

# Rapid Measurement of **Vitamin E, Vitamin A** and **Carotene** in Poultry with iCheck





# Vitamin A, Vitamin E, and Carotenoids in Poultry Nutrition: From Biological Role to On-Site Monitoring

## Biological and Diagnostic Relevance

Vitamin A, vitamin E, and carotenoids are fat-soluble micronutrients that play interconnected roles in poultry health, resilience, and product quality. While classical vitamin deficiency diseases are now rare, deficiencies and suboptimal status still occur in modern production systems and are often subtle, multifactorial, and performance-limiting rather than clinically obvious. Historically, vitamins were identified through clear deficiency syndromes such as night blindness (vitamin A) or rickets (vitamin D), but today deficiencies more often manifest as reduced efficiency, robustness, or uniformity rather than pathognomonic signs (Ward, 2022).

Vitamin A supports epithelial integrity in the gastrointestinal and respiratory tracts and is essential for immune competence, growth, vision, and reproductive performance. Because circulating retinol declines during inflammation independently of dietary supply, vitamin A status reflects both nutritional adequacy and immune activation, making it a valuable indicator in subclinical disease contexts (NRC, 1994; MSD Veterinary Manual).

Vitamin E, mainly present as  $\alpha$ -tocopherol, is the principal lipid-phase antioxidant in poultry. It protects cell membranes from oxidative damage, supports immune responses, and stabilizes meat and egg quality. Circulating  $\alpha$ -tocopherol integrates dietary supply, absorption efficiency, metabolic turnover, and oxidative demand, functioning as a marker of antioxidant reserve rather than a simple formulation input. Field experience across species shows that vitamin E-related problems are rarely isolated and are often compounded by other nutritional, metabolic, or management stressors (Surai, 2016).

Carotenoids such as lutein and zeaxanthin are diet-derived pigments deposited in blood, tissues, and egg yolk. They determine yolk and skin colour and provide antioxidant and immune-modulating support. Because carotenoid concentrations decline rapidly with impaired fat digestion or intestinal damage, they act as a sensitive early indicator of reduced absorption efficiency, even when dietary inclusion remains unchanged (Kljak et al., 2021).



Vitamin E Deficiency (<https://www.thepoultrysite.com>)



Low to high carotenoids diet and egg yolk colour.

## Sources, Targets, and Nutritional Balance

Vitamin A and vitamin E are supplied primarily through premixes, as natural ingredient levels are variable and both nutrients are sensitive to degradation during storage and feed processing. The NRC (1994) reports that vitamin A levels around 5,000 IU/kg feed supported maximal growth performance, while requirements vary with species, age, and production conditions. For vitamin E, the NRC lists a minimum requirement of approximately 10 IU/kg feed, although higher inclusion rates are commonly used to account for increased oxidative stress in modern systems (Surai, 2016).

Carotenoids have no defined physiological requirement; inclusion is driven by functional and market targets. Studies show that yolk colour standards can be achieved with dietary zeaxanthin levels of around 15 mg/kg feed, confirming that carotenoid targets are quality-oriented rather than survival-based (Hencken, 1992).





# The iCheck Fat-Soluble Nutrinetts: Health and Quality Panel

## Deficiency, Oversupply, and the Need for Status Monitoring

Vitamin deficiencies today rarely present as clear-cut syndromes but instead contribute to subtle losses in feed efficiency, growth, egg production, chick quality, and uniformity. Such responses are often exacerbated by co-deficiencies, dietary antagonists, mineral imbalances, oxidative stress, or immune challenges, making cause-effect relationships difficult to identify from formulation alone (Ward, 2022). Vitamin A deficiency compromises epithelial integrity and immune defenses, while chronic oversupply can impair performance (CFIA). Vitamin E deficiency increases oxidative damage and stress sensitivity, whereas oversupply mainly represents economic inefficiency (Surai, 2016). Low carotenoid status leads to pale yolks or skin and reduced antioxidant support, while excessive supplementation can cause over-pigmentation and diminishing returns due to competition for yolk deposition (García-Hernández et al., 2024).

Because absorption and utilization of fat-soluble nutrients are strongly influenced by gut health, oxidative load, and inflammatory status, birds fed identical diets can show markedly different biological status and performance. Measuring blood levels therefore enables earlier detection of subclinical challenges and supports precision nutrition beyond safety margins (MSD Veterinary Manual).

## The iCheck Fat-Soluble Health and Quality Panel

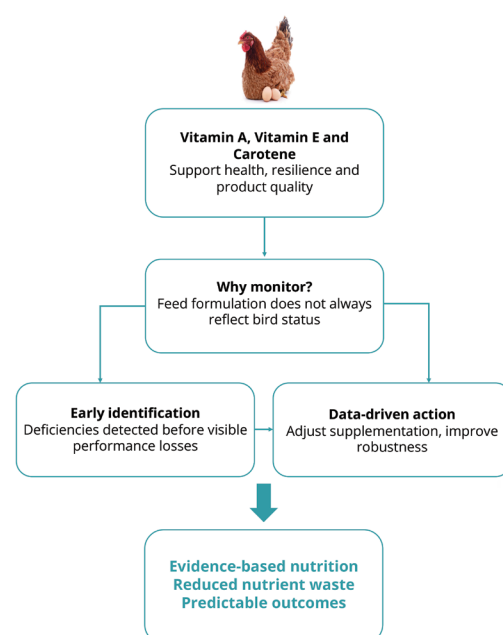
Conventional assessment of vitamin A, vitamin E, and carotenoids relies on laboratory chromatography, which is robust but slow and impractical for routine field use (Rodriguez-Amaya, 2001).

