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Study on the Impact of Functional Foods on the Nutritional Health Status of the Elderly

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Abstract: As China's population ages, health issues among the elderly have gained increasing attention. Functional foods, which meet basic nutritional requirements while offering specific health benefits for certain populations, play a significant role in research on the health and maintenance of the elderly. This paper focuses on the physiological characteristics and health needs of older adults, systematically reviewing the current state of functional food research, its core active ingredients, and their mechanisms of action. It aims to provide theoretical support and practical guidance for advancing functional foods that better serve the health of the elderly and contribute to the implementation of the active aging strategy.

Keywords: Elderly; Functional foods; Health needs; Nutritional interventions

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1. Introduction

As the global population ages at an accelerated pace, China's elderly population continues to grow. Data indicates that the number of individuals aged 65 and above in China increased from 209.78 million in 2022 to 220.23 million in 2024 [1]. The demand for "healthy aging" among the elderly has shifted from traditional disease treatment to a focus on "prevention first and proactive health management." Functional foods have thus emerged as a key vehicle bridging nutritional needs and health maintenance.

2. Overview of functional foods

Functional foods refer to products that possess specific nutritional and health benefits, can regulate human physiological functions, and do not aim to treat diseases. Firstly, functional foods provide essential nutrients required by the human body. These components help maintain normal physiological functions, enhance immunity, and thereby reduce the risk of illness. Secondly, certain functional foods contain antioxidants that effectively scavenge free radicals within the body, slow cellular aging, and preserve vitality. Moreover, certain functional

foods exert regulatory effects on specific health concerns, such as managing blood lipids, blood sugar, and blood pressure, thereby aiding in the prevention and control of chronic diseases. Additionally, functional foods improve the intestinal micro-ecological environment, promote digestion and absorption, enhance nutrient utilization efficiency, and positively impact the overall health status of the elderly.

3. A multidimensional perspective on elderly health needs: A systematic analysis from physiological changes to nutritional interventions

3.1. Physiological characteristics and health needs of the elderly

With advancing age, the elderly undergo a series of natural aging changes involving multiple systems. These primarily manifest as muscle mass loss, weakened digestive and absorption functions, decreased bone density, and a general decline in immunity, metabolic capacity, and overall organ function. Scientific approaches are needed to delay or adapt to these age-related changes. Health needs in older adults can be categorized based on different priorities, primarily including: (1) Basic nutritional supplementation (e.g., high-quality protein, calcium); (2) Support for managing chronic conditions (e.g., blood sugar control, lipid reduction); (3) Maintenance of physiological functions (e.g., gut health, muscle preservation). For basic nutritional supplementation, older adults should consume foods rich in high-quality protein—such as lean meats, fish, and legumes—to meet essential amino acid requirements. Concurrently, increased calcium intake through dairy products and leafy greens is crucial for maintaining bone health and preventing osteoporosis. For chronic disease management, blood sugar control prompts seniors to choose low-sugar or sugar-free foods while monitoring glycemic index. Lipid management encourages reducing saturated and trans fats while increasing unsaturated fatty acids—achieved through nuts and deep-sea fish. Regarding physiological function maintenance, gut health demands drive seniors to consume foods rich in dietary fiber and probiotics to promote intestinal motility and maintain microbial balance. Muscle preservation needs emphasize sufficient protein intake and moderate resistance exercise to slow muscle loss.

3.2. Analysis of functional foods' suitability for senior health needs

Functional foods demonstrate multifaceted advantages over conventional foods in meeting the precision health needs of the elderly. From a basic nutritional supplementation perspective, functional foods can provide required nutrients more precisely tailored to the physiological characteristics of older adults. For instance, certain functional foods are specifically fortified with calcium and vitamin D, which significantly aid in preventing osteoporosis and enhancing bone health in the elderly [2]—a level of targeted nutritional fortification often unattainable with conventional foods. Functional foods demonstrate even greater advantages in assisting the management of chronic diseases. While conventional foods primarily supply energy and basic nutrients, functional foods incorporate specific active ingredients—such as dietary fiber and phytosterols—to help older adults better control blood sugar and lipid levels [3]. These active components are typically present in low concentrations in conventional foods, making it difficult to achieve effective regulatory effects. Functional foods also play an irreplaceable role in maintaining physiological functions. To address gut health needs, they often incorporate probiotics and prebiotics, which help improve the intestinal microenvironment [4], promote bowel motility, and alleviate constipation common among the elderly. Regular foods have relatively limited effects in promoting gut health. In muscle preservation, functional foods can better support muscle synthesis and repair in the elderly by optimizing protein composition and adding ingredients like creatine, thereby slowing muscle loss—an advantage ordinary foods struggle to match.

4. Research on the efficacy of functional foods for the elderly

4.1. Protection of the cardiovascular system by functional foods

Cardiovascular disease is one of the primary threats to the health of the elderly. Research indicates [5] that consuming beneficial bacteria such as bifidobacteria and lactic acid bacteria can effectively regulate blood cholesterol levels, laying a foundation for cardiovascular health. When these beneficial bacteria synergize with functional foods that inhibit harmful bacterial proliferation, they not only further reduce damage to the cardiovascular system from toxic substances produced by harmful bacteria but also optimize cardiovascular metabolic indicators. This creates a more favorable internal microenvironment for cardiovascular health, significantly lowering the risk of cardiovascular disease. Additionally, foods rich in functional components such as dietary fiber, phytosterols, and omega-3 polyunsaturated fatty acids (omega-3 PUFA) demonstrate remarkable efficacy in regulating blood lipids. Dietary fiber binds to bile acids, promoting their excretion and thereby reducing cholesterol absorption. Phytosterols, structurally similar to cholesterol, competitively inhibit cholesterol absorption during the digestive process, while omega-3 PUFA offers multiple benefits, including lowering triglyceride levels, increasing high-density lipoprotein cholesterol (HDL-C) content, inhibiting low-density lipoprotein cholesterol (LDL-C) oxidation, and reducing the risk of atherosclerosis, thereby comprehensively safeguarding cardiovascular health.

