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Should We Test Commercial Magnesium Sources Used for Dairy Cows?

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Magnesium (Mg) is an essential mineral and plays a critical role in bone development, muscle contractions, and nerve function. Unlike calcium or phosphorus, Mg stored in bone cannot be easily mobilized during periods of deficiency, it needs to be consumed daily. This is especially important for high-producing cows, which have greater nutritional demands. Blood concentrations of Mg within 2.19 to 2.92 mg/dL are considered normal. When blood Mg levels fall below this range, cows are at risk of developing hypomagnesemia.

Clinical hypomagnesemia should be suspected when cows show signs resembling milk fever, such as muscle tremors, seizures, or sudden death, along with low blood Mg concentrations (<1.95 mg/dL suspicious of hypomagnesemia; < 1.7 mg/dL hypomagnesemia). In early lactation, hypomagnesemia is frequently associated with hypocalcemia. Cows in mid-lactation are also at risk of hypomagnesemia, particularly during heat stress or when diets are high in potassium. A case study from a California dairy reported some mid-lactation cows that experienced sudden seizures and death during the summer due to hypomagnesemia. After increasing the dietary Mg level, no further cases occurred that season (Urdaz et al., 2003). Magnesium deficiency can result from low dietary Mg, or reduced absorption of the Mg included in the diet.

What Affects Magnesium Absorption?

Type and quality of Mg sources: Not all magnesium sources are created equal. Manufacturing processes, such as calcination (removes impurities) at ~800 °C, improve reactivity, and smaller particle size proportion (<200 mesh) significantly increases solubility and Mg uptake by the cow (Schonewille, 2013; Jesse et al., 1981). However, finely ground particles can be fluffy and difficult to handle, which may pose challenges during mixing and feed preparation.

Dietary antagonists: Potassium (K) is considered the main dietary antagonist of Mg; it interferes with Mg absorption in the rumen. For every 1% increase in dietary K, Mg absorption may decrease by up to 7.5% (Weiss, 2004). This is particularly relevant during summer, when dairies may supplement extra K in diets as a heat stress mitigation strategy.

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Study. Our recent study at UC Davis evaluated the relative availability of five inorganic Mg sources commonly used in dairy diets (Silva-del-Río et al., 2024). The goal was to compare how different sources were absorbed and taken up by the cow. We tested **MgO** (magnesium oxide), **$CaMg(CO_3)_2$** (calcium magnesium carbonate), **$CaMg(OH)_4$** (calcium magnesium hydroxide), **$MgSO_4$** (magnesium sulfate, which is known to be highly available), and a new proprietary mineral blend containing multiple Mg forms. The solubility of the Mg sources at pH 6 was also tested.

Key Results. All sources tested showed good relative availability and solubility *except* $CaMg(CO_3)_2$, which had low solubility and limited availability within 24 hours. The positive correlation we identified between in vitro solubility and relative availability supports using solubility as a practical tool to screen Mg sources.

Bottom Line. Our study and recent research show that the solubility of common Mg sources used to feed dairy cows, like MgO and $CaMg(CO_3)_2$ can vary widely (5% to 35%; Khiaosa-arda et al., 2023), reinforcing the need for testing the quality of these products.

Join Our Study: Mg Testing

We are currently evaluating the solubility of commercial magnesium products. If you are interested in learning how your magnesium source performs, **please ask your nutritionist to complete this survey and submit a Mg sample:** Mg survey click here

References for the information presented in the article are available upon request, please email rbrancolopes@ucanr.edu

HPAI Survey

You are invited to participate in a short survey conducted by the University of California Cooperative Extension and University of California Davis. Our goal is to better understand how to support the dairy industry during the Highly Pathogenic Avian Influenza (HPAI) H5N1 outbreak. Your insights will help to make our extension program relevant to your operation. Your responses will remain anonymous, and the survey should take approximately 5 minutes to complete.

Survey link: https://ucanr.edu/hpaioutreachsurvey

Questions: Contact Noelia Silva-del-Río at nsilvadelrio@ucdavis.edu

Back to Basics: Adequate Quantities of Clean, Fresh Water Support Health and High Production Performance of Lactating Cows

Ed DePeters – UC Davis & Jennifer Heguy – UCCE Merced, Stanislaus & San Joaquin

Water is an essential nutrient for all animals and is particularly important for high-producing milking cows. A lactating dairy cow loses water through milk, feces, urine, respiration, and sweating. Milk is about 87% water, accounting for a tremendous amount of water loss each day by lactating cows. These water losses must be replenished.

