Peripartum calcium administration strategies influence on farrowing performance, stillbirths and piglet livability

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TAKE HOME MESSAGE:

1. Calcium gluconate injection can decrease stillbirths and increase the percentage of pigs born alive in sows identified as at-risk for greater stillbirth incidence
2. Feeding calcium chloride to sows prior to farrowing showed some benefits in early trials, but recent research failed to observe better performance. The lack of consistency may be related to the level of CaCl supplemented, duration of supplementation, or base level of sow productivity

Why may calcium be related to stillborn rates?

Many factors, including nutrition, farrowing management, supervision, intervention protocols, and overall environment have been examined for their influence on the incidence of stillborn pigs (Vanderhaeghe et al., 2013). Among U.S. swine farms with the lowest pigs weaned per mated female per year, stillbirths account for 8.8% of total pigs born (MetaFarms, 2024). Risk factors associated with increased stillbirth rate include older parity sows, prolonged farrowing duration, large litter sizes, late birth order, and lack of farrowing supervision (Le Cozler et al., 2002; Adi et al., 2024). In addition to increasing the risk of stillbirths, prolonged farrowing is associated with greater incidence of asphyxiated newborn pigs. Asphyxiated pigs consume less colostrum, which increases their susceptibility to hypothermia and starvation (Trujillo-Ortega et al., 2007). Recently, Craig et al. (2024) identified low blood calcium as a potential physiological risk factor, with increased stillbirth rates observed in sows whose serum calcium levels were below 2.5 mmol/L prior to farrowing. Calcium is essential for smooth muscle contraction, including effective uterine contractions during labor (Uehata et al., 1997), which may help explain why low calcium is associated with more difficult farrowings and higher stillbirth rates. Due to the significant focus on hypocalcemia (milk fever) in dairy cattle, calcium has also become a point of interest in sow research. However, physiological responses to different forms of calcium in sows remain unclear. This knowledge gap provided the basis for the trial and the resulting summary.

Calcium chloride ($CaCl_2$) is one feed supplement that has been used in sow diets from entry into the farrowing house until parturition to support calcium levels and potentially reduce stillbirth incidence. Previous research generally shows that $CaCl_2$ supplementation can reduce stillbirths (Elrod et al., 2015; Bents and Soto, 2023; González-Sánchez et al., 2023). However, some studies report benefits primarily in unsupervised (Ruampatana et al., 2024) or mid-parity sows (DeRouchey et al., 2005), while others, including Craig et al. (2024), found no effect. Beyond simply providing calcium, $CaCl_2$ lowers the dietary cation-anion difference (DCAD), which is known to improve calcium absorption and mobilization in dairy cattle (Abu Damir et al., 1994). Although calcium homeostasis around parturition is less understood in sows, DeRouchey et al. (2003) reported increased ionized calcium when DCAD was reduced. Another Ca supplement used in U.S. swine production systems to support farrowing performance is injectable Ca gluconate (CaG). This compound is commonly administered in dairy cattle to treat hypocalcemia which is a condition triggered by the sudden increase in Ca demand before parturition due to the rapid increase in milk production (Oetzel, 2022). Although no controlled research trials have evaluated the use of CaG injections during farrowing in sows, case studies suggest it may alleviate dystocia symptoms (Durrell, 1942; Chutia et al., 2018; Reshma et al., 2020).

Evaluation of calcium administration protocols around farrowing study objective and design

To compare these calcium administration protocols, researchers at Kansas State University recently completed a large commercial study in partnership with JBS Live Pork (Jenkins et al., 2025). A total of 933 sows (average parity 3.3, PIC Line 1050) and their litters were used to evaluate peripartum calcium administration protocols on piglet livability, sow performance before cross-fostering, and sow and piglet blood parameters. Sows were blocked by parity and average stillbirths in previous farrowings then allotted

to one of three treatments on approximately d 112 of gestation. Treatments included: 1) Control with sows receiving no intervention; 2) 25 g of a calcium chloride-based product ($CaCl_2$; TRIAD, Alltech, Inc., Nicholasville, KY) top-dressed daily each morning from approximately day 112 of gestation until farrowing; or 3) calcium gluconate injection (CaG; VetOne; Boise, ID) administered to primiparous and multiparous sows (15 or 20 mL injection, respectively), if a sow was classified as "at-risk" defined by the sow having more than 16 pigs, longer than 1 hour since the birth of the last pig, 2 or more stillbirths, or farrowing duration exceeding 4 hours. On a subset of sows, farrowing duration, sow blood metabolites, sow urine pH, and pig immunocrit were analyzed. Sows received the $CaCl_2$ top-dress which is a proprietary blend of $CaCl_2$, Yucca schidigera extract, and flavors encapsulated in a lipid matrix for an average of 4.8 ± 0.14 days before farrowing. All sows were fed approximately 4 lb/day (2 lb each morning and afternoon) from d 112 of gestation until farrowing.