4.2. Functional foods for elderly gut health

With aging, gut function gradually declines and microbial balance is disrupted. Consuming fermented milk or inulin-containing fermented milk increases fecal bifidobacteria while suppressing Escherichia coli and Clostridium perfringens, thereby improving intestinal function [6]. These functional foods regulate gut microbiota balance by promoting the growth of beneficial bacteria while suppressing harmful bacteria. This enhances the intestinal mucosal barrier function and reduces the occurrence of intestinal inflammation. Additionally, active components in fermented milk stimulate the activity of intestinal immune cells, boosting the body's resistance to pathogens and building a robust defense for elderly gut health.

4.3. Functional foods promote bone health

The skeletal system of the elderly is relatively fragile. Calcium, a primary mineral in bone composition, provides robust structural support and is crucial for maintaining bone strength and hardness. Vitamin D enhances intestinal calcium absorption [7], ensuring efficient utilization by the body to participate in bone formation and metabolism. Soy isoflavones exhibit estrogen-like effects, regulating hormonal levels to protect bone health. In terms of mechanism, enhanced calcium absorption ensures more efficient delivery to bone sites, supplying ample raw material for bone growth and repair. Regarding bone density and fracture risk, consuming functional foods rich in these core components significantly increases bone density, making bones denser and stronger. Simultaneously, they reduce fracture risk, minimizing physical injuries and quality-of-life declines caused by fractures in the elderly, thereby providing robust support for senior bone health.

4.4. Functional foods assisting in chronic disease management

Chronic diseases severely threaten the health and quality of life of the elderly. Dietary fiber, as a crucial core component, forms a viscous substance in the intestines that slows carbohydrate absorption, effectively delaying blood glucose elevation. This plays a positive role in managing diabetes in the elderly. Bitter melon saponins

exhibit insulin-like effects, promoting cellular uptake and utilization of glucose [8], further aiding in blood glucose regulation and assisting in improving diabetes conditions among the elderly. Phytosterols, structurally similar to cholesterol, competitively inhibit cholesterol absorption in the intestines, thereby reducing blood cholesterol levels. They offer excellent auxiliary regulation for conditions like hypertension caused by high cholesterol in the elderly. Through their distinct mechanisms of action, these core components collectively play a vital role in the auxiliary improvement of chronic diseases such as hypertension and diabetes in the elderly. This contributes to enhancing their quality of life and reducing health risks associated with chronic illnesses.

5. Current status and existing issues in the development of functional foods for the elderly

5.1. Current industry status

The global functional food market is projected to reach RMB 1.3031 trillion by 2025 and RMB 1.8045 trillion by 2032, with a compound annual growth rate (CAGR) of 4.76% (2025–2032) [9]. According to the *2025–2031 China Functional Food Industry Comprehensive Monitoring and Investment Direction Research Report* by Huajing Industry Research Institute, driven by consumption upgrades and policy support, China's functional food market will continue to expand. The market size is projected to double by 2031 compared to 2025 [10].

5.2. Existing core issues

While China's functional food industry for the elderly is booming, several core issues requiring resolution have emerged. First, the market regulatory system remains imperfect, with inconsistent and unclear standards leading to varying product quality. Some products feature false advertising or exaggerated efficacy claims, which not only harm consumer rights but also damage the industry's credibility. Second, severe product homogenization persists, with formulations failing to adequately accommodate the digestive and absorption characteristics of the elderly. Furthermore, efficacy claims for some products lack support from long-term clinical data. Most companies concentrate development efforts on a few popular categories, lacking innovation and differentiation, making it difficult to meet the diverse health needs of the elderly. Third, consumer perceptions of functional foods are skewed. Some seniors overly rely on these products while neglecting regular diets and medical care, and the spread of misinformation further misleads consumer choices.

6. Policy recommendations for advancing research and development of functional foods for the elderly

In response to the aforementioned challenges, the following policy recommendations are proposed to advance research and development of functional foods for the elderly. First, the market regulatory framework should be strengthened by establishing unified and explicit product standards, enhancing market oversight, and rigorously cracking down on false advertising and exaggerated claims. This will safeguard consumer rights and elevate the industry's overall credibility. Second, encourage enterprises to increase R&D investment and innovate product formulations. Fully consider the digestive and absorption characteristics of the elderly to develop differentiated functional foods that meet their diverse health needs. Strengthen support with long-term clinical data to enhance the scientific validity and efficacy of products. Third, strengthen consumer education. Disseminate knowledge about functional foods through formal channels to guide the elderly in correctly understanding their role and

avoiding over-reliance on them. Simultaneously, improve consumers' ability to discern false information and promote rational consumption.

7. Conclusion

As society continues to age, research and development of functional foods for the elderly have become increasingly important. Through comprehensive measures such as improving market regulatory systems, encouraging corporate innovation and R&D, and strengthening consumer education, the functional food industry for seniors can be guided toward more standardized, scientific, and healthy development. This not only helps meet the diverse health needs of older adults and enhance their quality of life but also injects new vitality into the sustainable development of the functional food industry. Moving forward, sustained attention should be paid to research developments in functional foods for the elderly, while continuously optimizing the industry's development environment. This will enable more seniors to benefit from the health advantages offered by functional foods.

Disclosure statement

The authors declare no conflict of interest.

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