TMR360: A Holistic Approach to TMR Feed Safety

trouw nutrition
a Nutreco company

WHY TMR FEED SAFETY MATTERS

Total Mixed Ration (TMR) sits at the heart of modern ruminant nutrition, designed to deliver consistent and balanced nutrients in every bite. But this same complexity also makes it vulnerable. With multiple ingredients and constant exposure during storage and feed-out, TMR can quickly become a hotspot for mycotoxins, harmful bacteria, spoilage organisms like yeasts and molds.

The real challenge is that these risks don't occur in isolation. Mycotoxins can act together, while microbial contamination further reduces feed quality . The result is a cumulative stress load that can silently impact intake, rumen stability, and immune resilience.

Too often, these issues are underestimated and they are not caused by a single issue, but by a combination of interacting factors across the entire feeding system.

That's why managing TMR quality isn't just about fixing one issue, it requires a holistic approach, from raw materials to feed-out, to protect performance where it matters most: at the feed bunk.

KEY CONTAMINANTS IN TMR

1. MYCOTOXINS: THE INVISIBLE THREAT

Mycotoxins are toxic secondary metabolites produced by fungi, commonly present in silages, grains, and by-products.

- Invisible and chemically stable, persisting even after molds are no longer visible.
- Often undetected without laboratory analysis.
- Typically responsible for chronic, subclinical effects rather than acute symptoms.

Negative effects of most common mycotoxins:

- Aflatoxins → liver damage, immune suppression, milk contamination
- Deoxynivalenol (DON) → lameness, immunosuppression
- Zearalenone (ZEN) → irregular heats, reduces conception rate, ovarian cysts, abortions
- DON, T2 toxin → reduces milk production, mastitis, gastroenteritis, hemorrhagic bowel, reduces ruminal function and intestinal absorption, diarrhea, ketosis
- DON, T2 toxin, Fumonisin (FUM) → feed refusal, reduced intake, reduced feed efficiency

KEY CHALLENGE:

Co-contamination is the rule, not the exception. Multiple mycotoxins frequently occur simultaneously, even at low concentrations, increasing overall risk.

2. MICROBIAL CONTAMINATION: OFTEN IGNORED

TMR is highly susceptible to spoilage due to microbial activity combined with environmental and management factors.

Primary microbial risks:

- Yeasts → Trigger aerobic spoilage, causing heating and energy losses
- Molds → Proliferate following yeast activity and oxygen exposure, further degrading nutrients and potentially producing additional mycotoxins
- Enterobacteria / Clostridium → Typically indicates suboptimal hygiene, leading to nutrient losses and reduced feed quality.
- Pathogenic bacteria (e.g., Clostridium, Listeria, Salmonella) → Direct health risks

Key risk factors:

- Microbial load → Higher microbial load accelerates spoilage dynamics
- Temperature → Warm conditions (≥21 °C) accelerate spoilage; yeast populations can double every 2 hours
- Ingredient quality → Even 10% spoiled silage or unstable by-products can destabilize the entire TMR
- Moisture content → Higher moisture favors yeast and bacterial growth; wet TMRs heat faster than drier rations
- Management practices → Poor silage face or feed bunk management increases microbial proliferation

THE SYNERGY PROBLEM:
WHEN 2 + 2 = 7

One of the most critical, and often overlooked, aspects of TMR safety is the synergistic interaction and cumulative effect between contaminants.

Even when individual contaminants are below recognized risk thresholds, their combined effects can significantly amplify negative outcomes.

