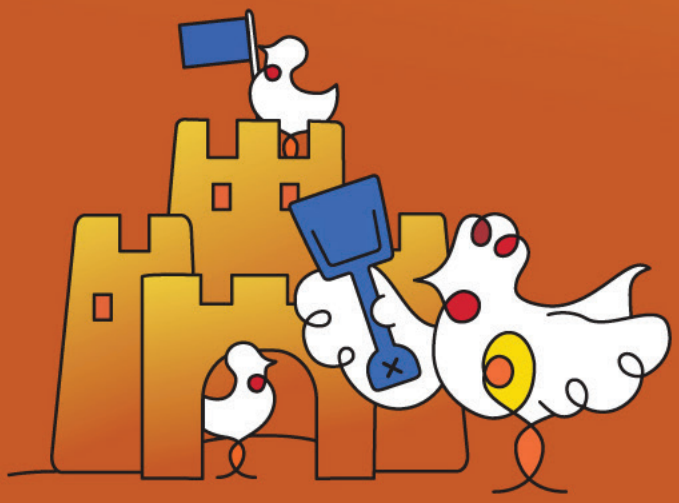
Managing Heat Stress to Improve Nutritional Efficiency in Poultry



E-BOOK

FOR POULTRY NUTRITIONISTS AND PRODUCTION TEAMS

Prepared by Jefo Nutrition

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Purpose and scope

This paper summarizes the physiology of heat stress in poultry, explains how heat load reduces nutritional efficiency through lower feed intake, altered digestion, compromised intestinal function, and changes in nutrient partitioning, and outlines mitigation practices that integrate nutrition with ventilation, cooling, water management, and monitoring. It is intended as an educational resource and a practical framework for on-farm decision-making during hot weather conditions.

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About Jefo

Founded in 1982, Jefo is a globally recognized leader in precision intestinal nutrition, serving producers and feed manufacturers in over 80 countries worldwide. The company is committed to improving animal health, productivity, and sustainability through innovative nutritional solutions designed for ruminants, swine, poultry, aquaculture, and pets.

By combining advanced scientific research with practical field expertise, Jefo develops specialized products that help optimize feed efficiency, strengthen animal performance, and support long-term farm profitability. Through its Jefo Matrix Technology® (JMT®), the company enhances nutrient delivery and stability, allowing animals to better absorb essential nutrients while reducing waste and environmental impact.

Beyond innovation, Jefo places great importance on sustainability, animal welfare, and customer partnership. The company's mission is centered on helping producers meet the growing global demand for high-quality animal protein in a responsible and efficient manner. With a strong international presence, dedicated technical support teams, and a commitment to continuous improvement, Jefo continues to position itself as a trusted partner in the advancement of sustainable animal nutrition and agricultural excellence.

