*, *University of Kentucky Dairy Club*.

Accelerating the growth rate of heifers can help decrease the age at first calving, but this objective must be accomplished without compromising first-lactation or lifetime milk production. Many classical studies done prior to 1990 showed that prepubertal heifers severely overfed energy had decreased amounts of ductal tissue, which resulted in decreased first-lactation milk yields. Studies have shown that heifers from 3 to 12 months of age fed to gain up to 1000 g/d did not result in excessive fattening. However, other research demonstrated a decrease in milk production of 7.1% when heifers were fed to gain 1000 g/d in comparison to 700 g/d with the accelerated-growth heifers reaching puberty 32 days earlier. Using data present in the literature, VandeHaar concluded that 61% of variation in mammary impairments was attributed to the protein to energy ratio being fed. In another study, feeding a diet with a crude protein to metabolizable energy ratio of 50:1 compared to 61:1 g/ Mcal improved feed efficiency, increased structural and overall growth rates, and decreased body condition scores in heifers from 28 to 48 weeks of age. More recent studies also have seen decreases in actual first-lactation milk yield in heifers reared on diets formulated for 1000 g/d gain prepartum. After breeding, all heifers were fed a common diet ad libitum and heifers fed to gain 680 g/d prepubertally showed compensatory gain after puberty with no difference in body condition at calving. These changes in growth after puberty explained most of the differences seen in milk production between the prepartum treatments. Therefore, prepubertal gain may only explain part of the decreases seen in first-lactation milk production. More research needs to be conducted to develop feeding and management programs, which allow for early calving and optimum milk production.

Key Words: dairy heifers, growth

Original Research/Independent Study Undergraduate Paper Presentations

2003 Genetic relationships among electrical conductivity of milk, somatic cell scores and mastitis. R.C. Goodling*[1], G.W. Rogers[1], J.B. Cooper[1], and B. Rune[2], [1]*Pennsylvania State University,* [2]*SAE Afikim, Kibbutz Afikim, Israel*.

Electrical conductivity of milk (EC) increases during mastitis and can be routinely measured during each milking of dairy cattle. The objectives of the study were to examine the relationships among EC, somatic cell scores and mastitis. The Afikim computerized milking and management system measures composite EC in millimho (mmho) during milking and records daily averages for EC. Analyses were performed on 3503 cows sired by 259 bulls in eight herds. Heritabilities for EC were determined using the PROC MIXED procedure of SAS® with a model that included herd-year-season, age at calving, and sire. Heritabilities for lactation 1 ranged from .27 to .39; lactation 2 ranged from .21 to .23. Regression of daughter EC on sire PTASCS were all highly significant (.80 for lactation 1 and .67 in lactation 2). Genetic correlations among EC and clinical mastitis incidence were also estimated using a subset of the data where clinical mastitis was present. Bulls with higher PTASCS had daughters with significantly higher EC. The positive regressions and moderate heritabilities from this study indicate that EC might be useful in selecting for mastitis resistance in dairy cattle.

Key Words: Conductivity of Milk, Heritability, Mastitis Resistance

2004 Effects of Propylene Glycol or Fat Drench on Plasma Metabolites and Liver Composition of Transition Dairy Cows. M. M. Pickett*, M. S. Piepenbrink, and T. R. Overton, *Cornell University, Ithaca, NY*.

Forty eight Holstein cows were used to test the effects of short-term oral drenching of propylene glycol (PG) and EnerG II (Ca soaps of palm oil fatty acids, Bioproducts Inc., Fairlawn, OH) on milk production, blood metabolites, and liver triglyceride composition during the first three weeks of lactation. Treatments (2 X 2 factorial arrangement) given orally once daily for the first three days postcalving were water (Control), 500 ml PG, 454 g EnerG II (Fat), or 500 ml PG plus 454 g Fat brought to a volume of 2.5 L, using warm water. Concentrations of non-esterified fatty acids (NEFA) in plasma tended (P = 0.11) to decrease from day 2 through 7 in cows treated with PG (694.0, 570.7, 684.8, 582.4 μ E/L for control, PG, Fat and PG + Fat, respectively). Concentrations of β -hydroxybutyrate (BHB) in plasma tended (P = 0.09) to decrease from day 2 through 7 in cows treated with PG (10.1, 8.3, 8.9, 8.1 mg/dl). There was a tendency for an interaction of PG and Fat for plasma glucose concentrations (P = 0.07) for days 2 through 7 (36.3, 38.3, 39.4, 37.1 mg/dl), such that concentrations were greater for PG and Fat compared with the control or PG + Fat. Concentrations of triglyceride in liver on d 7 postcalving were not affected by treatment (P > 0.15; 10.82, 6.10, 10.01, 9.96%). Cows drenched with Fat tended to have lower DMI (P = 0.13; 38.0, 39.6, 37.3, 34.9 kg/d) and milk yield (P = 0.13; 36.5, 36.1, 32.5, 34.8 kg/d) during the first 21 d of lactation. There was no effect of treatment on milk composition. There was an interaction of PG and Fat for milk fat yield (P = 0.14; 1.7, 1.5, 1.5, 1.6 kg/d) which led to a trend (P = 0.15) in 3.5% fat corrected milk yield (42.9, 40.3, 38.1, 41.6 kg), such that yields were higher in the control and PG + Fat treatments compared with the other two treatments. Short term drenching of PG as described in this experiment has a slight beneficial effect on concentrations of NEFA and BHB while fat drenches appear to not affect concentrations of these metabolites in early postpartum cows.

Key Words: Propylene Glycol, Fat, Transition Cow

Meat Thermoprocessing: Products and Processes

2005 Thermal Processing of Meat Products. Romeo Toledo*[1], [1]*University of Georgia* .

Meat products are heated to eliminate the bloody red color, set the cured meat color, heat set proteins to form a gel and develop the texture, and thermally inactivate pathogenic and spoilage microorganisms. A number of RTE meat products are water cooked in a flexible film package, cooled, and then the covering is stripped followed by reheating to develop a roast and/or smoked flavor and color. Heating rates must be optimized to maximize color development and minimize purge. Too slow a heating rate will slow down production and may result in excessive shrink. A very fast heating rate will overcook the outer sections before the center reaches the endpoint temperature and results in excessive purge on cooling. Heat transfer mechanisms of conduciton, convection, and radiation govern heating rates and different mechanisms predominate in a particular equipment. Surface heat transfer coefficients play a major role in heating but when the Biot number gets too high, the effect is more on the surface than the interior where conduction becomes the rate limiting mechanism. Radiant heating systems have extremely high surface heat transfer coefficients and are effective for controlling purge and shrink in a post-processing pasteurization process.

Key Words: Heating rates, Post-processing pasteurization, Shrink and purge