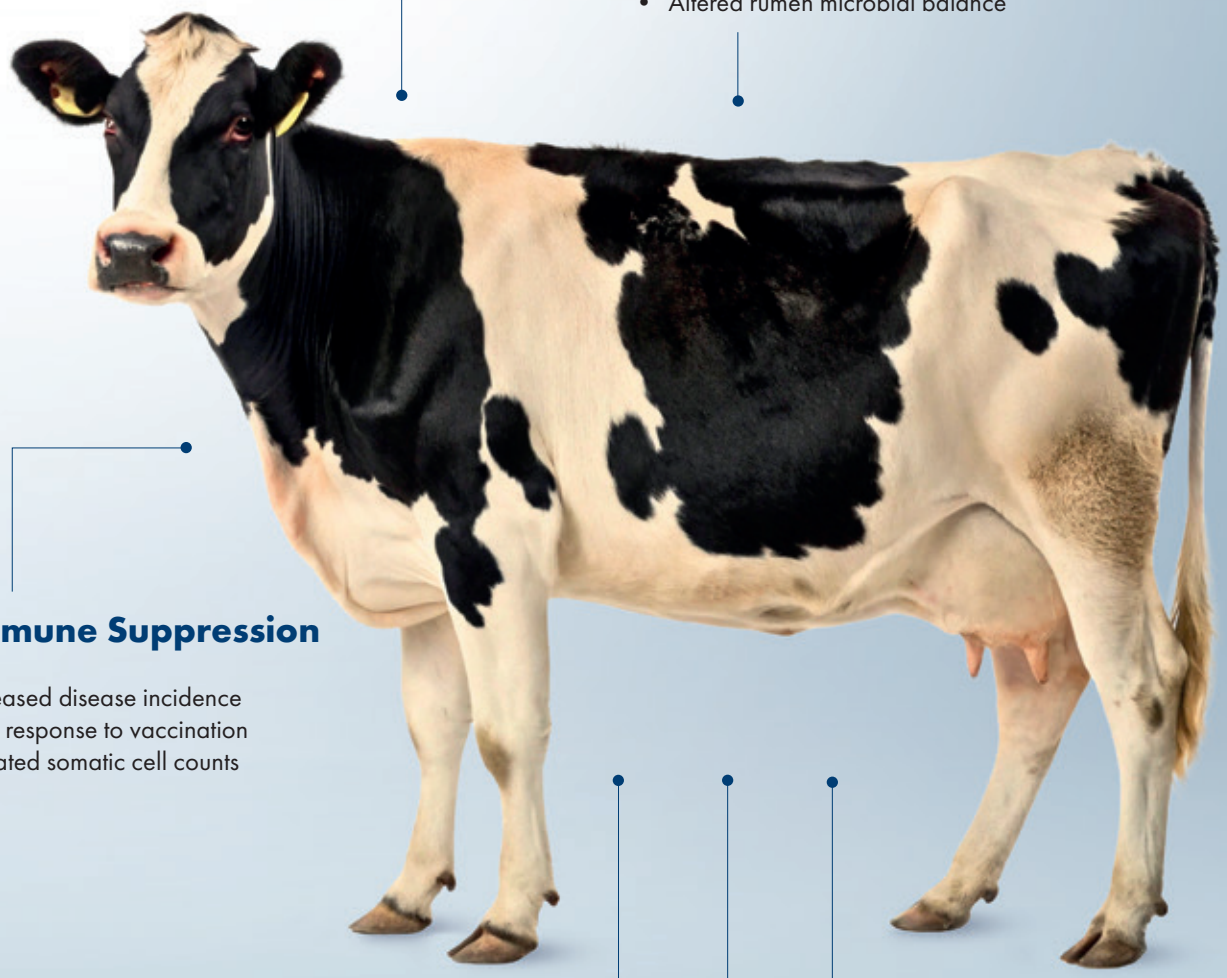
For example, in lactating cows, exposure to a TMR contaminated with a spectrum of low-level mycotoxins has been shown to markedly suppress milk production and reduce dry matter intake. These effects were significantly more severe than those observed when animals were exposed to the individual toxins at the same concentrations.

At the same time, the concurrent presence of mycotoxins and spoilage organisms such as yeasts and molds can impair rumen fermentation and reduce fiber degradability, while also compromising the rumen's natural detoxification capacity. In parallel, mycotoxins can disrupt gut barrier function and immune responses, creating favorable conditions for the proliferation and translocation of pathogenic bacteria.

Together, these factors increase the risk of toxin exposure and systemic microbial challenges, contributing to overall rumen instability and reduced animal resilience.

IMPACT ON ANIMAL HEALTH AND PERFORMANCE

Contaminated TMR typically leads to subclinical effects, which are difficult to detect but have substantial economic impact.



