cable or again using bluetooth technology. Applications enable the user to wand an animal and if a management option is needed for that animal, the information is visually displayed and an audible alert is sounded. Additionally, a milk weight input program has been developed utilizing these same technologies. In a 450 cow herd in Texas, results show that misidentification of animals has been eliminated. On days that milk weights are obtained, time required to identify animals has been reduced by 70%. New applications, such as routine verification of cows in designated groups, are accomplished by passing the wand past each cowâ•™s ear in a particular management group. This application was not previously feasible with visually read eartags. RFID eartags facilitate advancements to herd recording by providing an inexpensive, accurate devise for animal identification that has been incorporated into the herd management system.

Key Words: Herd Management, RFID, Bluetooth

471 Use of radio frequency identification (RFID) eartags and barcoded labels for identification of laboratory submissions. S. Stewart*[1], C. Clobes[2], B. Dokkebakken[2], and S. Eicker[3], [1]*University of Minnesota*, *St. Paul*, [2]*Minnesota DHIA*, *Buffalo, MN*, [3]*Valley Ag Software*, *Tulare, CA*.

The National Animal Identification System (NAIS) is a system of premises and individual animal identification currently under development. The system will allow rapid traceback of animals in the case of an animal disease outbreak or a bioterrorism attack. Details are still being determined, but producer acceptance and adoption will be critical for the overall success of the program. Producers will be more likely to adopt these identification systems if there were additional uses for management. While other forms of identification may also be utilized, one leading candidate for individual animal identification is radio frequency identification (RFID) eartags. A project was designed to utilize electronic recording of RFID eartags to produce barcoded labels for milk and blood samples for diagnostic testing. At the lab, barcoding should greatly lessen manual entry, improve tracing of samples, and help integration of results. During this project, RFID eartags were placed in 3369 animals on 9 premises. Blood was drawn from 2575 of these animals. These samples were placed in ultracold storage after being labeled with the date, visual ID, RFID, and premise ID embedded in the barcodes. Milk samples were obtained from 229 additional animals for mastitis culture. The milk samples were labeled at the time of collection with a label containing the visual ID, RFID, premise ID, date, and the DHIA herdcode in both human readable text and barcodes. Equipment utilized included a handheld computer communicating via BlueTooth to a battery operated RFID reader and also communicating via 802.11b (WiFi) to a portable barcode printer. Software (PocketDC) was developed for data recording and transfer to herd management software as well as the BlueTooth and WiFi communication protocols.

Key Words: RFID, Dairy, Barcode

Extension Education: Training Programs, Program Evaluation, and Economics

472 Competency acquisition of workers participating in the Penn State Dairy Production Skills Certificate. S. S. Costello*, L. A. Holden, A. J. Heinrichs, E. P. Hovingh, M. O'Connor, V. A. Ishler, R. E. Stup, and B. J. Hilty, *Pennsylvania State University*, *University Park*.

High performing dairy workers must effectively apply key production competencies in their work. The Penn State Dairy Production Skills Certificate (DPSC) is intended to improve job competencies of new employees. DPSC consists of six 2-day modules taught on a commercial dairy. To obtain a certificate, workers must successfully complete the General Production module and 3 additional electives. Choices include Reproduction, Herd Health, Calf-Heifer, Feeding, and Milking Management. The study objective was to evaluate module effectiveness toward enhancing job competencies. Pre and post-training instruments were administered and a score of 70% or above indicated successful competency. An evaluation was used to measure training effectiveness and document plans for 1 to 3 months post-training. Results from Reproduction, Herd Health, and General Production are presented here. A mean of 10 workers attended each module. Pre-training scores ranged from 2 to 95% demonstrating diverse prior knowledge. Mean pre-training scores for Reproduction, Herd Health, and General Production were 46, 50, and 53%, respectively. Mean post-training scores were 89, 76, and 83%, respectively. Competency improvement from highest to lowest was 43% for Reproduction, 30% for General Production, and 26% for Herd Health. Of 28 employees participating in three modules, 89% scored 70% or above on post-training assessment. Based on survey instrument and paired t-test, students made significant improvement within each production area ($p<0.005$). Most common plans for change included: practice improved listening, 77.7%; improve time management, 66.7%; improve breeding timing, 44%; use estrous synchronization differently, 44%; improve heat detection, 44%; use new herd tools for diagnosis, 44%; and improve safety hazard awareness, 44%. Results from individual modules will be used to enhance DPSC and develop advanced and management certificates. Post-training scores indicate competency improvement for workers participating in DPSC.

