

## High-Protein Ready-to-Eat Meat Snacks from Spent Poultry: A Review

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### Abstract

Ready-to-eat meat snacks are gaining more acceptance by consumers as high-protein options because of their convenience, changing lifestyle and nutrient density. Spent poultry meat stands out as a key raw material because the meat which is the major raw material is derived from Spent hens laying birds that have reached the end of their productive egg-laying cycle and therefore offer a low-cost, nutrient-rich protein source that remains largely underutilized in the food industry. This review explored the nutritional composition, methods of production, preservation strategies and functional properties of poultry meat bar as they impact consumer acceptance of the final product and likewise considers its sustainability and regulatory aspects of this industry. Poultry meat has been reported to contain balanced amino acids, vitamins, and minerals. These make poultry meat a good source of raw material for the development of nutrient-dense snacks. It supports muscle growth with the potential to be fortified with plant-derived bioactive compounds such as to  $\beta$ -carotene content for added functionality. Despite consumer interest in meat bars made from poultry, the product still faces some challenges like: oxidation, stability, sensory appeal, and consumer perception. These challenges can be addressed through innovation, sustainable use of byproducts, and consumer education. Adhering to regulatory protocols could also enhance the growth and market acceptance of poultry meat bars.

**Keywords:** Ready-to-Eat, Snacks, Protein

### Introduction

Spent hens are laying birds that have completed their productive egg-laying cycle. Once their egg yield declines, they are often culled and marketed at low economic value due to their tougher meat texture and increased collagen cross-linking, which makes the meat less desirable for traditional culinary uses (Mediani et al., 2022). However, this undervalued protein source holds significant potential in the food processing industry. Spent hen meat is rich in essential amino acids, affordable, and well-suited for transformation into value-added shelf-stable, ready-to-eat meat snacks such as sausages, nuggets, jerky biltong, and meat bars etc. They are becoming more accepted as high-protein options (Luchansky *et al.*, 2019; Mediani et al., 2022).

In recent years, global demand for ready-to-eat (RTE) meat snacks has surged, driven by rapid urbanization, busier lifestyles, and the growing preference for convenient, protein-rich foods (Mediani et al., 2022). RTE products are defined as packaged items that can be consumed directly without any need for cooking, or preparation heating, unlike ready-to-cook (RTC) items, which require boiling, frying, or baking before consumption (Mediani et al., 2022). This shift in consumer behavior presents a unique opportunity to repurpose spent hen meat into shelf-stable, nutritious snacks that align with modern dietary trends. By leveraging innovative processing techniques, manufacturers can enhance the texture and flavor of spent hen meat, making it a sustainable and economically viable ingredient in the expanding RTE food market. In a review to assess the effect of drying on meat products, the reviewer noted that a comprehensive review will offer a clear framework for designing poultry snacks with improved shelf life and flavor (Mediani *et al.*, 2022). Therefore this review explored the nutritional composition and the technologies used in the production of poultry meat bars. It also explored preservation strategies and functional properties as they impact consumer acceptance of the final product. Finally it looked at the sustainability and regulatory aspects of the poultry meat bar industry.

### Nutrient Composition of Poultry Meat

**Poultry meat stands out as a valuable source of high-quality protein, enriched with essential nutrients that support overall health.** Research highlights its well-balanced profile of essential amino acids, vitamins, and minerals, making it an excellent candidate for crafting nutrient-dense snacks (Biesalski, 2016). Compared to red meat, poultry contains significantly less connective tissue, which contributes to its tenderness and digestibility. Beyond protein, poultry offers a rich supply of easily absorbed micronutrients, including B-vitamins such as niacin,

B<sub>6</sub>, and B<sub>12</sub> as well as iron, phosphorus, and zinc. These micronutrients play a crucial role in driving enzymatic functions and maintaining consistent energy levels throughout the body (Biesalski, 2016).

Poultry meat typically contains lower levels of intramuscular fat and cholesterol yet remains rich in heart-friendly unsaturated fats like linoleic and oleic acids. One of its key advantages lies in the rapid digestibility and absorption of its proteins (Biesalski, 2016). Studies have shown that poultry protein scores close to 1.0 on the Protein Digestibility-Corrected Amino Acid Scale, indicating excellent bioavailability. This high digestibility makes poultry an ideal nutrient source for vulnerable populations and active individuals such as frontline troops. To further enhance their nutritional profile, poultry-based bars are often fortified with dietary fiber, plant proteins, or omega-3 fatty acids boosting their overall protein value and functional health benefits (Biesalski, 2016).

### Processing Technologies for Poultry Meat Bars

To meet consumer expectations, the meat bar must offer balanced nutritional content, long shelf life, and appealing sensory characteristics. Key technologies employed in meat bar production include thermal processing, drying, and extrusion each contributing to the texture, flavor, and stability of the finished bar (Zhang et al., 2019).

This technique applies controlled heat to inactivate pathogenic microorganisms and significantly reduce microbial load, thereby enhancing product safety and shelf stability. Additionally, thermal treatment improves protein digestibility through denaturation, facilitating better nutrient absorption. However, excessive heat exposure must be avoided, as it can lead to degradation of heat-sensitive nutrients and compromise the nutritional integrity of the final product (Zhang et al., 2019).

Elevated water activity promotes microbial proliferation, which compromises the nutritional quality, safety, and sensory acceptability of the final product. Common drying methods include hot-air drying, freeze-drying, and vacuum drying. Among these, freeze-drying is particularly effective in preserving heat-sensitive nutrients and maintaining the sensory attributes of poultry meat. However, due to its high cost, alternative technologies such as microwave-assisted drying have demonstrated enhanced efficiency and improved product quality in poultry applications (Zhang et al., 2019).

