# Economic and Nutritional Challenges of Dietary Fat Sources in Poultry Feed

## Next-Generation Synthetic Emulsifiers Based on Polyethylene Glycol Ricinoleate (PEGR): An Innovative and Effective Approach to Improving Dietary Energy Efficiency

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Efficient utilization of dietary energy is one of the major challenges in animal nutrition. Fats, as the most concentrated source of energy in the diet, play an important role in meeting the animal's energy requirements. However, due to their hydrophobic nature, the digestion and absorption of fats in the gastrointestinal tract face limitations. Reduced efficiency of fat digestion not only decreases energy utilization but may also negatively affect growth performance, feed conversion ratio, gastrointestinal health, and overall production costs.

In recent years, the use of feed emulsifiers as a nutritional strategy to improve the emulsification process, enhance fat digestibility, and increase energy efficiency has gained considerable attention. Among these, next-generation synthetic emulsifiers based on polyethylene glycol ricinoleate (PEGR) have emerged as a promising nutritional approach, owing to their favorable structural characteristics, optimal hydrophilic–lipophilic balance (HLB), stability under gastrointestinal physiological conditions, and desirable performance with different dietary fat sources. This article reviews the physiology of fat digestion and absorption, the role of emulsifiers in improving energy efficiency, and the characteristics and benefits of Volamel Extra® as a next-generation synthetic emulsifier based on PEGR.

**Keywords:** fat, lipase, bile salts, fat digestion, metabolizable energy, feed conversion ratio, gut health, emulsifier, Volamel Extra®, polyethylene glycol ricinoleate (PEGR), hydrophilic–lipophilic balance (HLB)