506 Control of cow hypocalcemia: Field application of ion-selective field effect transistor technology. E. M. Rodríguez*[1], A. Bach[1,2], N. Abramova[3], A. Bratov[3], A. Ipatov[3], and A. Arís[1], [1]*Department of Ruminant Production, IRTA, Caldes de Montbui, Spain,* [2]*ICREA, Barcelona, Spain,* [3]*BioMEMS Group, IMB-CNM, CSIC, Bellaterra, Spain.*

The early detection of subclinical levels of blood calcium (Ca) in the cow can avoid later health and production problems. Therefore, a field Ca sensor could be a powerful tool. The aim of this study was to develop a reliable prototype to quantify blood Ca in the cow, to define its specifications and to determine the influence of blood Ca daily circadian fluctuations in the periparturient cow. An analytical system based on ion-selective field effect transistor (ISFET) with Ca selective photocurable membranes was developed to offer a semiautomatic Ca analysis of serum (obtained by thrombin coagulation or centrifugation), plasma or direct blood. The sensor Ca measurements were validated by comparing the results with those obtained using the ICP-OES reference method. Cleaning solutions based on proteolytic enzymes in a neutral solvent, detergent or HCl were tested. Twelve Holstein multiparous cows were sampled at 24–48 h postcalving to analyze daily blood Ca changes at 0700, 1400, and 2000 h. Data were analyzed with a mixed-effect model with repeated measures. The precision of the analysis by ISFET was greater than reported for double charged ions with a σ within 3–7%. A linear response in the $0.1–10^{-5}$ *M* Ca concentration range and a detection limit of 3×10^{-6} *M* were obtained. Each analysis takes <20 min and only 100 µL of sample is needed. The serum samples obtained after thrombin coagulation or centrifugation and the plasma samples did not differ from the total Ca concentration determined using the reference method. However, direct blood measures differed from the reference measures and shortened the life of the ISFET to a single use. The best way to recuperate the sensors' response was the cleaning of the system with the proteolytic solution, although the detergent yielded positive outcomes as well. Blood Ca levels were not affected by daily circadian fluctuations. In conclusion, the results demonstrate that ISFET technology can be applied efficiently to analyze serum or plasma Ca in the cow as a new fast, reliable and inexpensive method. Also, blood samples from the periparturient cow can be obtained any time of the day.

Key Words: cow, hypocalcemia, ion-selective field effect transistor (ISFET)

507 Calcium urinary excretion in dairy cows with different levels of glucose tolerance. E. Schwegler*[1], F. da Rosa[1], A. Silva[1], E. Oliveira[1], P. Montagner[1], M. Weschenfelder[1], A. Krause[1], C. Brauner[1], E. Schmitt[2], V. Rabassa[1], A. Schneider[1], E. Xavier[1], F. Del Pino[1], and M. Correa[1], [1]*Federal University of Pelotas, Pelotas, RS, Brazil,* [2]*Brazilian Agricultural Research Corporation, EMBRAPA-CPAFRO, Porto Velho, RO, Brazil.*

During the peripartum dairy cows experience a transitory period of insulin resistance. In humans, insulin resistance is associated with increased urinary excretion of calcium (Ca). Therefore, the aim of this study was to assess the Ca urinary excretion during the peripartum in dairy cows with different levels of glucose tolerance during the prepartum period. Nineteen pluriparous Holstein cows were enrolled in this study. Glucose tolerance tests (GTT) were conducted at 20d prepartum. The GTT was based on an infusion of 500 mg/kg body weight of glucose and posterior determination of serum glucose concentrations at several time points up to 180 min and the calculation of the glucose area under the curve (AUC). The cows were categorized according to the rate of glucose metabolism into sensitive group (GS: higher glucose metabolism, 8,194 ± 388.6 mg/dl), intermediate group (GI, 12,079 ± 528.2 mg/dL) and resistant group (GR: lower glucose metabolism, 15,507 ± 292.4 mg/dL). Blood and urine samples were collected on d −23, −14, −7, −3, 0, 3, 6, 9, 16 and 23 from calving. Concentrations of creatinine (Creat) and Ca were analyzed in serum (S) and urine (U). The Ca excretion in the urine was estimated by calculating the fractional excretion (EF) using the formula: (UCa/SCa) × (SCreat/UCreat) × 100. Statistical analysis was performed using the SAS. According with the AUC categorization, 6 cows were in the GS, 7 cows were in the GI and 6 cows in the GR. The GR had higher fractional excretion of calcium in the prepartum (96.3 ± 10.4%) than the GS (59.2 ± 8.8%) ($P < 0.01$). Calcium excretion in GI (59.5 ± 7.6%) was similar to GS ($P > 0.05$), but lower than GR ($P < 0.05$). In the postpartum period the GR (27.7 ± 3.7%) had an increased Ca excretion than GS (16.1 ± 3.3%) ($P = 0.02$), although GI similar between GR and GS (21.9 ± 3.0%) ($P > 0.05$). In summary, the present study indicates that prepartum cows less tolerant to glucose excrete more urinary calcium in the pre and postpartum periods. More studies to understand the potential effects of these results on the etiology of hypocalcemia are necessary.

Key Words: glucose tolerance, peripartum, calcium urinary excretion

508 The association of postpartum calcium concentration with body weight change and milk production in dairy herds with automatic milking systems during the first 30 days in milk. L. S. Caixeta*[1], P. A. Ospina[1], S. K. Johnson[1], M. Capel[2], and D. V. Nydam[1], [1]*Cornell University, Ithaca, NY,* [2]*Perry Veterinary Clinic, Perry, NY.*

The objectives were to characterize calcium concentration variability and evaluate the association between subclinical hypocalcemia (HPC) and changes in body weight (BW) and milk production (MP) within the first 30 d in milk (DIM) in herds with automatic milking systems. In a prospective cohort study of 3 herds, 105 dry cows were enrolled and followed until 30 DIM. Serum samples were analyzed for calcium at 1, 2 and 3 DIM. Based on previous reports, HPC was defined as having at least one reading between 6 and 8 mg/dL and treated as a dichotomous variable in the analysis. Daily measurements of BW and MP were used to estimate BW change over time and total MP in the first 30 DIM. Occurrence of any disorders: displaced abomasum, ketosis, milk fever, retained placenta or metritis, was also included in the analysis as a dichotomous covariate. The Mixed procedure in SAS was used to evaluate the association between HPC, disease, herd, and any biologically relevant interactions with BW and MP. HPC was found in 17% of primiparous and 65% of multiparous animals. Both disease and HPC status were significant predictor variables ($P < 0.01$), thus the result of the interaction between them is reported in Table 1. Subclinical hypocalcemia was not a significant predictor of milk production in primiparous animals, but multiparous cows with HPC produced 45.5 kg ($P < 0.01$) less milk than those without HPC during the first 30 DIM. Mature animals with HPC exhibited more rapid weight loss and produced less milk than their normocalcemic counterparts.

Table 1. Body weight change (kg) per day over the first 30 DIM and the interaction between disease (Dz) and subclinical hypocalcemia (HPC) by parity group; ll interactions had $P < 0.01$.

	Parity 1	Parity 2	Parity ≥3
No Dz × No HPC	−0.42	−1.44	−1.25
No Dz × HPC	−1.35	−1.22	−1.75
Dz × No HPC	−1.67	−2.40	−0.75
Dz × HPC	−1.10	−0.66	−2.13

Key Words: hypocalcemia, body weight, milk