

and lipolysis. Second, disease-induced anorexia could decrease serum IGF-I and increase serum GH which causes irreversible change in the partitioning of nutrients for tissue deposition. Ward et al. (1992) found that fasted cattle have higher serum cortisol concentrations than do fed cattle. Cortisol may be involved in anorexia-associated decreases in carcass weight and fatness through decreased thyroid hormone activity and increased protein catabolism. Third, cytokines and endotoxin induce various behavioral symptoms of sickness including lethargy, adipisia, and reduced social interactions. The result may be an indirect effect of anorexia on growth and carcass traits in that sick cattle are effectively on feed for fewer days than healthy penmates.

**Key Words:** Respiratory Disease, Cattle, Carcass Value

**486 Effects of nutrition and management on carcass value and profitability.** L. L. Berger\* and N. A. Pyatt, *University of Illinois, Urbana.*

As increasing numbers of cattle are being marketed on a grid basis, carcass value rather than live weight is becoming the primary determinant of profitability. Carcass value is determined by weight, quality grade, yield grade, choice-select spread, and premiums and discounts. Early-weaned steers (n = 192, Simmental or greater) of known genetics were individually fed in a four-year study to determine performance and carcass factors explaining variation in carcass value and profitability. Steers were weaned at  $88.0 \pm 1.1$  d and fed a high concentrate diet

(\$108.99/T) for  $84.5 \pm 0.4$  d prior to allotment. Steers consumed a 90% concentrate diet (\$98.93/T), consisting primarily of whole shelled corn and corn silage, for  $249.7 \pm 0.7$  d and harvested at  $423.3 \pm 1.4$  d of age. Five-year price data were collected for feedstuffs, dressed beef, and grid premiums and discounts. Average dressed beef price was \$110.67/45.4 kg. Premiums (\$/45.4 kg) were given for Prime (\$5.62), premium Choice (\$1.50), yield grades (YG) 1 (\$2.46), 2A (\$1.31) and 2B (\$1.11). Discounts (\$/45.4 kg) were given for Standard (-\$17.72), Select (-\$8.90), YG 3A (-\$0.12), 3B (-\$0.19), 4 (-\$14.16) and 5 (-\$19.56), and hot carcass weight (HCW) extremes (409-431 kg, -\$0.64; 432-454 kg -\$11.39; > 454 kg, -\$19.71). Input costs included annual cow costs (\$327.77), veterinary/medical and labor (\$35/hd), feed markup (\$22/T), yardage (\$0.25/hd/d) and interest (10%). Dependant variables were carcass value and profit per steer. Independent variables were yearling weight EPD, marbling EPD, daily DMI, ADG, feed efficiency, HCW, 12th rib fat, calculated YG and marbling score (MS). Carcass value was correlated ( $P < 0.05$ ) with yearling weight and marbling EPD, DMI, ADG, feed efficiency, HCW and MS. Carcass weight, MS and YG accounted for over 79% of the variation in carcass value among steers; explaining 57, 12 and 10%, respectively. Profit was correlated ( $P < 0.05$ ) with DMI, ADG, feed efficiency, HCW and MS. Marbling score, DMI, ADG, YG and HCW accounted for over 77% of the variation in profit among steers; explaining 30, 14, 12, 12 and 9%, respectively

**Key Words:** Carcass Value, Quality Grade, Yield Grade

## Companion Animal Symposium

**487 Nutritional management of obese animals.** G. D. Sunvold\*, *The Iams Company Research and Development, Lewisburg, OH.*

Being overweight or obese is the single most common nutritional disease in companion animals. Traditional weight management technology involves diluting dietary calories with fiber. The potential side effects of high fiber diets will be noted in the presentation. An alternative weight management strategy, managing the underlying physiological changes that occur in overweight animals or put these animals at risk for obesity, will be discussed. The close relationship between obesity and glycemia makes it important to study glucose and insulin metabolism in order to effectively treat obesity. This metabolic association will be discussed. The role of several nutrients for use in weight management has been examined and will be an important aspect of this presentation.