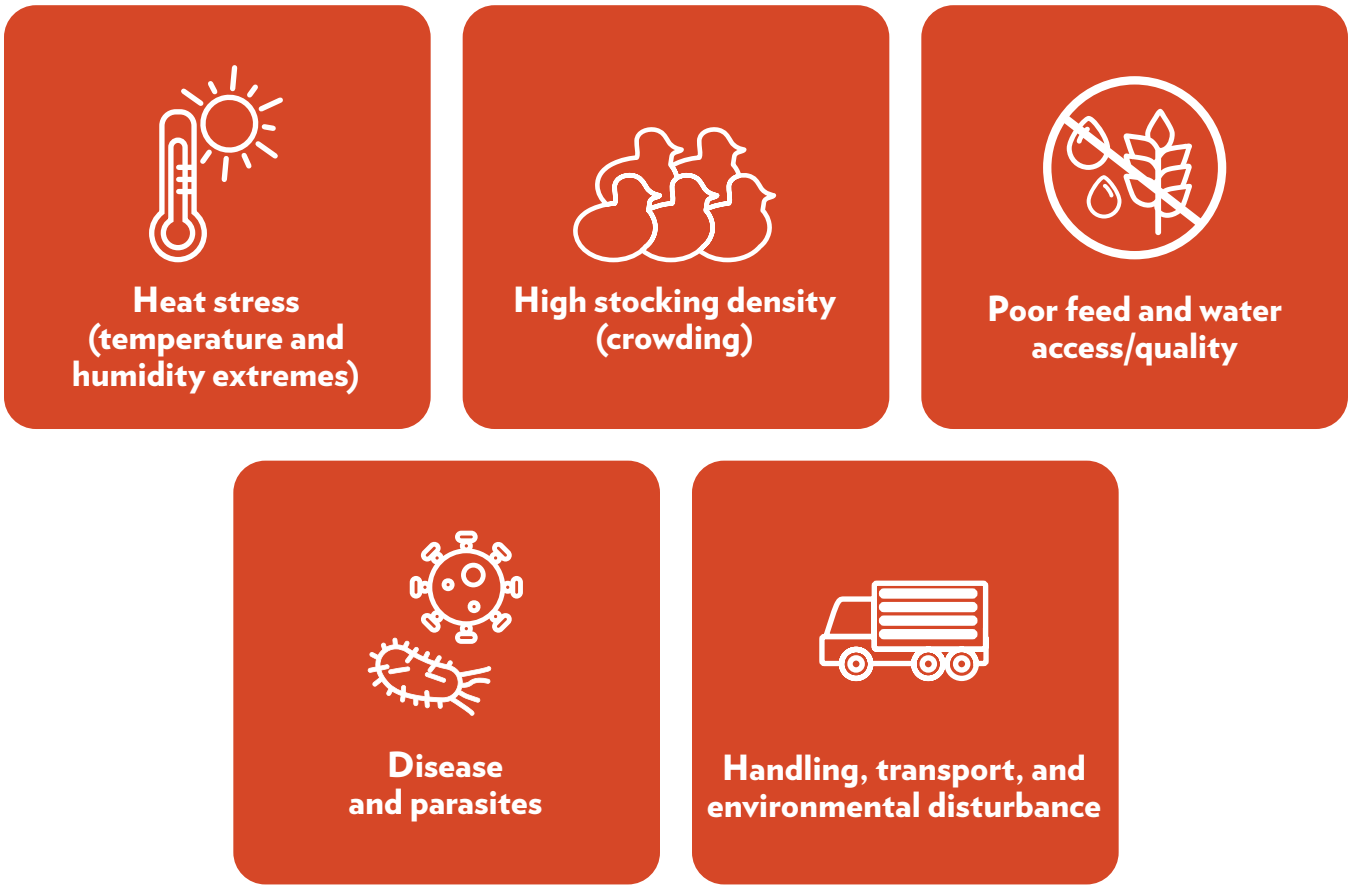
A key element of Jefo's success lies in its strong focus on research and technological innovation. Jefo collaborates closely with universities, research institutions, veterinarians, and nutritionists to continuously deliver solutions to tackle the evolving challenges of modern agriculture across the world.

Introduction

Heat stress is one of the most visible and costly challenges in modern poultry production, but it rarely acts in isolation. To frame the discussion that follows, this section first places heat stress within the broader landscape of stressors affecting poultry, then narrows to the mechanisms through which heat stress influences nutritional efficiency and flock performance.

Stressor mapping: Five key stress categories

Poultry are exposed to multiple stressors that can interact and compound their effects on health, welfare, and productivity. A practical way to frame the discussion is to recognize the main categories of stressors affecting birds, then narrow to the specific mechanisms through which heat stress reduces nutritional efficiency and performance. The five main categories of stressors in poultry include:



Heat stress is an increasingly important and costly constraint on poultry productivity as high ambient temperature and humidity reduce the bird's ability to dissipate body heat. Because poultry have high metabolic heat production and cannot sweat, hot conditions quickly affect feed intake, digestive efficiency, intestinal function, growth, egg output, welfare, and survival. In practice, this becomes a nutritional efficiency problem: birds consume less feed, use nutrients less efficiently, and divert more physiological resources toward thermoregulation rather than production.

A practical way to screen this risk is to monitor a poultry-adapted heat load index alongside bird-level indicators such as panting, wing spreading, flock distribution, feed intake, and water consumption. As heat load rises, the result is a measurable decline in nutritional efficiency, with downstream effects on growth, feed conversion, egg production, shell quality, flock uniformity, and welfare.

