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Energetic Cultivation Mode: Targeted Regulation of Attributes of Animal-Derived Ingredients for TCM Dietary Therapy Based on a Three-Dimensional Evaluation System

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Abstract

Objective: Aiming at the disconnection between animal-derived ingredient cultivation and the attributes of Traditional Chinese Medicine (TCM) dietary therapy, this study constructs an attribute-oriented regulation scheme centered on "Energetic Cultivation" based on the Three-Dimensional Evaluation System. Taking greenhouse/free-range breeding as the application scenarios of the energizing model, the scheme fills the attribute regulation gap of traditional scenarios through energizing regulation, and hierarchically meets the basic and precise dietary needs of the public based on the natural attribute baseline of species. Methods: Adopting reverse design logic (target attribute → quantitative index → breeding parameter), this study verified the regulation logic of environment, exercise, and controllable stress on the attribute balance of ingredients from the dimension of "species-parameter-metabolism-attribute" through literature cases. Results: A scenario adaptation system centered on the energizing model with clear parameters, scenario adaptation, and energizing mechanism was formed. Literature verification showed that environment (light, temperature, salinity), exercise, and controllable stress could directionally regulate ingredient attributes, which supports the theoretical logic of the energizing model. Limitations: Large-scale field trials have not been carried out; parameter fine-tuning, cost control, and variety-specific adaptation in practical application require further research. Conclusions: The attribute regulation scheme centered on the energizing model breaks the dual limitations of intensive breeding ("yield priority, attribute degradation") and traditional free-range breeding ("uncontrollable attributes, low benefits"). It provides stable and controllable raw material support for TCM dietary therapy, and promotes the high-quality transformation of the breeding industry to "selling attributes", with both academic and industrial value.

Keywords: TCM nutrition; animal-derived ingredients; attribute-oriented breeding; energizing mechanism; breeding parameter optimization

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1. Introduction

As the core practice of the "preventive treatment of disease" concept in TCM, the precision of the conditioning effect of TCM dietary therapy highly depends on the "attribute stability" of ingredients with homologous food and medicine. As the main food source for humans, animal-derived ingredients are the key to determining the stability of the effect of TCM dietary formulations—their cold-heat bias and functional orientation need to be highly consistent with individual constitutional needs to realize the scientific implementation of "dietary therapy based on constitution differentiation".

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Existing studies have provided important support for the standardization of TCM dietary therapy: On the one hand, the "environmental habit-metabolic characteristic-growth cycle" Three-Dimensional Evaluation System constructed in the previous preprint study of our team [29] has realized the quantitative determination of Yin-Yang attributes of animal-derived ingredients, breaking the industry bottleneck of "attribute cognition relying on experience"; On the other hand, the dietary formulation research based on the attribute quantification results of this evaluation system has solved the problem of "difficult reproduction of formulation effects". However, as the source of attribute formation of animal-derived ingredients, the breeding link is still seriously disconnected from these two supporting systems.

Current industry cognition of "animal-derived ingredient quality" remains at the empirical level: Consumers generally recognize that "free-range chicken is more delicious than fast-growing chicken" and "grassland mutton is more warm-nourishing than caged mutton" but cannot explain the underlying principles; Although breeders can observe that "activity and feed affect meat quality", they cannot convert this into "quantifiable and replicable attribute regulation parameters". This situation of "knowing what it is but not why" leads to two major dilemmas in the breeding field: First, the breeding end lacks "attribute-oriented" precise regulation standards, resulting in vague and unstable attribute expression of ingredients; Second, the demand for "functional, attribute-clear" ingredients in TCM dietary therapy and high-end markets (e.g., Yang-deficiency constitution requires "Yang-warming" ingredients, Yin-deficiency requires "Yin-nourishing" ingredients) is seriously disconnected from the supply capacity of the breeding end. Eventually, phenomena such as "loss of attributes of authentic ingredients" and "reduced efficacy of classic dietary therapy" occur frequently, and an innovative breeding concept with both scientific systematization and practical guidance is urgently needed to break the deadlock.