For each sow, litter characteristics (liveborn, stillborn, and born mummified) were recorded on a sow card by a member of the farm farrowing team during each walk through the farrowing house (approximately every 15 min). If it had been longer than 30 min since the birth of the last pig or the sow appeared to be in distress, farrowing assistance (sleeving) occurred and if a pig was present in the birth canal, it was manually removed. Any instances of farrowing assistance were recorded on the sow card, regardless of whether a pig was removed or not. Oxytocin was used sparingly and only 8 sows received oxytocin during this trial, with 4 sows from the CaG treatment and 4 sows from the $CaCl_2$ treatment. On a subset of sows (74/treatment) farrowing duration, sow blood metabolites, sow urine pH, and piglet immunocrit were analyzed.

Sows were also categorized into 2 subsets: at-risk sows (n = 411) or other sows (n = 522) across the three treatments for additional statistical analysis. At-risk sows were those that met the criteria to receive Ca gluconate injection (sows with > 16 pigs, > 1 h since the last birth, ≥ 2 stillbirths, or farrowing lasting > 4 h) and farrowed during hours when personnel were present (between the hours of 6:00 AM until 3:00 PM). Because sows were assigned to treatment before farrowing, there were also sows assigned to the CaG treatment that were not later classified as at-risk sows and, thus, did not receive an injection of CaG. Other sows included those that farrowed during working hours (6:00 AM until 3:00 PM) but did not meet the criteria for a CaG injection, as well as those that farrowed overnight when farrowing intervention was unavailable.

What did we learn?

For the overall sow population, there were no differences in total born, percentage born alive, or percentage stillborn between treatments; however, when at-risk sows were compared, administration of CaG decreased stillbirths and increased percentage of pigs born alive. Birth to cross-foster mortality was increased in $CaCl_2$ sows compared to control sows with CaG sows intermediate.

For blood measurements, when considering all sows, sows fed $CaCl_2$ had increased blood Cl and ionized Ca compared to Control or CaG sows. Sows provided CaG had increased blood glucose levels compared to Control sows with $CaCl_2$ sows intermediate. In the present study, the only difference in sow metabolites in at-risk CaG sows when compared to

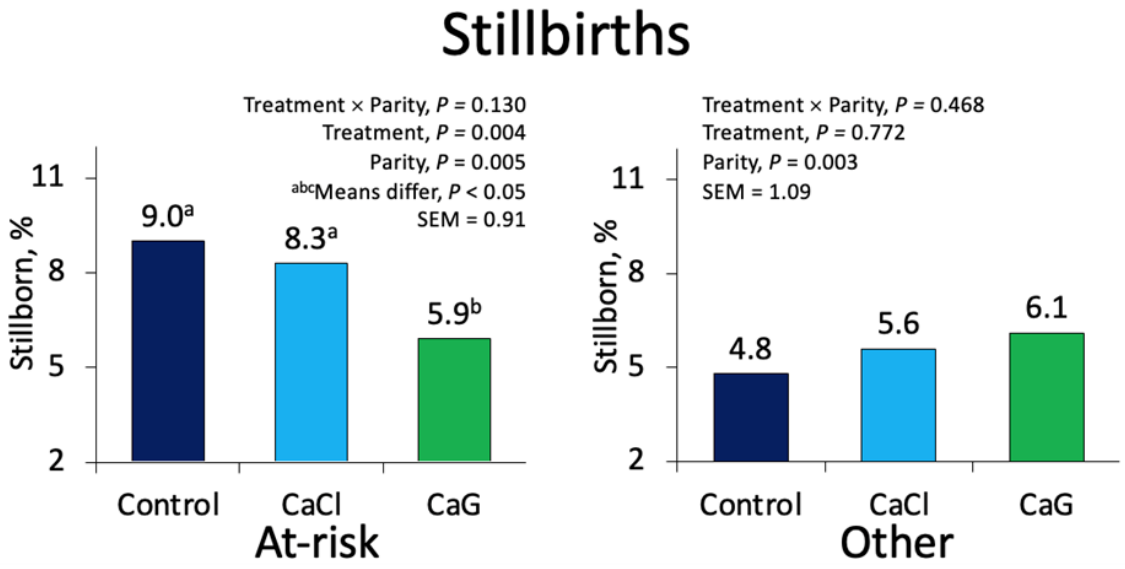

Figure 1. Effect of calcium administration protocol on stillbirths within risk group.

at-risk control and $CaCl_2$ sows was elevated circulating glucose. Sows given $CaCl_2$ or CaG had decreased urine pH compared to Control sows. Pig immunocrit ratios tended to differ due to Ca protocol, with CaG offspring having a numerical increase compared to other treatments indicating potentially increased colostrum consumption.

Conclusion

For the overall sow population, topdressing the $CaCl_2$-based product before farrowing affected sow blood and urine metabolites during farrowing but did not influence farrowing performance. However, for at-risk sows (sows with > 16 pigs, > 1 h since the last birth, ≥ 2 stillbirths, or farrowing lasting > 4 h), administration of a CaG injection decreased stillbirth rate leading to an increase in the percentage of pigs born alive.

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This project was supported by the National Pork Board (PR-005981) and the Foundation for Food and Agriculture Research.

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