The sections that follow therefore move from the physiology of heat stress to its nutritional consequences, to its performance impacts, and finally to the management and nutritional actions required to mitigate those losses effectively.

Impact

Heat Stress Physiology in Poultry

Thermoregulation and bird-specific vulnerability

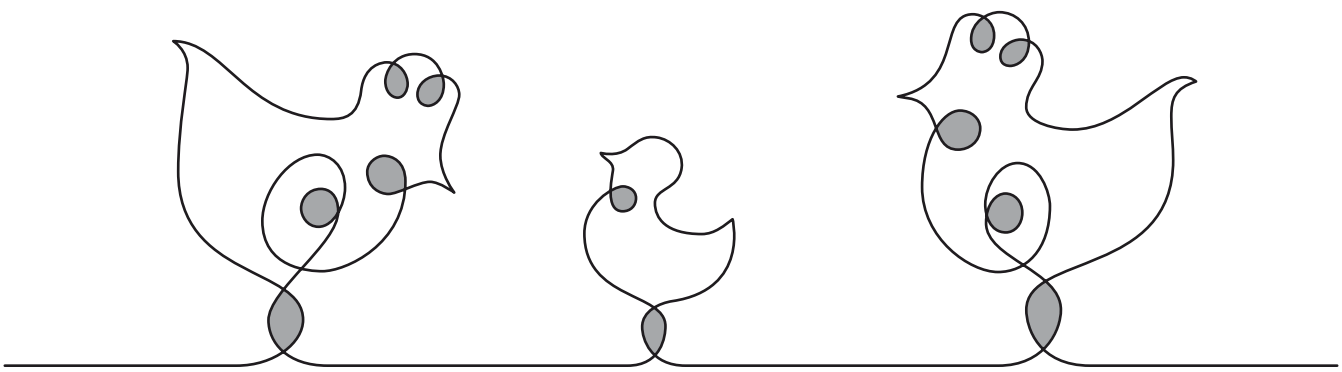
Poultry are especially sensitive to heat because they lack sweat glands, are covered with feathers that limit heat dissipation, and generate substantial metabolic heat through rapid growth or egg production. As environmental temperature rises, birds increase panting and wing spreading, reduce activity, and seek cooler areas. These responses help remove heat but also increase physiological strain and can disturb acid-base balance.

Metabolic and digestive adaptation

During heat stress, poultry typically eat less and drink more. Reduced feed intake decreases nutrient supply, while panting increases respiratory losses and can contribute to respiratory alkalosis. At the same time, intestinal function may become less stable, nutrient digestion and absorption may be impaired, and inflammatory pressure may increase. The result is a widening gap between the diet as formulated and the nutrients actually captured for growth, egg production, and maintenance.

Why this matters nutritionally

In practical terms, heat stress shifts nutrient use away from productive outputs and toward survival responses. This is why hot weather frequently depresses average daily gain in broilers, worsens feed conversion, lowers egg production and shell quality in layers, and increases flock variability. Even when mortality remains limited, the cumulative biological cost can be substantial.



Nutritional Consequences of Heat Stress

Reduced feed intake and lower nutrient supply

One of the most visible effects of heat stress is lower voluntary feed intake. As birds eat less, their intake of energy, amino acids, minerals, and vitamins declines at the same time that maintenance needs rise. This creates an immediate drop in nutritional efficiency because fewer nutrients are available for muscle deposition, egg mass, immune function, and recovery.

Gut integrity, digestion, and microbiota

Heat stress can compromise intestinal barrier function, alter digestive enzyme secretions, and disrupt the microbial environment in the gastrointestinal tract. When gut function becomes less stable, nutrient digestibility and absorption may decline, while inflammatory pressure may increase. In practice, this means that the same feed formula may deliver less productive value during periods of heat s than under thermoneutral conditions.

Electrolytes, acid-base balance, and oxidative stress

Panting changes carbon dioxide loss and acid-base balance, while increased water consumption modifies electrolyte dynamics. Heat stress is also associated with oxidative and inflammatory stress, which can raise the biological cost of maintaining performance.