Key Words: Dairy, Worker, Training

473 Calf sense: Learning to manage newborn dairy calves. R. E. Stup*, A. J. Heinrichs, R. Van Saun, and D. Wolfgang, *Pennsylvania State University*, *University Park*.

Calf morbidity and mortality continues to be a large problem on dairy farms across the United States. Although mortality rates of less than 2% are achievable, the average rate in the U.S. in 2001 was 8.7%. Calf management practices at birth and in the first hours immediately thereafter can have a profound impact on health and survivability. Management is more than simply understanding the science behind calf health and survival; it also involves taking steps to ensure that effective practices are consistently used in the workplace. Calf Sense is a one-day farm owner and employee training program designed to combine scientific knowledge with practical management schemes in a learning experience that helps participants transfer effective calf management to the workplace. Calf Sense includes presentation of scientific and background material along with small-group, hands-on workshops where participants practice what they have learned. Presentations are held in the morning; topics include newborn calf health, colostrum absorption and management, and achieving consistent calf care. Participants divide into small groups for afternoon workshops and rotate through four, one-half hour sessions focusing on: conducting a basic newborn health exam, testing colostrum quality using a colostrometer and understanding rumen physiology, testing for transfer of antibodies from colostrum to blood, and applying standard operating procedures and record-keeping systems. Evaluation results were overwhelmingly positive. Participants rated the usefulness of presentations and workshops on a scale from 1 to 5 with 1 = "not useful" and 5 = "extremely useful." Results from 75 participants on five separate workshops have been summarized. All presentations scored between 4 and 5, except immunity transfer which scored 3.9. On a scale from 1 = "strongly disagree" to 5 = "strongly agree," participants indicated that they would use the training (4.55) and equipment (4.44) they received to improve newborn calf management at their farm.

Key Words: Calf, Management, Labor

474 Documenting the impact of continuing and extension education on changing adult behavior. D. Moore*[1] and H. Slotnick[2], [1]*University of California, Davis*, [2]*University of North Dakota, Grand Forks*.

Behavior change is the ultimate goal of an educational program but is difficult to accomplish and document. Behavior change theory suggests that adults go through stages of change. This project tested a learning stage evaluation method in two different audiences. A survey using clinical scenarios was used to elucidate participant stage of learning before and after a 5-day continuing veterinary education course on dairy records management. Pre-program learning stage prevalences were compared with those of non-participants. Responses included: 1. I would refer this problem (not applicable); 2. I can handle this, no need to update (evaluation); 3. I need to update (learning); 4. I have recently updated (gaining experience). Differences in stage prevalence were analyzed using Chi-square analysis and a triangular graphical method which resulted in vectors of group movement through learning stages. Each vertex of an equilateral triangle represented each stage. Each side of the triangle represented up to 100% of each stage. Given three mutually exclusive responses, a single point representing the group was plotted before and after the program. A vector was drawn between them to show magnitude and direction of movement. The technique was also used to evaluate a short-term educational program (90-minute). Four scenario topics were covered in the lecture while three were not. After the 5-day program, learning stage prevalence for six of eight scenarios were different between attendees and non-attendees. Participants' rate of change ranged from 31-81%. For four scenarios, participants moved from learning to gaining experience. For the others, they moved through two stages, evaluation to gaining experience. After the 90-minute program, the majority moved toward evaluation for three scenarios not covered and to learning or gaining experience for four topics covered. Readiness to change dictates the change a person can make or whether they attend a program or not. A long-term program can move more people from one stage to another. A short program can make small changes in learning stage movement.

