gies that have not been proven by development research and thus are unfamiliar to food processors. In our laboratory, we have shown that supercritical carbon dioxide (SCO_2) at pressures, P, greater than 7.4 MPa, when injected into solutions containing whey protein isolate or whey protein concentrate is effective for production of enriched fractions of the whey proteins, α-lactalbumin (α-LA) and β-lactoglobulin (β-LG). Fractions containing 70 wt% of α-LA, in solid form, and 95 wt% β-LG in a soluble liquid form uncontaminated with chemical additives have been obtained. We have also produced CO_2-casein, a high calcium-containing casein and other food protein isolates using the process under high pressure conditions in the range from 4.1 MPa to 7.4 MPa. The process is not an extraction process but relies on the production of carbonic acid that results from hydrolysis of solubilized CO_2. Separation of whole protein or the enriched whey fractions is achieved through manipulation of P, temperature, agitation rate, protein concentration, and holding time, all factors which have been shown to affect solvent pH, protein conformation, and yield. A continuous pilot plant process was developed to produce CO_2 casein in kg quantities, and a large-scale process for production of the whey fractions is being designed. Both processes may be integrated to simultaneously produce CO_2-casein and the enriched whey fractions from milk. Processes based on CO_2 separation may be considered sustainable, because much of the CO_2 may be recovered after separation has been achieved. Other advantages are that a relatively concentrated feed stream containing the whey proteins may be processed and post-treatment washing is minimal compared to other methods. This presentation will focus on the casein and whey fractionation processes, as well as some of the properties of the proteins obtained from these processes.

Key Words: CO_2, whey, casein

ADSA Southern Section Symposium: Dairy Replacement Health Challenges in the Southeastern U.S.

167 Advances in colostrum management. S. Godden*[1], S. Wells[1], J . Stabel[2], D. Haines[3], R . Bey[1], J. Fetrow[1], P. Pithua[1], and M. Donahue[1], [1]*University of Minnesota*, *St. Paul*, [2]*USDA, ARS, National Animal Disease Center*, *Ames, IA,*, [3]*University of Saskatchewan*, *Saskatoon, SK, Canada*.

Failure of passive transfer (FPT) continues to affect a significant portion of North American dairy calves, contributing to high preweaning morbidity and mortality rates as well as impaired long-term health and performance. The goal of this presentation is to review key components of a successful colostrum management program with emphasis on recent research findings of practical importance to the industry. A successful colostrum management program will require producers to consistently provide calves with a sufficient volume of clean, high quality colostrum within the first 6 hours of life. Colostrum quality may be improved through the dry cow vaccination program, proper feeding and management of the dry cow, and rapid harvest of colostrum within 6 hours after calving. Use of either a nipple bottle or esophageal tube feeder will provide equal and high levels of passive transfer of immunoglobulin (Ig), provided a large enough volume of colostrum is fed. Microorganisms that may be found in colostrum are of concern because i) pathogenic organisms can cause clinical or subclinical disease and ii) bacteria in colostrum can interfere with passive transfer of colostral Ig, contributing to FPT. Experts recommend that fresh colostrum contain fewer than 100,000 cfu per ml total bacteria count and fewer than 10,000 cfu per ml total coliform count. Methods to reduce colostrum contamination will include careful attention to udder preparation prior colostrum harvest, strict adherence to protocols for sanitation of milking, storage and feeding equipment, and avoiding the pooling of raw colostrum. Bacterial proliferation in stored colostrum can be reduced or minimized by feeding within 1-2 hours of collection, rapid refrigeration (feed within 48 hours) or freezing. Colostrum replacers can also be useful tools, with recent studies demonstrating a lower risk of subclinical Johne's disease in calves originally fed a colostrum replacer vs raw colostrum. If using replacers, producers should feed 150 to 200 g IgG in a product that has been tested for efficacy. Pasteurization of colostrum (60 ° for 60 min.) can reduce pathogen exposure while maintaining colostrum Ig, resulting in enhanced passive transfer of Ig.

Key Words: colostrum, bacteria, calf

168 Strategies to minimize the impact of heat stress on heifer health and performance. J. W. West*, *University of Georgia*, *Tifton*.

Heat stress research has largely focused on the lactating cow because of easily measured parameters such as milk yield and efficiency. Less emphasis has been placed on dairy heifers, either because they are not affected by heat stress (doubtful) or because economic returns to managing for heat stress are less evident. Literature suggests that heifers are impacted by heat stress through slowed growth, impaired immune function or poor reproduction. Data from the southern U. S. and Caribbean regions at latitudes less than 34°N suggests that Holstein females weigh 6 to 10 percent less at birth and average approximately 16 percent lower body weight at maturity than those in more northern latitudes, even when sired by the same bulls (NRC, 1981). Potential explanations include greater maintenance requirements with hot weather, poorer forage quality, and reduced immune function. Is there a physiologic difference in newborns which experience heat stress *in utero*? Heat-stressed ewes and beef cows exhibited reduced uterine blood flow and lower birth weight for newborns. Brains and livers of lambs from heat stressed ewes were smaller, leading to the concern that newborns from heat-stressed mothers may be smaller at birth and less vigorous and lacking the metabolic machinery to thrive following birth. Colostrum from cows exposed to heat stress during late gestation and early lactation may have lower immune globulin content and coupled with the impact of heat stress on newborn calves, mortality losses can be large. Management in heat stress environments should occur at several levels. Environmental modification is crucial for the late gestation cow and for the newborn calf. Maintenance costs are higher reducing potential growth rate for heifers, thus attention to nutrition is necessary to achieve desired rate of gain. Heifer conception rate is typically better than for mature cows; however reproduction efficiency suffers in heifers as well. Good performance in a heifer management program will result from attention to environment, nutrition and health in hot climates.

Key Words: heat stress, dairy heifers, management