(MS) boars experience puberty at a younger age than commercial crossbred (CB) boars in association with earlier cessation of Sertoli cell proliferation and smaller postpubertal testicular size. The objectives of the current study were 1) to define changes in the production of anti-Mullerian hormone (AMH) and p27kip1, markers of Sertoli cell differentiation, in prepubertal MS and CB boars (n > 3/breed/d), and 2) to relate these changes with the pubertal expansion of the seminiferous tubules. Presence of AMH and p27kip1 were assessed by immunohistochemistry and densitometric analyses using a Bioquant Nova color imaging system. Testicular weights were similar (P>0.10) in MS and CB boars at 7, 28 and 49 d of age although CB boars had greater (P<0.01) body weight at these ages. Testes weights of MS increased more rapidly than in CB after 49 d of age and were greater (p<0.02) at 70, 91 and 112 d of age. Diameter of seminiferous tubules increased (P<0.01) at a younger age and to a greater extent in MS than in CB boars. Relative amount of AMH, a product of less mature Sertoli cells, increased in both breeds from 7 to 28 d. AMH then declined thereafter at a more rapid rate (P<0.001) in MS than in CB boars and was nearly absent at 70 d in MS and at 112 d in CB boars. Seminiferous tubules containing p27kip1 were first detected at 28 d in some MS and at 70 d in some CB boars (P<0.01) and increased in both breeds through 112 d. The earlier onset of pubertal development in MS boars was characterized by expansion of seminiferous tubules at a younger age in association with a more rapid decline in AMH production and an earlier increase in p27kip1, indicative of an earlier onset of Sertoli cell differentiation in MS relative to CB boars.

Key Words: Boar, Testis, Puberty

895 Transcript profiling of testes from boars divergently selected for testosterone production. M. S. Ashwell*, S. Druyan, C. M. Ashwell, and J. P. Cassady, *North Carolina State University*, *Raleigh*.

The objective of this research is to identify changes at the gene level associated with 10 generations of divergent selection for testosterone production in response to a GnRH challenge. After ten generations of selection, average testosterone levels were 75 and 200 ng/ml for the low and high lines, respectively. Lines were subsequently maintained using random selection. Testicles from five boars from each line in generation 21 were collected at 1, 30, and 120 days of age. Tissues were snap frozen in liquid nitrogen and stored at -80°C for transcript profiling using a 13,297-oligonucleotide swine microarray. RNA was extracted from all boars from both lines, pooled by age and line, fluorescently labeled with either Cy3 or Cy5, and hybridized to the arrays. Hybridization intensity data were LOWESS-normalized within and across the arrays and analyzed using ANOVA. In total, 25 genes showed differential expression with a false discovery rate of 8%. Ten of these 25 genes have no known function or characterization. Most of these 25 genes were found to be differentially expressed across ages and by the interaction of age and line. The ability to detect differences in gene expression between the lines that are related to the observed differences in testosterone level is in part a result of the degree of replication in the array. Two genes associated with steroid biosynthesis, steroidogenic acute regulatory protein and aromatase type II, were shown to be differentially expressed. Validation of these findings is underway using real-time PCR methods.

Key Words: Swine, Gene Expression, Steroid Biosynthesis

Production, Management & the Environment - Livestock and Poultry: The Evolving National Animal Identification System

896 The Canadian Livestock Traceability System. J. M. Stitt*, *Canadian Cattle Identification Agency*, *Calgary, Alberta, Canada*.

The Canadian Cattle Identification Agency (CCIA) is a not-for-profit National Agency, incorporated in 1998, and led by a Board of Directors, representing all sectors of the livestock industry. The mandate of CCIA is to establish and maintain an efficient Animal Health and Food Safety Identification and Traceability system. With the program fully implemented on July 1, 2002, CCIA has been successfully established as a leader in Animal Identification and Traceability. Guided by National Standards and operating Under the ID Regulations within the Federal Health of Animals Act, the CCIA, in partnership with the Canadian Food Inspection Agency (CFIA), has achieved 98-100% compliance nationally. The CCIA system provides multi-species services and currently houses the beef, dairy, bison and sheep trace back data and is offering services to pork and poultry. In 2003, the Canadian cattle industry committed to the transition from barcode dangle tags to Radio Frequency Identification Devices (RFID). The program is industry supported, sustainable and has proven invaluable through the recent BSE investigations. The Canadian System incorporates the 3 Key Pillars for Traceability; Animal Identification, Premises Identification and Animal Movement. Additionally, it offers Value-Added services, as required by industry. Age Verification is one example of a Value-Added service assisting in assuring market access. The program implementation was not easy and as we expand on the national infrastructure we continue to face challenges. The successful implementation and commitment to ongoing development of the National Livestock Traceability System can be attributed to:

- support from all sectors of the cattle industry across Canada

- national communications strategy

- shared industry/government partnership

- commitment for industry to lead the program

- commitment to keep the program user-friendly, cost-effective and scaleable

- the unfortunate but timely global Animal Health and Food Safety issues.

CCIA is committed to ensuring that all program components continue to meet and exceed evolving Domestic and International requirements.

Key Words: Traceability, Identification, CCIA

897 Issues surrounding existing and potentially disruptive RFID technologies for the identification of food producing animals. D. A. Blasi*, *Kansas State University*, *Manhattan*.