**Key Words:** Dogs, Cats, Obesity

**488 Humans and companion animals: hand-in-paw towards aging and obesity.** B. T. Larson\*, D. F. Lawler, Y. Pan, and J. R. Jackson, *Nestle Purina PetCare Co.*

The effects of aging are relentless. In response to aging, living organisms make functional, physiological and zoometric adaptations. Beyond these seemingly pre-ordained genetic and physiological adaptations, there are

increasing adverse effects upon aging mediated through obesity. The relative abundance of inexpensive, entertaining, and delectable food energy sources combined with a lack of immediacy or initiative to use calories through physical activity has caused an epidemic of obesity. Statistics regarding obesity in humans and companion animals compels science to explore available options. Scientific knowledge surrounding obesity and aging is growing at a remarkable rate. New revelations have been made of adipose tissue's regulatory effects on whole-body physiology (insulin resistance, ex.). In addition, obesity is related to chronic disease development (osteoarthritis, organ function, cancers, ex.) through insulin sensitivity. These new developments have opened new venues in the science of aging and obesity. Additionally, the aging-related loss of lean tissue mass physiologically intersects with age-associated fat tissue deposition to multiply downstream physiological effects. Unfortunately, this exponential knowledge growth exceeds population implementation rate. How companion animal science approaches these issues is critical to implementation. What is the science component in the aging and obesity implementation equation? Given, that science agrees to disagree about mechanistic theories, how is interim credibility preserved with partners outside science? Who are sciences potential partners in the aging and obesity implementation equation? What might this partnership look like in order to curb the acceleration of obesity in aging companion animals?

**Key Words:** Companion Animals, Aging, Obesity

## Dairy Foods and Human Nutrition

**489 Fortification in dairy products.** C. Boeneke\*, *Louisiana State University Agricultural Center, Baton Rouge.*

Webster's dictionary defines fortification as the act or process of adding materials to for strengthening or enriching. Fortification of dairy products is not a new idea. The process of fortification of milk with vitamin D dates back to the 1930's. The acceptance of this practice led to additions of vitamin A and minerals in the 1940's. No vitamin content levels were specified by the Milk Ordinance and Code until 1953 when a level of at least 400 International units (IU) per quart was established for vitamin D. In 1965, the Milk Ordinance and Code became the Grade A Pasteurized Milk Ordinance or PMO. This PMO defined low fat milk but gave no provisions for its fortification. An increase in consumption of the lower fat products led to nutritional concerns over vitamin A. The content of vitamin A, a fat-soluble vitamin, is smaller in the lower fat product. The 1978 PMO required fortification of these lower fat products at levels of not less than 2000 IU per quart for vitamin A. Vitamin D

fortification was still optional and could be added at 400 IU per quart. Consumers are demanding products that taste good and have health benefits. Dairy products are already rich in nutrients like potassium, riboflavin, calcium and vitamins A, D, and B-12. Fortification has the potential to improve them further. Dairy products fortified with added calcium, whey proteins, beneficial bacteria, and isoflavonoids are already on the shelves. Other ingredient additions such as vitamin C and E, lactoferrin, lutein, and others are available. Fortification poses unique problems to scientists and manufacturers involved with dairy products. Interactions with the ingredients used in fortification can cause product improvement or product detriment. More research must be conducted to examine the results of fortification in dairy products.

**Key Words:** Fortification, Dairy

**490 Consumer attitudes toward dairy foods.** C. M. Bruhn, *University of California, Davis.*

Taste is the number one reason for selecting food, but interest in nutritional content and special health benefits is also important. Consumers respond positively to the taste of many dairy products, but perceptions of health benefits are not as positive as they could be, perhaps because of the strong association of dairy with high fat. An increasing number of consumers are aware that food can provide special health promoting nutrients. Both traditional nutrients, like calcium, and nutrient components of emerging importance, like probiotics, can increase the appeal of dairy foods. Consumers are aware that dairy products help protect against osteoporosis, and many recognize that they do not get enough calcium, however young and middle aged people incorrectly believed they do not have to guard against this disease until they were older. People are not aware of other benefits of dairy products, such as the potential protection provided by calcium against certain cancers and lowering of blood pressure. Furthermore, people have not heard that diets that include dairy result in faster weight loss. While yogurt is generally perceived as a healthy product, consumers are not aware of the numerous potential benefits that probiotic cultures may provide. Although parents expect children to consume dairy product, modeling this behavior by parents is lacking in many home. Label statements may help alert consumers to a fuller range of dairy advantages. Promotion programs that emphasize the number of servings needed at each stage in the life cycle would provide information not generally known by the public today.