Performance Impacts

Broiler performance

In broilers, heat stress commonly reduces average daily gain and worsens feed conversion ratio because birds eat less and use consumed nutrients less efficiently. Growth may become less uniform across the flock, and carcass yield can also be affected when heat exposure is prolonged or recurrent.

Layer and breeder performance

In layers and breeders, hot weather may reduce egg production, egg mass, shell quality, fertility, and hatchability. These effects reflect both lower nutrient intake and direct physiological stress. As a result, the economic impact of heat stress is often broader than a simple drop in production, extending into reproduction, chick quality, and flock persistence.

Welfare and hidden costs

Heat stress also raises welfare concerns through increased panting, discomfort, reduced activity, and higher mortality risk during acute events. Even when mortality remains moderate, the hidden costs can include weaker flock uniformity, poorer resilience, higher condemnations, and reduced return on feed investment. For production teams, this makes heat stress both a biological challenge and an operational efficiency issue.

Solution

Why Nutrition Alone Is Insufficient

From a ration-design perspective, heat stress often leads to closer attention to electrolyte balance, vitamin support, antioxidant strategy, and additive programs intended to protect gut function and nutrient utilization. Even so, nutrition programs are often optimized assuming birds can express normal feeding behavior, maintain gut function, and dissipate excess heat effectively. Under heat stress, these assumptions break down if the environment does not support adequate heat loss. In practice, even well-formulated diets can underperform when:

Ventilation is inadequate

(low air speed at bird level, poor air distribution, dead zones, insufficient air exchange).

Cooling capacity is limited or inconsistent

(ineffective tunnel ventilation, insufficient pad or fogging performance, poor maintenance, uneven temperature within the house).

Resource access is restricted

(limited drinker availability or flow rate, inadequate access to cool water, competition due to stocking density).

Environmental and flock monitoring is insufficient

(limited tracking of temperature, humidity, and air speed, no observation of panting or behavioral changes, delayed detection of feed intake decline).

Housing and litter conditions amplify heat load

(high stocking density, wet or deteriorated litter, poor heat dissipation at bird level).

Implication for nutritionists

For nutritionists and production teams, the practical objective is not only to formulate for hot weather, but also to ensure that the production system allows the feeding program to perform as intended. That means aligning feed strategy with barn environment, water availability, flock density, handling routines, and heat-event response protocols.

Integrated Solution

Heat stress mitigation is most effective when implemented as an integrated program rather than as a single nutritional correction. Environmental control remains the primary lever for reducing heat load, while nutrition and management help stabilize intake, protect gut function, and support resilience. Monitoring is essential because heat stress develops dynamically across the day, across houses, and across bird age or production stage.

A practical poultry heat-stress program should combine facility readiness, drinking-water management, feed delivery adjustments, and targeted nutritional support. This reduces the gap between formulated diet value and realized animal performance.

Practical framework

Nutrition:
maintain nutrient density, support electrolyte balance, protect intestinal integrity, and consider targeted additive strategies during heat events.

Ventilation:
verify actual air movement, not only fan presence, and reduce dead zones within the building.

Cooling:
use appropriate cooling strategies according to building design and climate, while maintaining litter quality and bird comfort.

Water management:
ensure cool, clean, accessible water with sufficient flow capacity during peak heat periods.

Monitoring:
track temperature, humidity, bird behavior, panting, feed intake, water intake, mortality, and performance deviation.

Response timing:
act early, before performance losses become severe, and prepare in advance for forecasted heat events.

Enabling Nutrition Programs to Perform Under Heat Stress

From a nutritionist's standpoint, the objective during heat stress is to preserve nutrient utilization efficiency, meaning the ability of birds to capture, absorb, and convert nutrients into growth, egg output, and resilience despite thermal challenge. Within an integrated mitigation plan, Jefo Nutrition's role can be positioned as supporting the conditions that allow feeding programs to remain more effective under heat stress, especially through gut-health support, oxidative-stress management, and practical additive strategies.