Key Words: Program Evaluation, Continuing Education, Extension

475 Benchmarking dairy information for efficient decision making using interactive visual tools. G. Boda*, R. Lacroix, and K. M. Wade, *McGill University, Montreal, QC, Canada*.

The objective of the study was to explore the concepts of benchmarking for dairy-herd decision making, specifically in North America. The major concepts of benchmarking are introduced and illustrated in the dairy-herd context. Internal and competitive benchmarking techniques are proposed as useful approaches in the identification of problem areas on the dairy farm over time. An existing interactive visual tool (IVT), [copy write dairy information systems group, 2004] is used for the visual representation of dairy data from different databases. Visually descriptive and interactive features of the tool are useful to choose the comparison group, focus on specific variables, filter the data according to selected criteria, and zoom in on specific traits to examine performance in greater detail. Such flexibility should allow users both to identify potential problem areas sooner and to concentrate on areas that will allow for a maximization of productivity. Dairy farm profitability is directly related to production management factors. However, simply increasing production does not necessarily lead to more profit. In order to improve overall profitability, targets are set for production parameters in dairy herds with the aim of enhancing the efficiency of production. Improvements to existing visual tools that allow for the study of various scenarios in existing management parameters may help in this regard. This study examined such a procedure using four of the main areas of management in Quebec dairy-herd management - namely, somatic cell count, calving interval, days dry, and age at first calving. If we consider a dairy farm of 60 cows with a bulk tank SCC of 234 thousand cells/ml, then the estimated loss is $32,292, considering a proposed optimum of 100 thousand cells/ml. An economic gain visual interactive tool is proposed, utilizing profit or loss estimates based on current herd performance parameters.

Key Words: Benchmarking, Interactive Visualization, Dairy

476 Changing to an internet-based aquaculture service program. G. J. Burtle*, *University of Georgia, Tifton*.

Distance diagnostics and E-mail usage has increased, but telephone calls, site visits, and office visits are still important service activities for aquaculture related issues in Georgia. Service requests included the issues of fish disease control, pond water quality, aquatic weed identification and control, and aquacultural economics. Communications between the Extension aquaculture specialist and Extension agents have traditionally been dominated by telephone calls that result in a site visit or the shipment of samples for diagnostics or analysis. A system of distance diagnostic image transfer was developed in order to replace visits to counties or individual producers which require large expenditures of time and resources. Two methods of image transmission were made available to Extension agents, 1) attachments to E-mail messages and 2) a Distance Diagnostics System with security protection. Images sent by E-mail were unformatted and included information at the discretion of the Extension agent. The Distance Diagnostics System required password protected access, a formatted report, a requirement for image submission, the option of referrals to other professionals, a submission filing system, and technical assistance. Digital imaging systems with microscopes and video cameras were placed in 57.6% of the counties strategically located to allow multi-county use. Over a four year period, Extension agents increased service calls (14.4%). The traditional service communications also increased (3.6%). Extension agents using the Distance Diagnostics System increased by 833% while use of E-mails to request services declined by 57.7%. However, Extension agents still used E-mail almost twice as much as the Distance Diagnostics System. Sample submission for analysis continues to be required after digital image submission due to poor image quality, the limitations of the imaging system, or need for laboratory analysis prior to recommendations.