Summer, with its high environmental temperatures, is approaching so now is the time to catch up on maintenance:

- thoroughly clean water troughs/tanks,
- check water-flow rates,
- perform repairs to prevent leaks or overflows (picture),
- think about how your troughs meet the needs of your cows and if changes need to be made to function and design.

Photo: Deanne Meyer, UC Davis & UC ANR

A lactating dairy cow will consume anywhere from 70% to 90% of her daily water intake as free water (drinking from the trough), with the remainder coming from feed ingredients. Silages and wet by-products, commonly fed in total mixed-rations (TMR), are the main sources of water in feed. In a daily time budget for lactating cows housed in freestalls, cows spent approximately half an hour a day drinking. This is a small amount of time, but it is important. Cattle are suction drinkers, and a lactating dairy cow can drink water at a rate as high as 6.3 gallons/minute. A lactating dairy cow requires between 4.5 to 5 pounds of water for each pound of milk produced. For a herd average of 100 pounds of milk/cow/day, the average cow is drinking between 55 and 65 gallons of water each day. This quantity will vary, especially when high summer environmental temperatures greatly increase a lactating cow's consumption of water. Of the 30 minutes spent drinking, lactating cows tend to drink after feeding and after milking. These are important time points during the day when an adequate supply of clean, fresh water is needed to support health, productivity, and welfare.

Recommendations for providing water for lactating dairy cows are challenging to make because every freestall housing design differs. But we will make some "broad" recommendations to consider. Managers will need to consider their facility design and modify the recommendations.

* **Water flow rate.** To provide adequate water for cows during thirsty times, a flow rate of as high as 30 gallons/minute has been recommended by professionals. A range of 12 to 30 gallons/minute is probably typical on dairy farms.

* **Water access.** For pens with 100 or more milking cows, a minimum of two locations for water allocation is needed. In freestall barns, water troughs are often located at crossovers. Adequate space is needed at these crossovers, so cows have free and easy access to water. Cows also seek water when leaving the milking parlor, making water access important in the exit alleys.

* **Water access proximity.** Cows should not be required to walk more than about 50 feet to access water, meaning water troughs should be close to feed lanes. Cows tend to drink after eating.

* **Sizing water troughs is not easy.** For a cow group of 200 cows or less, the water stations should accommodate 15% of the cows at any time. For groups over 200 cows, that accommodation increases to 20% of the cows at one time.

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* **Water trough depth.** Water troughs with a depth of 10 to 14 inches tend to keep water fresh and clean. Water troughs/tanks with greater depth tend to accumulate feed and other debris, are more difficult to clean, and often create stagnant water.

* **Cleanliness**. Water troughs should be easy to clean. Troughs that both empty (for cleaning) and fill quickly make routine cleaning easier. Troughs should be cow-proof so curious cows do not empty the trough, leaving all cows without water. Cleaning frequency is dairy labor and management dependent. Cleaning water troughs frequently, at least weekly, keeps the water clean and fresh. If visual inspections determine the trough needs cleaning, then it should be cleaned, even if it deviates from the predetermined schedule.

* **Maintenance.** Water trough plumbing should be visually inspected every time staff enters a pen to ensure everything is working properly.

Take Home Message: Water is an essential nutrient. Providing cows with an adequate supply of clean, fresh water supports cow health and high production performance. Cleaning and inspecting water troughs are an important part of any management program that supports overall farm profitability.

References for the recommendations and information presented in the article are available upon request, please email jmheguy@ucdavis.edu

Strengthening Biosecurity on Dairies: Best Practices for a Healthy Herd

Betsy Karle – UCCE Sacramento Valley & Northern California & Noelia Silva-del-Rio – UC Davis & UC ANR

As we continue to navigate Highly Pathogenic Avian Influenza (**HPAI**) H5N1 (Bird Flu) in our local dairy herds, reinforcing biosecurity protocols among employees and visitors remains critical. As of May 8, 2025, CDFA has confirmed a total of 771 infected dairies since the outbreak began in California. Over 600 of those dairies have been released from quarantine and Northern California still remains largely unaffected by HPAI H5N1 cases. Strengthening basic biosecurity practices is key for preventing HPAI H5N1 transmission but also for reducing the spread of other infectious diseases that threaten animal health and productivity. Here are some basic biosecurity recommendations:

Animal movement- It was clear that animal movement played a significant role in the HPAI H5N1 outbreak. Even if you've already navigated through the outbreak and have some level of herd immunity, it is still wise to evaluate animal movement protocols. Can newly arrived animals be isolated more effectively in the future? Can your daily procedures involve handling these animals last during daily chores? Is there a way to close the herd or limit animal movement? In an open herd, what other biosecurity practices can be implemented to mitigate the risk that animal movement poses? These are big questions that might not work for your facility but are worth pondering.