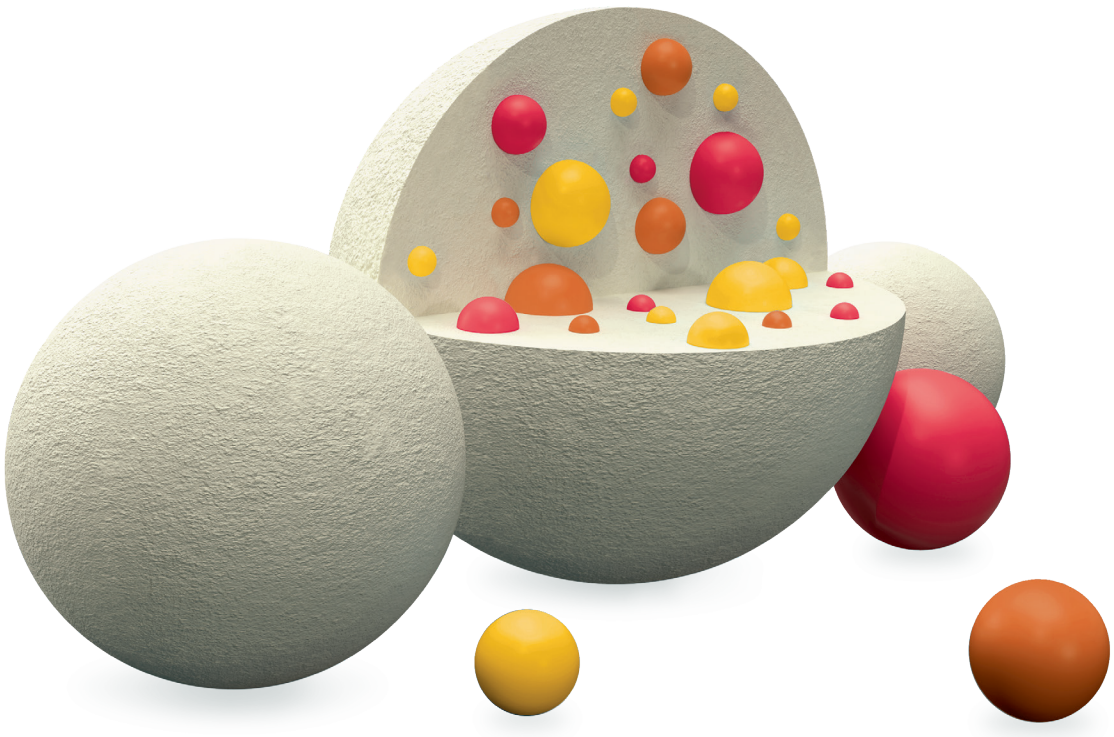
This approach is especially relevant in poultry because heat stress frequently affects the intestine before major visible losses appear in production data. Supporting intestinal integrity and digestive efficiency can therefore help reduce the hidden biological and economic cost of hot weather.

Targeted nutritional support

When heat stress depresses feed intake and challenges intestinal function, one practical objective is to support nutrient availability without increasing digestive burden. Depending on flock type and farm conditions, this may include targeted support **for intestinal integrity, oxidative stress management, electrolyte and vitamin balance, digestive stability, and growth** and **feed efficiency resilience** during stress periods.

In practice, this often involves reinforcing diets with key functional nutrients such as **vitamin C and vitamin E** (to support antioxidant defenses), **electrolytes** (to help maintain acid–base balance during panting), and selected **trace minerals** and gut-support additives that contribute to intestinal barrier function and nutrient absorption.

In Jefo Nutrition's framing, **precision intestinal nutrition** can be used as part of a broader strategy to help reduce the gap between diet formulated and performance realized during heat stress. In this context, **Jefo Matrix Technology (JMT)** is designed to protect and deliver targeted nutrients, such as vitamins, plant extracts, and functional compounds, to their site of action, helping improve the consistency of nutrient availability and utilization under challenging environmental conditions. This approach remains complementary to effective ventilation, cooling, and monitoring systems.



Heat Stress Toolbox

- ☐ Track **feed intake, water intake, and flock behavior** closely during hot weather.
- ☐ Protect **intestinal function** and nutrient absorption when heat stress rises.
- ☐ Review **electrolyte balance** and practical antioxidant support.
- ☐ Adjust **expectations for nutrient utilization**, not only diet formulation.