Key Words: Aquaculture, Diagnostics, Service

477 Youth livestock handling safety education. J. Yost* and S. Boyles, *The Ohio State University, Columbus*.

The study group was composed of 273 4-H and FFA youth ranging in age from 8 to 19 years old. All participants are given a pre- and post-test on animal handling techniques and animal behavior. There were a total of 7 questions on each test relating to animal behavior. After the pre-test, a 15 min lecture on animal behavior was presented. Participants were then divided into groups of ten based on 4-H/FFA project species. Each group is given a sheet of paper (66 x 78 mm) and a permanent marker. The groups were allotted 20 min and instructed to develop the type of facilities they would house their animals in during their project. The groups would then present their designs to the rest of the participants. There is no critiquing allowed. The pre- and post-test had the same questions. All pre- and post-test questions were multiple choice and there could be more than one correct response to each question. One-way ANOVA was used with a confidence interval of 95%. There was an increase in the percent correct responses from the pre-test to the post-test questions relating to safe animal handling (+11), what causes injuries (+14), what frightens animals (+21), an animal's blind spot location (+21), causes of stress (+17), and why animals get excited (+21). However, no change was observed in their knowledge of an animal's flight zone. Participants increased their knowledge of the factors that effect safe animal handling. The youth also gained a greater understanding of the negative physiological effects stress impose on livestock. Through development of the facility and presentation of the drawing, members were allowed to develop their communication, teamwork, leadership, problem solving, and decision-making skills.

Key Words: Youth, Facilities, Animal Handling

478 Factors influencing the value of West Virginia feeder cattle. P. Osborne*, E. Rayburn, and J. Pritchard, *West Virginia University, Morgantown*.

West Virginia cattle producers have been marketing feeder calves through commingled graded sales since 1932. The sale price of feeder calves is influenced

by a number of factors such as sex, weight, grade, breed, lot size, location and health. A multiple regression analysis was conducted on data gathered from eight WV sale barns during the fall of 2000 to 2004 for special graded sales. The base calf for the analysis was a black, medium frame (M), No.1 muscle, steer calf weighing 550 lbs..The following table quantifies the average value of the factors influencing price. WVU Extension developed a feeder calf marketing program that specialized in the development and sales of Quality Assurance(QA) Cattle. The program was developed to pool and sell load lots of source and health process verfied calves under Beef Quality Assurance standards. An economic analysis was conducted to compare the QA and graded sales(GS) in 2001-2004. The comparison was made between the QA calves and the M1 & L1 Black & BWF calves in the graded sales. The QA calves had a market advantage in increased value of $61,$54,$66 and $61/hd in 2001 to 2004 respectively. The QA calves were heavier than the GS calves (P<.01) with average increase in weight ranging from 40 to 76 lbs/hd and an average value per head due to weight of $36 to $90. Historically, the pooled calves have sold for 12% more than comparable barn cattle.

Factors Influencing Calf Values

Year	<2000>	<2001>	<2002>	<2003>	<2004>
Avg. Base Value	483.55	464.37	417.83	516.99	592.48
Heifer	-51.68	-55.02	-47.05	-45.31	-46.54
Bulls	-29.41	-31.00	-37.97	-29.52	0.00
L1	-6.82	-9.62	-7.98	-6.31	-9.16
S1	-62.57	-70.12	-65.28	-72.04	-73.04
LM2	-42.72	-35.46	-30.06	-29.95	-41.96
No Grade	-65.33	-39.94	-53.95	-45.76	-56.44
BWF	2.97	-2.53	-0.49	6.30	7.24
CHARX	-15.40	-14.25	-15.62	-11.80	-12.61
REDX	-20.07	-23.49	-17.93	-20.03	-18.05
HERE	-45.53	-44.36	-38.86	-44.60	-59.97
LOT SIZE	0.41	0.56	0.61	0.50	0.71
WEIGHT	0.51	0.53	0.50	0.69	0.75