**Key Words:** Consumer, Calcium, Probiotic

**491 Probiotics in health: Their immunomodulatory potential against allergic disorders.** Z. Ustunol\* and J. J. Pestka, *Michigan State University, East Lansing.*

Prevalence of allergic disease such as asthma, food allergies hay fever and eczema is rising with most rapid increases are observed in developed countries. In the U.S., today, one in every four children and one third of the adult population are reported to have allergies. Although the reason for this increase are not completely known, over the past 20 - 30 years changes in food processing, sanitation, disease eradication and extensive use of antibiotics have been suggest to have altered postnatal immune function and development favoring allergic immune profiles. While the primary reason for atopic diseases may be genetic susceptibility, gastrointestinal microflora is recognized to modulate the local immunological environment and influence systemic immunological events, thus, response to allergens. Probiotic ingestion may alter the gastrointestinal microflora by providing bacterial cells to this ecosystem and have been suggested as potential candidates for immunomodulation and for ameliorating allergic diseases. The major mechanism by which probiotics influence the immune system may relate to their ability to differentially modulate expression of cytokines and co-stimulatory molecules. Probiotic administration can also enhance IgA production, which is thought to be important in clearing of allergens. Although,

the etiology of allergies is complex and the exact mechanisms by which probiotics may affect these diseases are still speculative and mechanistic details are yet to be elucidated, probiotics are already being explored with increasing interest for their therapeutic potential in the management and even primary prevention of allergic disorders. Clinical and epidemiological studies indicate that probiotics potentially may be a viable option for management and prevention of allergies.

**Key Words:** Probiotics, Immune Modulation, Allergies

**492 Nutritional properties of whey proteins.** K. J. Burrington\*, *Wisconsin Center for Dairy Research, Madison.*

Whey proteins have long been recognized for their functional properties and broad application in foods. Only recently, has interest developed in the nutritional properties of whey-derived food ingredients. Body builders were some of the first consumers to recognize the nutritional value of whey proteins as dietary supplements. Though the body builders' main interest is the muscle repair and building ability of the branched chain amino acids found in whey products, there are many other nutritional benefits associated with selected whey proteins. For example, alpha-lactalbumin, lactoferrin, glycomacropeptide and other whey peptides have been shown to manifest unique nutritional bioactivities. This presentation will review the current knowledge detailing the nutritional properties of whey proteins.

**Key Words:** Whey Proteins, Nutrition, Bioactivity, Peptides

**493 The beneficial role of dairy foods on weight and body fat loss: Where we are and where we are going.** D. B. DiRienzo\*, *National Dairy Council, Rosemont, IL.*

Obesity has been classified as an epidemic in the U.S. A growing body of evidence indicates that dairy products may be part of the solution, not part of the problem for weight and body fat management. Several studies have indicated an inverse relationship between calcium/dairy product intake and weight/body fat in men, women and children. Animal and in-vitro studies have provided a plausible mechanism on how dairy foods may exert a beneficial effect. Clinical studies have demonstrated that the inclusion of at least three servings of milk, yogurt, or cheese per day can augment weight and body fat loss which occurs from reduced energy intake. Moreover, the impact of dairy foods is greater than calcium supplements or low calcium diets suggesting dairy foods contain additional components, beyond calcium, which impact weight. Additional research is underway or planned to further expand the beneficial impact of dairy foods on weight management. Industry and consumer communication efforts on this relationship have been initiated and expand in 2004 and 2005. This presentation will review the science and communication activities associated this newest benefit of consuming 3+ servings of milk, yogurt or cheese products per day.

**Key Words:** Dairy Products, Weight Management

## **Growth and Development: ADSA - Mammary Development - The Role of Progenitor Cells and Nutritional Modulation on Lactation**

**494 Bovine mammary progenitor cells.** S. Ellis\*, *Clemson University, Clemson, SC.*

Dairy profitability is dependent on the cyclic development and differentiation of the mammary gland. As in other somatic tissues, a resident population of mammary stem cells is thought to be responsible for supporting the development of the mammary parenchyma. While there is general agreement regarding the existence of mammary stem cells, little else about this important cell population is known. There is a particular lack of information about stem cells in the bovine mammary gland. Data from a number of experimental models suggest that mammary stem cells are scattered throughout the mammary parenchyma and are resistant to stimuli that would promote differentiation. Investigations of prepubertal mammosgenesis in heifers indicate that a histologically distinct population of lightly staining epithelial cells are the primary proliferative cell population in mammary parenchyma. The so-called

light cells have been described in mammary parenchyma of all species examined to date. Unfortunately, the nomenclature relating to these putative mammary stem cells is inconsistent and classification of the cell staining is very subjective. Much of the confusion around mammary stem cells relates to epithelial cells being mistaken for wandering lymphocytes and to the differences between progenitor cells and true stem cells. However, recent ultrastructural studies have clearly shown that light cells do indeed possess epithelial characteristics, and molecular analyses are beginning to identify potential markers that will help identify stem cells in situ. The application of refined embedding, microtomy, and staining techniques for histologic examination with the light microscope has helped to facilitate investigations of putative mammary stem cells, but the experiments are still time-consuming, relatively subjective, and difficult to perform on a large number of tissue samples. Critical needs for future studies of bovine mammary stem cell physiology include: the development of genomic and proteomic information for