

acids of total lipids were determined by gas chromatography. The results showed that birds supplemented with 1.5%SO and 3%SO had significantly ( $P<0.05$ ) higher levels of n-3 (25.27, 50.62 mg/100g) than control group (5.65 mg/100g) into breasts. With regard to leg/thigh the higher incorporations of EPA and DHA were obtained with 1.5%SO (20.68, 24.64 mg/100g) and 3%SO (49.17, 43.37). The n-6/n-3 ratios obtained in each treatment were: breast 16.4, 4.7, 3.1, 1.8 and for leg/thigh 16.6, 9.6, 5.4, 2.1. There were not changes induced by the sex ( $P>0.05$ ). Under conditions of the present study, it is concluded that SO could be used to increase the EPA and DHA content in tissue lipids of poultry, that there is higher incorporation of FA into leg/thigh than in the breast and, than the sex no affect the deposition of FA in the muscle of the birds.

**Key Words:** Fatty acids, Sardine oil, Broilers

**1993 Changes of magnesium and calcium contents and adenosine triphosphatase activity of shell gland mucosa during eggshell formation in Brown Tsaiya ducks and White Leghorn hens.** W. L. Chen and T. F. Shen\*, *National Taiwan University, Taipei, Taiwan.*

The changes of magnesium and calcium contents, adenosine triphosphatase (ATPase) activity of shell gland mucosa during various stages of eggshell formation in brown Tsaiya ducks and white Leghorn hens

were investigated. Ducks and hens containing an egg in the shell gland were sacrificed at 6, 10, 15, 20 and 22 hours after oviposition, respectively. The whole shell gland lumen was flushed immediately by 50 mL 10 mM Tris-buffer (pH 7.4) for analyzing the amounts of Mg and Ca and their shell gland mucosa were scraped off to determine Mg, Ca contents and ATPase activity. Calcium content in eggshell gland mucosa of both birds decreased to lowest level at 10 hours after oviposition and the data in ducks were lower than hens after active eggshell formation. Total flushed Ca content in uterus lumen of duck or hen were rapidly increased from initial to active stages of eggshell formation. Magnesium content in duck shell gland mucosa was significantly higher ( $p<0.05$ ) than those in hens from 6 to 20 hours after oviposition. Total flushed Mg content in whole shell gland lumen of chicken was higher than duck after 15-hr stage. The specific activities of  $\text{Ca}^{2+}$ -,  $\text{Mg}^{2+}$ - or  $\text{Ca}^{2+}$ - $\text{Mg}^{2+}$ -ATPase in shell gland mucosa were only minor changes ( $p>0.05$ ) during eggshell formation in both birds.  $\text{Mg}^{2+}$  added to incubation medium improved uterus mucosa ATPase activity of Leghorn hens, but not in Tsaiya duck. It was concluded that brown Tsaiya ducks could retain higher Mg and lower Ca contents in shell gland mucosa, and secrete less Mg and more Ca to shell gland lumen for depositing in eggshell. The Mg transport mechanism of shell gland mucosa in brown Tsaiya duck is worthy to be further studied.

**Key Words:** Shell Gland Mucosa, Magnesium, Adenosine Triphosphatase

## ADSA STUDENT AFFILIATE DIVISION

### Dairy Foods Undergraduate Paper Presentations

**1994 Drinking reduced-fat milk may reduce heart disease risk.** C.M. Opsahl\*<sup>1</sup>, <sup>1</sup>*University of Minnesota-St. Paul.*

Cardiovascular disease (CVD) is the major cause of mortality in the U.S. There are multiple risk factors for CVD including genetics, gender, race, age, tobacco use, exercise, diabetes, obesity, hypercholesterolemia, high blood pressure, elevated triglyceride, and high levels of homocysteine (a by-product of protein metabolism). Recent studies have shown that drinking at least four glasses of reduced-fat milk (<2% fat) may significantly reduce the risk of CVD. The exact mechanism of this relationship is not known but there are several possibilities. The dietary calcium from milk has been shown to reduce blood pressure in individuals susceptible to hypertension. Milk drinkers tend to be leaner, have higher levels of good or HDL (high-density lipoproteins) cholesterol, and lower incidence rates of diabetes. Finally, dairy products reduce artery-damaging homocystenine. Don't pass up the milk, drink to your health!

**Key Words:** Cardiovascular disease, Reduced fat milk

**1995 Improving calcium availability with dairy foods and inulin.** R. L. Blades\*<sup>1</sup>, <sup>1</sup>*Louisiana State University.*

Osteoporosis affects millions of Americans each year. This disease, resulting from inadequate calcium bioavailability, is of particular concern to the elderly but may begin during childhood. Only 30% to 40% of the calcium consumed is absorbed by the body, so new methods must be developed for increasing the bioavailability of this important mineral. One way to improve calcium availability is to increase intake of products high in calcium, particularly dairy foods. Another alternative would be to increase calcium absorption from foods. Inulin, an oligosaccharide derived primarily from the chicory root, has been shown to have numerous positive effects on human health. One benefit of this substance is its effect on intestinal flora. This product enhances growth of favorable bacteria while retarding growth of harmful bacteria. One of the most promising aspects of inulin is its ability to increase the intestinal

absorption of calcium. Inulin additive research has been proven to enhance calcium absorption without increasing caloric intake. One study has shown a 20% increase in calcium absorption from yogurt and fermented dairy beverages with only half of the normal usage level. With new technology and the added benefits of inulin, bone loss could be a major concern of the past, and a minor concern for the future.

**Key Words:** calcium, dairy foods, inulin

**1996 Conjugated linoleic acid: Cancer prevention from dairy products.** B. E. Dixon\*, *University of Kentucky, Lexington, KY.*

Conjugated linoleic acids (CLA) are fatty acids produced by ruminants that are found in meat and dairy products. After the discovery of CLA in meat, a synthetic form of CLA was developed to use in initial research on laboratory animals. In rodents where cancer was induced, consumption of a diet with high levels of this synthetic CLA reduced the incidence of breast, colon, prostate and skin cancer in the order of 50%. Approximately 40% of synthetic CLA are found as the *cis-9, trans-11* form, the isomer responsible for its anti-carcinogenic effects. In natural dairy products, however, at least 90% of CLA are found as the *cis-9, trans-11* isomer. Recent studies feeding butter with high CLA levels to rodents have indicated a similar decrease in cancer incidence and severity. Butter with high concentrations of CLA decreased mammary cancer in one study with rats and colon cancer in another rat model. Similar effects on humans consuming a diet high in CLA can be expected; thus, CLA have great potential in the diet as an anti-carcinogen. Dairy products that include milk fat with increased levels of CLA have a broad potential market. Milk with increased CLA content can be processed with little effect on CLA levels or anti-carcinogenic benefits. Taste tests have shown that butter and milk with high CLA content are considered acceptable by a majority of samplers. Based on a survey, these consumers

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. Lager\*<sup>1</sup>, <sup>1</sup>*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

## Dairy Production Undergraduate Paper Presentations

**1998 The importance of biosecurity measures in dairy herds.** D.D. Leuty\*<sup>1</sup>, *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\*<sup>1</sup>, <sup>1</sup>*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

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

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\*<sup>1</sup>, <sup>1</sup>*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\*<sup>1</sup>, <sup>1</sup>*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