Visitors and traffic patterns- Vendors, consultants, haulers, and other visitors should understand they have a responsibility to adopt biosecurity practices, especially if they are visiting multiple farms on the same day. There should be a clear expectation that all visitors wear clean clothing and disinfected boots or disposable boot covers. Parking areas away from animal housing and handling areas should be used and visitors should not be driving around the dairy, especially in feed alleys. Higher risk traffic like rendering trucks should have a specific route that keeps them away from the herd.

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Employee attire and PPE- Farm-specific boots and coveralls are a simple yet effective first line of defense to reduce the risk of pathogen transfer from employee clothing or footwear onto your dairy. Employee attire should remain on-site and be laundered at the facility. Such practices are especially important when employees work at multiple farm locations or share housing with individuals employed at other farms. Shared housing has been identified as a potential route for HPAI H5N1 transmission between dairy and poultry operations.

HPAI H5N1 is a zoonotic disease (meaning that it can spread from animals to humans) as are many other endemic diseases present on dairies. Personal protective equipment (PPE) should be used according to the level of risk present in the herd. While gloves are always mandatory for milkers, additional PPE should be worn when handling sick animals or milking cows during any disease outbreak. According to OSHA (Bird Flu Information for Employers), additional measures such as enhanced PPE use (protection for the eyes, nose, and mouth), biosecurity and PPE training, exposure controls, and written safety procedures are required in workplaces during the outbreak or quarantine. Above all, handwashing facilities should be readily available and properly used before eating or drinking and after handling animals. Eating and drinking should only take place in designated areas.

Wildlife, Bird, & Rodent Control- Non-farm animals can play a role in the spread of numerous diseases. Efforts to mitigate the impacts of nuisance and pest animals is challenging, but implementing an integrated pest management strategy to minimize their impact can be beneficial.

Final Considerations

While it's impossible to lock down facilities in a way that will completely prevent the spread of disease, there are small steps that can be taken for incremental improvements. A veterinarian in the thick of the outbreak in another state recently remarked, "H5N1 is a dress rehearsal for a foreign animal disease." While we all hope that won't happen, the comment is valid and should be heeded. Steps that we take now will set us up to be better prepared in the face of another, probably inevitable challenge in the future.

More resources and signage can be found at https://h5n1.extension.org/ . The California Dairy Quality Assurance Program (CDQAP) has a resource page at https://cdqap.org/hpai/. The National FARM program has biosecurity resources that are accessible at https://nationaldairyfarm.com/dairy-farm-standards/farm-biosecurity/.

Thoughts for Future Newsletter Editions?

Please fill out a quick survey to help us tailor future editions of the Golden State Dairy Newsletter to your needs. It should take you less than two minutes to complete the survey.

Click the survey link or scan the QR code with your phone's camera:

https://ucdavis.co1.qualtrics.com/jfe/form/SV_9FCbztTDx9YhL82

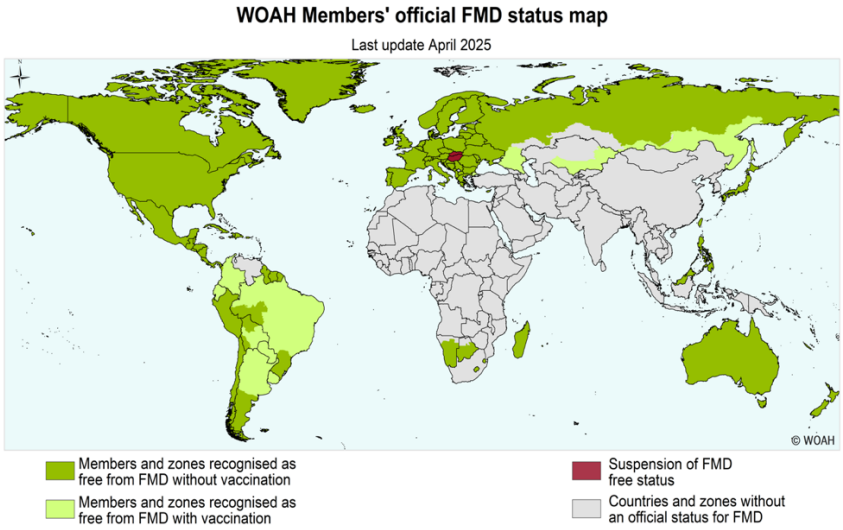
Foot-and-Mouth Disease in Europe: Insights for California Dairy Farmers