Key Words: Feeder Cattle, Value Added, Graded Sales

479   Beef artificial insemination economics. W. Ellis*, *Southeast Missouri State University*, *Cape Girardeau.*

The objective of the study was to compare gross sale income between calves sired by artificial insemination (AI) or a clean-up bull. One hundred and twenty animals were enrolled in the study (12 heifers, 108 cows). A 30-day CIDR-based AI protocol was used to synchronize estrus and computerized Heat Watch technology was used to detect estrus in heifers. Cows were Fixed-time AI following a CIDR-based protocol that included GnRH. One AI sire was used for all AI services. Cows were randomly assigned to one of two experienced AI technicians, stratified by age of cow, days postpartum, and body condition score. Clean-up bulls were introduced 14 days after fixed-time AI. Pregnancy diagnosis was determined by ultrasonography. First AI service pregnancy rate following estrus synchronization was 70/120 (58%) and pregnancy rate after the breeding season (AI and clean-up) was 113/120 (94%). There were 66 AI and 42 cleanup calves conceived. Calves were marketed as weaned calves (n=25, 5 AI), bred heifers (n=37, 23 AI) or harvest weight steers on a grid system (n=46, 38 AI). Overall, gross income per calf from AI and clean-up sires averaged $1169.97 ± 33.76 and $952.15 ± 60.76, respectively. Gross income per calf was significantly different between sire groups for weaned calves (p<0.05) and harvest weight steers (p<0.05) but not bred heifers (p>0.5). Bred heifer buyers were knowledgeable of their mode of conception. Weaned calves from clean up bulls were fed 119 days longer post weaning than their AI counterparts and had a higher gross sale value (+$220/calf). Gross income per bred heifer averaged $34 higher for AI over clean up bulls while gross income per harvest weight steer averaged $131 higher for AI. The cost of synchronization and AI was $31.29 per female and $56.89 per AI calf. The cost of synchronization and AI was recovered through higher sale income per AI calf in harvest weight steers but not in weaned calves or bred heifers.

Key Words: Beef, Artifical Insemination, Economics

FASS Symposium on Toxic Levels of Minerals

480   Sources and bioavailabilities of toxic levels of minerals. J. W. Spears*[1] and J. P. Goff[2], [1]*North Carolina State University*, *Raleigh*, [2]*USDA, National Animal Disease Center*, *Ames, IA.*

Most minerals, whether essential or nonessential, can produce negative effects on production and/or health of animals when consumed orally at high concentrations. This presentation will focus on potential sources and bioavailability of minerals most likely to present toxicosis in animals. For the essential trace minerals copper and selenium, oversupplementation or errors in formulation of mineral supplements are frequent causes of toxicosis. Depending on the mineral in question, other potential sources that may lead to toxicosis include: 1) feedstuffs, 2) water, 3) minerals present as contaminants of certain mineral ingredients, 4) consumption of animal waste or by-products, 5) soil ingestion, and 6) exposure to industrial products (batteries, paint, etc.). High concentrations of a mineral in feedstuffs can result from high soil mineral levels due to soil type, use of sewage or industrial sludge, or industrial pollution. In animals ingesting high concentrations of a mineral, bioavailability of the mineral from the source of exposure is a major factor determining whether toxicosis will occur. Chemical form of the mineral present in a given source and the presence of antagonists in the diet are primary factors that affect bioavailability

Key Words: Minerals, Toxicity, Bioavailability

481   Toxic levels of minerals in the diets of animals. J. Goff*[1] and J. Spears[2], [1]*National Animal Disease Center, USDA-ARS, Ames, IA*, [2]*North Carolina State University*, *Raleigh.*

Ingestion of any mineral at a high enough level can have detrimental effects on the health and productivity of animals. This presentation will provide examples of the maximal tolerable levels of a number of minerals commonly causing problems in food and companion animals. These maximal tolerable levels are, for most minerals, also dependent on the length of time they are fed. For most minerals a maximal tolerable level is noted for a single oral dose; an acute dose, at which problems would not be expected if feeding the mineral at this level for less than10 days; and a chronic dose, at which problems would not be expected if feeding the mineral at this level for more than 30 days. In general the maximal tolerable level implies no effect on productivity of the animal. For some minerals such as sulfur in ruminants, sudden death due to polioencephalomalacia may be one of the first indicators of decreased performance of the animal when the mineral is fed beyond the maximal tolerable level. In the case of minerals such as calcium, intolerable levels may be defined as levels interfering with feed intake or utilization of other minerals, rather than induction of pathological changes. The presentation will briefly review the new recommendations, especially as they contrast with the 1980 Mineral Tolerances of Domestic Animals publication.

Key Words: Toxicosis, Minerals, National Research Council

332

J. Anim. Sci. Vol. 83, Suppl. 1/J. Dairy Sci. Vol. 88, Suppl. 1