**Extrusion is a widely utilized technique in meat bar production, valued for its capacity to texturize proteins, enhance digestibility, and facilitate the incorporation of functional ingredients.** In the context of poultry meat bars, extrusion enables efficient blending of poultry proteins with plant-based components, leading to the development of innovative hybrid products. This integration significantly improves both the nutritional profile and sensory attributes of the final product (Zhang et al., 2019).

### Shelf Stability and Preservation

**Ensuring shelf stability is essential for maintaining consumer acceptance of poultry-based meat bars.** Due to their high water activity and nutrient density, poultry bars are highly perishable and susceptible to microbial contamination by pathogens such as *Salmonella spp.*, *Listeria monocytogenes*, and *Escherichia coli* (Zhang et al., 2019). To mitigate spoilage and extend shelf life while preserving nutritional and sensory quality, producers employ preservation strategies including vacuum packaging and modified atmosphere packaging (MAP). Additionally, natural antimicrobial agents have been incorporated to suppress microbial activity in meat bars (Zhang et al., 2019). The previously discussed processing methods—such as thermal treatment, drying, and extrusion—also contribute to water activity reduction, further enhancing product stability.

**Lipid oxidation represents a significant barrier to the shelf stability of poultry meat bars, contributing to rancidity, off-flavor development, and nutrient degradation.** The high content of polyunsaturated fatty acids in poultry products predisposes them to oxidative deterioration (Lorenzo *et al.*, 2014). To mitigate these effects, natural antioxidants—including ginger extract, garlic extract, and green tea catechins have been effectively employed to inhibit lipid oxidation and preserve product quality (Falowo *et al.*, 2014).

### Functional Properties of poultry-based meat bar

**The functional properties of meat bars encompass both their intrinsic nutritional value and the health-promoting effects of their constituent ingredients.** Poultry-based meat bars are particularly recognized not only for their complete amino acid profile but also for the high digestibility of their proteins (Corcia *et al.*, 2022). Poultry meat provides all essential amino acids and has been shown to support efficient protein metabolism. Emerging evidence suggests that its consumption may aid in reducing muscle injury and enhancing recovery in athletes (Corcia *et al.*, 2022). Furthermore, poultry proteins have been associated with promoting muscle growth and repair,

underscoring their potential role in functional food applications targeting active and vulnerable populations (Lorenzo et al., 2018).

**High-protein food intake has been associated with reduced overall energy consumption, primarily through enhanced satiety and delayed subsequent food intake, thereby supporting weight management strategies** (Lorenzo et al., 2018). Poultry meat bars, characterized by their high protein density, are well-suited as functional snacks for appetite regulation. In response to the increasing consumer demand for plant-based nutrition, these bars can be fortified with bioactive plant-derived components. Additives such as omega-3 fatty acids, dietary fibers, probiotics, and antioxidants have demonstrated potential to further enhance the nutritional and functional value of meat-based products (Lorenzo et al., 2018).

#### **Consumer Acceptance and Market Potential of meat bars from poultry**

**Consumer acceptance of poultry meat bars is closely linked to product quality, particularly sensory attributes such as taste, texture, flavor, and visual appeal.** These characteristics play a critical role in shaping consumer perception and preference. Achieving an optimal balance between nutritional value and health-conscious formulation—such as reduced fat and sodium content is essential for enhancing market acceptance and aligning with contemporary dietary trends (Grasso et al., 2019).

**The protein snack market has demonstrated sustained growth, driven by increasing health consciousness, fast-paced lifestyles, and the rising adoption of high-protein dietary patterns.** Poultry meat bars, as portable and convenient options, are well-suited for on-the-go consumption. The market has further evolved to include organic, clean-label, and functional variants enriched with bioactive compounds (Markets and Markets, 2020). Despite growing consumer interest and market expansion, challenges persist particularly limited public awareness, health concerns related to processed meat, and issues surrounding sensory acceptability. Addressing these barriers requires targeted consumer education and ongoing engagement strategies to improve understanding and acceptance of poultry-based functional snacks. research and innovation in formulation and processing of the bars will also go a long way (Grasso and Jaworska, 2020).

#### **Sustainability Considerations**

Products like mechanically deboned meat, skin, and connective tissues often overlooked are rich in proteins and bioactive compounds. These nutrient-dense byproducts have the potential to be transformed into affordable, sustainable, and nourishing meat bars. Utilizing such materials not only reduces waste but also keeps valuable resources in circulation, for instance, repurposing chicken feathers into insulation. Moreover, poultry farming has a lower environmental impact than raising ruminant livestock, generating fewer greenhouse gases, requiring less land, and consuming less water (Lorenzo et al., 2018).

#### **Regulation of meat bar production**

The production and sale of poultry meat bars in Nigeria are governed by strict food safety regulations. Oversight is provided by the National Agency for Food and Drug Administration and Control (NAFDAC), which ensures that manufacturers adhere to established control protocols, maintain microbiological safety standards, and uphold proper hygiene throughout the production environment to safeguard consumer health. Before meat bars can be introduced into the market, they must meet NAFDAC's regulatory requirements. These include accurate labeling of nutritional information, identification of allergens, and disclosure of any additives used (NAFDAC 2014).

#### **Conclusion**

In summary, poultry-based meat bars represent a valuable opportunity to meet modern demands for convenient, nutritious, and portable snacks. By incorporating plant-derived bioactive compounds and refining processing methods, their functionality, safety, and sensory appeal can be significantly enhanced. Continued research into nutritional optimization, functional ingredient integration, and sustainable packaging will be essential to fully realize their potential as next-generation protein-rich foods.

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