The primary objective of a voluntary US National Animal Identification System (NAIS) when fully operational is the integration of the

regulatory capacity of animal health. Several species working groups (bison, cattle and equine) initially recommended the implementation of low frequency (LF) radio-frequency identification (RFID) technology based on internationally recognized ISO 11784/11785 standards in order to achieve the goal of a 48-hour trace back when the system is fully operational. LF technology has been manufactured, on an industrial basis, since the mid 1990s and is used in multiple animal identification systems worldwide. The subsequent adoption of a technology-neutral position by USDA to ensure a level playing field for all types of technologies has created a surge of startup companies promising new technologies that are readily available off the shelf and capable of offering improved solutions to existing LF technology at a fraction of the cost. Emerging technologies have not been validated under a variety of livestock environments for transponder retention and read range performance. Moreover, performance standards do not exist for any existing technology at the present time. The USDA has recognized the importance of standardization within NAIS for ensuring compatibility across vendors and international recognition of identification technologies used within the system. The USDA has subsequently endorsed the use of ISO 11784/11785 standards for livestock producers who elect to use RFID in the NAIS with the proviso for establishment of voluntary consensus standards for emerging technologies in the US through the American National Standards Institute (ANSI). This institute could facilitate the acceptance of standards for emerging technologies at the international level. All technologies must be fairly and consistently evaluated in transparent testing environments. The development of this process is essential for ensuring that NAIS– approved technologies can achieve the primary objective while providing the most economical means of individual identification for the livestock producer.

Key Words: Animal Identification, Technology

Ruminant Nutrition: Intake Behavior/Acidosis/Metabolism - Dairy

898 Feed sorting in dairy cattle: Effects of repeated acidosis challenges. T. J. DeVries*[1], F. Dohme[2], and K. A. Beauchemin[1], [1]*Agriculture and Agri-Food Canada*, *Lethbridge, AB*, [2]*Agroscope Liebefeld-Posieux*, *Posieux, Switzerland*.

An experiment was conducted to determine if dietary forage content influences feed sorting by dairy cattle and whether this changes during acidosis. Eight ruminally cannulated cows were assigned to either a high (HF, 60% forage) or low forage (LF, 45% forage) diet (DM basis). Following a 2 wk adaptation, cows were exposed to 2 repeated acidosis challenges (2 periods) separated by 14 d. The challenge consisted of restricting feed to 50% of ad libitum intake for 24 h, followed by a meal of 4 kg of ground barley/wheat before ad libitum allocation of TMR (challenge day). Ruminal pH was measured continuously. Feed and orts were sampled for 2 baseline days, on the challenge day, and 1, 2 and 5 d after the challenge day for each animal and subjected to particle size analysis. The separator contained three screens (18, 9, and 1.18 mm) and a bottom pan to determine the proportion of long, medium, short and fine particles, respectively. Sorting activity was calculated as actual intake as a percentage of predicted intake. To determine if sorting occurred, each fraction was tested for a difference from 100%. The bout of acidosis following the challenge was more severe ($P<0.05$) in period 2 and was greatest ($P<0.05$) for cows fed LF. Cows fed LF sorted ($P<0.01$) for medium particles (107%), but against long (92%), short (98%), and fine particles (90%). Cows fed HF sorted ($P<0.01$) for medium (103%) and short particles (102%), but against long particles (89%). Overall, sorting for medium particles and against fine particles were greater ($P<0.01$) on the LF diet. Diet × period × day interactions ($P<0.01$) indicated that during period 2, LF cows decreased their sorting against long particles and increased sorting against short and fine particles on the day after the challenge when acidosis was most severe. These results suggest that the proportion of forage in the diet affects how dairy cows sort their feed. Furthermore, cows experiencing severe acidosis preferentially sort their feed to attenuate the effects of this disease.

Key Words: Acidosis, Sorting, Forage

899 Severity of ruminal acidosis increases with repeated bouts particularly when cows are fed low forage diets. F. Dohme*[1], T. J. DeVries[2], K. A. Beauchemin[2], K. M. Krause[3], and K. S. Schwartzkopf-Genswein[2], [1]*Agroscope Liebefeld-Posieux, Research Station ALP*, *Posieux, Switzerland*, [2]*Agriculture and Agri-Food Canada*, *Lethbridge, AB*, [3]*West Virginia University*, *Morgantown*.

An experiment was conducted to determine the response of cows to repeated acidosis challenges. Eight lactating ruminally cannulated cows were assigned to one of 2 diets (DM basis): high fiber (HF, 60% forage) or low fiber (LF, 45% forage). Following a 2-wk adaptation, cows were exposed to 3 acidosis challenges (3 periods), each separated by 14 d. The challenge consisted of restricting feed to 50% of *ad libitum* intake for 24 h, followed by a meal of 4 kg of ground barley/wheat before *ad libitum* allocation of TMR (challenge day). Ruminal pH was measured continuously. Total acidosis was defined as pH < 5.8, moderate acidosis as pH < 5.5, and severe acidosis as pH < 5.2. The entire grain allotment was consumed by all cows in Period 1, 6 cows in Period 2, and only 3 cows in Period 3. Despite reduced grain intake in each period, the severity of acidosis increased ($P < 0.05$) in each period: mean pH dropped by 0.13 pH units, minimum pH dropped by 0.20 units, and duration of total acidosis increased by 2 h/d. Furthermore, the severity of acidosis following the challenge was greater for cows fed LF compared to HF, as evidenced by diet × period interactions ($P < 0.05$) for area under the total acidosis threshold, area under the moderate acidosis threshold, and duration of acute acidosis. Those variables indicated that the severity of acidosis increased from Period 1 to 3 by 3 to 6-fold for cows fed LF and by 2 to 4-fold for cows fed HF. This study indicates that cows become more prone to acidosis over time even though they alter feed intake to avoid acidosis. The severity of each subsequent bout of acidosis increases, especially when cows are fed diets low in physically effective fiber. Therefore, a bout of acidosis that occurs due to improper feed delivery or poor diet formulation can have long-term consequences on cow health and productivity.

Key Words: Acidosis, Ruminal pH, Physically Effective Fiber