1. Reduced Dry Matter intake

2. Rumen Dysfunction

- Reduced fiber digestion
- Increased risk of subacute ruminal acidosis
- Altered rumen microbial balance

3. Immune Suppression

- Increased disease incidence
- Poor response to vaccination
- Elevated somatic cell counts

4. Gut Health and Integrity

- Increased intestinal permeability ("leaky gut")
- Systemic inflammation
- Greater susceptibility to pathogens

5. Reduced Performance

- Reduced milk yield and components
- Lower feed efficiency

6. Reproductive Disorders

- Irregular estrous cycles
- Reduced conception rates
- Increased embryonic loss

WHY A HOLISTIC APPROACH IS ESSENTIAL

Focusing on a single contaminant (e.g., mycotoxins alone) is not the best way to deal with the complexity of real-world conditions.

A Holistic TMR Safety Strategy Includes:

1. Raw Material Risk Assessment

- Evaluate silages, grains, and by-products for visible defects, microbial load, dryness, and prior spoilage history.
- Consider agronomic, harvest, and storage conditions, including weather stress, field contamination risk, silo density, packing quality, and oxygen exposure during storage -each of which influences mycotoxin formation and microbial growth.

2. Fermentation Quality Control

- Optimize ensiling practices by ensuring rapid anaerobic conditions, correct chop length, adequate compaction, and use of suitable inoculants to promote lactic-acid–dominated fermentation.
- Monitor pH, stability, and hygiene - silages with fast pH decline and minimal aerobic activity reduce the risk of yeast and mold proliferation and subsequent toxin formation.

3. Feed-Out Management

- Minimize oxygen exposure at the silage face and during mixing by maintaining clean, tight surfaces, removing only what is needed, and preventing excessive disturbance.
- Prevent heating, sorting, and secondary spoilage by controlling feedout speed, avoiding inclusion of visibly spoiled layers, maintaining mixer hygiene, and delivering rations with stable moisture and temperature.

4. Continuous Monitoring

- Track intake, milk production, and health indicators to detect early changes in performance, metabolic stability, or immune status that may signal feed hygiene issues.
- Regular checks of TMR for essential feed safety KPIs such as temperature, mycotoxin and microbial analysis.

TMR360 PROGRAM

TMR360 is a comprehensive feed risk assessment programme developed by Trouw Nutrition, integrating mycotoxin and microbial analysis to proactively manage hygienic risks in TMR. It supports safer rations, more resilient cows and supports sustainable dairy performance. The service integrates four key elements.

1. Global leadership in mycotoxin analytics

- Trouw Nutrition is recognised as a leader in **mycotoxin analysis,** supported by our **MasterLab facility** and an **established global network of laboratory services.**
- Through harmonised analytical methods and consistent quality standards, we generate **reliable, comparable mycotoxin data** across regions and feed materials.
- This global capability allows us to detect patterns, benchmark risks and support local decision-making with **globally grounded expertise.**

2. Robust microbial testing at global scale

- Our microbial analyses are underpinned by **MasterLab expertise** ensuring accuracy, consistency and scientific rigour.
- We assess key microbial indicators in forages and TMRs to support understanding of **feed hygiene, stability and spoilage risk.**

3. Data turned into feeding strategy

- What differentiates Trouw Nutrition is the link between **analytical results and nutritional expertise.**
- Analysis embedded in nutrition, not isolated from it.
- Insights are connected to **practical feeding recommendations.**

4. Integrity at the heart of everything we do

- At Trouw Nutrition, integrity is fundamental to how we work, how we analyse and how we advise.
- Integrity underpins every step of the **TMR360 analytical service**, from analysis to interpretation and advise
- Built on **scientific rigour, transparent reporting and ethical standards.**
- Evidence-based recommendations focused on animal health, performance and long-term farm resilience - not product-led solutions.

WHY THIS MATTERS

TMR360 is a trusted analytical service, combining:

- Mycotoxin & microbial expertise
- Nutritional interpretation & insights
- Integrity-driven tailored support and advice

All to support better decisions in complex ruminant feeding systems.

TMR360 helps shift feed management from a reactive to a proactive approach, supporting safer rations, healthier cows and more sustainable dairy performance.

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