Practical mitigation actions (whole-farm)

Use ventilation systems (fans, tunnel ventilation), evaporative cooling (pads/foggers), and shading to improve convective and evaporative heat loss, especially at bird level and in high-density areas.

Provide cool, clean water with sufficient drinker access and flow rate; water demand increases significantly under heat stress and is critical for thermoregulation.

Adjust feeding schedules toward cooler periods (evening/night) to support feed intake when birds are more likely to eat.

Increase nutrient density when feed intake declines, while maintaining digestive balance and avoiding excessive heat increment from poorly balanced diets.

Maintain feed quality by minimizing feed retention time in bins and feed lines, reducing the risk of nutrient degradation and feed deterioration during hot weather.

Prioritize vulnerable flocks and hot zones by ensuring adequate ventilation and cooling in high-density areas, and by paying particular attention to fast-growing broilers, high-producing layers, and birds in poorly ventilated sections of the house.

Jefo Resources articles and podcasts

For additional practical implementation details (farm checklists, management considerations, and discussion-style learning), the Jefo resources below complement the peer-reviewed literature cited in this paper. These resources are intended as practitioner references and should be interpreted alongside farm-specific conditions and the scientific evidence base.

Articles

- Stay Cool: Tackle Poultry Heat Stress with Smart Feed Additives
- Beat the Heat: Keep Your Poultry Cool with Precision Nutrition
- The Hidden Cost of Heat Stress: What You Need to Know
- 5 Smart strategies to safeguard your farm from summer heat
- Boosting Poultry Production: The Power of Protein Management

Technical reports and guides (TRR/TP)

Jefo technical research reports (TRR) and technical publications/guides (TP) provide additional trial details, methodology, and practical decision support related to heat stress and stress resilience. Availability may vary by region; contact Jefo Nutrition to request the full document.

- EU592_TRR_POULTRY_JEFO_P(OA+EO)__GROWTH_PERFORMANCE_BROILERS_STRESSORS
- EU593_EN_TRR_POULTRY_JEFO_P(OA+EO)__INTESTINAL_INTEGRITY_AND_FOOTPAD_LESIONS_BROILERS_STRESSORS
- GL559_EN_TRR_POULTRY_JEFO_PRO_SOLUTION_SUPPLEMENTATION_OF_A_HIGH_
- GL555_EN_TRR_POULTRY_LIQUIDE_VIT_BLEND_JEFO_LIQUID_SOLUTIONS_ALLEVIATE_THE_NEGATIVE_EFFECTS_OF_HEAT_STRESS_ON_GROWTH_PERFORMANCE_OF_BROILER
- EU515_EN_TRR_POULTRY_JEFO_(AOX)_BENEFITS_OF_JEFO_(AOX)_SUPPLEMENTATION_AS_A_REPLACER_OF_VITAMIN_E_ON_BROILER_UNDER_HEAT_STRESS
- EU516_EN_TRR_POULTRY_JEFO_(AOX)_BENEFITS_OF_JEFO_(AOX)_SUPPLEMENTATION_AS_A_REPLACER_OF_VIT_E_ON_BROILERS_OXIDATIVE_STRESS_MARKERS
- EU474_EN_TRR_POULTRY_JEFO_(AOX)_BENEFIT_OF_PARTIAL_SUBSTITUTION_OF_E_VITAMIN_WITH_JEFO_(AOX)_ON_BROILERS_SUBMITTED_TO_HEAT_STRESS
- GL398_EN_TRR_POULTRY_JEFO_P(BF+AOX)_HEALTH_STATUS_OF_BROILER_AT_EARLY_LIFE_STRESS
- GL399_EN_TRR_POULTRY_JEFO_P(BF+AOX)_GROWTH_PERFORMANCE_OF_BROILER_AT_EARLY_LIFE_STRESS_

Podcasts

- Jean Fontaine: Precision Poultry Nutrition | Ep. 165
- Vitamins and Poultry: New Frontiers in Animal Nutrition

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