Emmanuel Okello – UC Davis & UC ANR

Recent outbreaks of foot-and-mouth disease (FMD) in parts of Europe have raised concern among global livestock industries. While the disease is currently contained overseas, it serves as a stark reminder of the vulnerability of livestock operations worldwide, including right here in California.

What is Foot-and-Mouth Disease?

Foot-and-mouth disease is a highly contagious viral infection that affects cloven-hoofed animals such as cattle, pigs, sheep, and goats. It is endemic in many countries, particularly in regions like Africa, Asia, and South America. The United States has been free of FMD since 1929.



Source: World Organization for Animal Health

The typical clinical signs of FMD include blisters on the nose, tongue, lips, inside the mouth, and feet. Ruptured blisters can lead to severe lameness, reduced appetite, and hypersalivation. Other signs may include fever, depression, weight loss, and decreased milk production. In acute cases, death can occur before blister development.

The FMD virus spreads rapidly through direct contact, aerosols, and contaminated feed and equipment; it can also spread over long distances through the air. While FMD does not impact public health or milk safety, it poses significant challenges to the livestock industry due to trade restrictions, culling measures, and prolonged movement bans.

Recent FMD outbreaks in Europe

On March 7, 2025, an FMD outbreak was confirmed at a dairy farm in Hungary located near the Hungarian-Slovakian border. Two weeks later, Slovakia confirmed FMD outbreaks in facilities adjacent to the Hungarian border. Laboratory tests confirmed that the FMD virus from both outbreaks was a complete match. Both countries swiftly implemented animal health control measures following European Union regulations, including the culling of all cattle at the affected site and a contact establishment, as well as the establishment of a provisional restricted zone, ring vaccination, and surveillance. The outbreak has already led to temporary trade bans on meat and dairy products from affected regions.

Other recent outbreaks have occurred in Germany in January 2025, Georgia in 2023, Turkiye in 2023, and the United Kingdom in 2007. These outbreak events have reminded the global livestock community that FMD remains a persistent threat, especially in an era of global trade and increased movement of people and animals.

What Are the Risks to the U.S.?

Although the United States has been free of FMD since 1929, the risk of an outbreak remains. The FMD virus can be introduced through the illegal importation of contaminated meat products, infected animals, or travelers who have come into contact with affected livestock abroad. California, as the nation's leading dairy-producing state, has a lot to lose. An outbreak could halt exports, lead to the culling of thousands of animals, and severely disrupt the dairy supply chain.

U.S. Preparedness and What You Can Do?

The good news is that federal and state animal health agencies are vigilant. The U.S. Department of Agriculture (USDA), in collaboration with state agencies and industry stakeholders, has developed a national FMD response plan. This includes:

- Surveillance and early detection systems
- Emergency vaccination strategy
- Movement control protocols and biosecurity guidelines
- Mass depopulation, disposal, and sanitization
- Secure food supply plans for continuity of business during outbreaks

For more info, see: https://www.aphis.usda.gov/sites/default/files/fmd_responseplan_ppshort.pdf

As a dairy farmer, your role in ensuring preparedness includes:

- Strengthening on-farm biosecurity: Restrict farm access, disinfect vehicles and equipment, and maintain visitor logs.
- Educating farm workers about FMD signs and reporting procedures.
- Avoid risky imports and be cautious if returning from travel to affected countries.
- Staying informed through your veterinarian, CDFA, and USDA updates.

What is the bottom line?

While the FMD outbreak in Europe is currently under control, it is important to remain vigilant. By staying alert, improving biosecurity, and being prepared to respond, California's dairy community can help safeguard animal health and maintain market access.

References for the information presented in the article are available upon request, please email eokello@ucdavis.edu

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http://cetulare.ucanr.edu/Agriculture782/Dairy/

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