The iCheck® Fat-Soluble Health and Quality Panel enables rapid on-site assessment using a **single direct whole-blood sample without classical sample preparation**. The same extract is used sequentially to quantify **total carotenoids, vitamin E (α-tocopherol), and vitamin A (retinol)**, with results available **within minutes**.

Interpreted together, carotenoids primarily indicate dietary intake and intestinal absorption, vitamin E reflects systemic antioxidant reserve and oxidative demand, and vitamin A provides context on immune competence and inflammation. This triangulated approach improves biological specificity compared with isolated measurements.

## Practical Value for Poultry Production

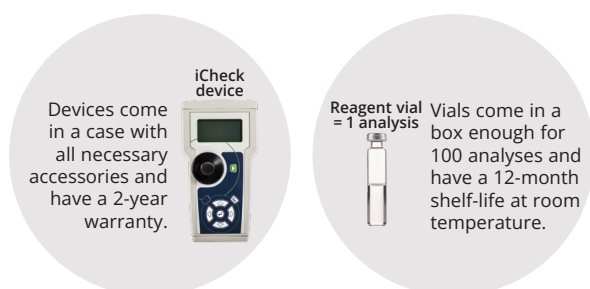
For poultry farmers, the panel enables earlier identification of enteric challenges, oxidative stress, and immune activation before performance losses become visible, supporting timely intervention and improved robustness. For feed suppliers and integrators, it provides objective feedback on premix performance and real animal status, enabling data-driven optimization and reduced nutrient wastage. Overall, the Fat-Soluble Health and Quality Panel supports more precise, evidence-based nutrition and more predictable production outcomes across the poultry value chain.



# iChecks are Portable Devices with All-Inclusive **Test Kits** that Deliver Results in Minutes

## OUR TECHNOLOGY

iCheck consists of 2 parts: a measurement device and a ready-to-use reagent vial.



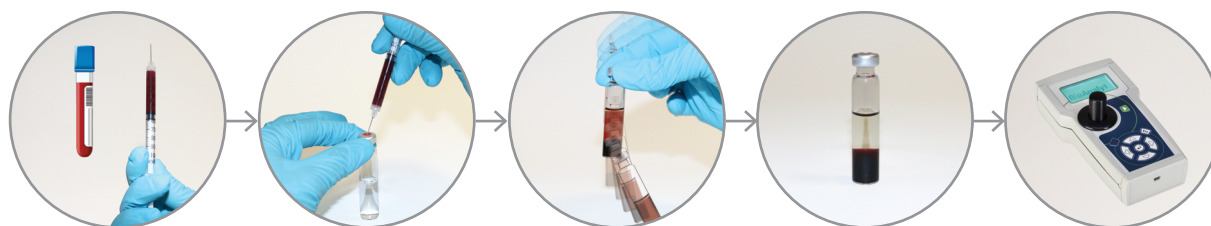
Devices come in a case with all necessary accessories and have a 2-year warranty.

Reagent vial = 1 analysis

Vials come in a box enough for 100 analyses and have a 12-month shelf-life at room temperature.

iCheck Vitamin E and iCheck Fluoro (for vitamin A) are both portable, single-wavelength fluorometers and iCheck Carotene is a portable, single-wavelength photometer. All are pre-calibrated for the quantitative measurement of vitamin A (as retinol), vitamin E, and  $\beta$ -carotene in animal whole blood, plasma and tissue sample.

## HOW DOES IT WORK?



Collect whole blood and take it up in a syringe provided with your Test Kit.

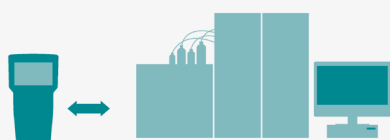
Inject the blood into iCheck Reagent vial.

Shake the Reagent Vial vigorously for a minimum of 10 seconds.

Let the Reagent Vial stand for a minimum of 5 minutes for vitamin extraction and phase separation.

Insert the Reagent Vial into your iCheck device and measure. Result is displayed in seconds.

## Benefits of iCheck



- **Speed:** Results in 5 minutes.
- **Economy:** Cost is only 10% of conventional lab methods.
- **Easy implementation:** Only 1 day of training is required.
- **Scalability:** Portable, with no set-up calibration required.
- **Accuracy:** Performance is comparable to reference lab methods.

iChecks are manufactured in Germany, used in over 80 countries and validated against standard laboratory methods. Learn more at [www.bioanalyt.com/products](http://www.bioanalyt.com/products).



measure for life

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