Based on this, this study focuses on the breeding link of animal-derived ingredients, takes the attribute quantification standard of the Three-Dimensional Evaluation System as a bridge, and reversely converts the "constitution-attribute" adaptation demand of TCM dietary therapy into operable parameters at the breeding end. It aims to construct a systematic theory and practical scheme of "from energizing regulation to attribute compliance, and then to dietary adaptation"—taking greenhouse/free-range breeding as the industrial application scenario of the energizing model, and filling the gap of "single/uncontrollable attributes" in traditional scenarios through energizing regulation. Its core value lies in breaking the limitation of "empirical breeding", transforming the attribute of animal-derived ingredients from "passive formation" to "active regulation", providing "attribute-oriented and function-stable" raw material support for TCM dietary therapy, and promoting the high-quality transformation of the breeding industry from "selling weight" to "selling attributes".

2. Literature Review: Analysis of Attribute Defects in Existing Breeding Modes and Research Gaps

2.1. Current Status of "Attribute Loss" and "Quality Discontinuity" in Animal-Derived Ingredients

2.1.1. "Efficacy Deviation" from the Perspective of TCM Dietary Therapy

The application of animal-derived ingredients in TCM dietary therapy relies on the precise matching between cold-heat bias and constitutional needs, yet this matching relationship is gradually imbalanced with the evolution of breeding methods. The ingredient efficacies defined in classic texts (e.g., "chicken warms the middle energizer and replenishes Qi" in *Compendium of Materia Medica*) have shown significant differences from the dietary effects of modern fast-growing ingredients—fast-growing chicken retains basic nutrients but its "warming the middle energizer and replenishing Qi" efficacy is weakened in clinical practice, with a much lower symptom remission rate in people with Qi deficiency compared to traditional free-range chicken.

A 2021 study in *Poultry Science* confirmed that free-range chicken contains higher levels of immune-active substances, and its effect on enhancing immune function is significantly superior to fast-growing chicken [17]; a 2024 clinical trial in *Chinese Journal of Integrative Medicine* also showed that the symptom remission rate of fast-growing chicken for people with Qi and blood deficiency was <10%, while that of free-range chicken was >30% ($P<0.05$). Mechanistically, the sufficient growth cycle, high activity level, and diverse food sources of the free-range mode result in significantly higher contents of functional components (Omega-3, Vitamin E, myoglobin) in free-range chicken than in fast-growing chicken, which can precisely improve the core problems of Qi-deficiency constitution; in contrast, fast-growing chicken undergoes short-term rapid growth, which suppresses the synthesis of functional components and easily increases inflammatory load and spleen-stomach burden, leading to weakened dietary therapy effects.

The problem of "attribute distortion" in authentic ingredients is prominent. For example, traditional free-range chicken is "mild-natured, tonifies essence and replenishes Qi", but after intensive caged breeding, its fatty acid composition changes (increased SFA, decreased Omega-3), showing "mildly warm and dry nature with weak Qi-replenishing ability", deviating from the classic definition. This efficacy deviation directly leads to the "accurate formula but inferior ingredients" dilemma in TCM dietary therapy, while industry cognitive limitations (only 12% of consumers can accurately describe the differences in free-range ingredients, and 70% of breeders cannot quantify the impact of parameters on attributes) further exacerbate this problem.

2.1.2". Quality Decline" at the Sensory and Nutritional Levels

The consumer feedback that "chicken lacks chicken flavor and fish lacks fish freshness" essentially results from breeding methods inhibiting the synthesis of flavor precursor substances. Inosine monophosphate (IMP), the core substance for umami, is strongly correlated with breeding modes: the IMP contents in intensively farmed large yellow croaker and chicken are significantly lower than those in wild/free-range individuals, and the difference in "umami richness" scores in consumer sensory evaluations is significant ($P<0.001$). The composition of volatile flavor substances also deteriorates—for example, intensively farmed abalone has higher contents of fishy substances and lower contents of aroma substances, directly leading to bland flavor, which has become a common problem in intensively farmed ingredients.

The nutritional differences between free-range and intensive farming are particularly evident in poultry eggs: free-range eggs have significantly higher contents of conjugated linoleic acid (CLA), lutein, and Omega-3 than caged eggs, and their amino acid composition is more suitable for human needs [1]. In the field of poultry breeding, fat-soluble vitamins (e.g., Vitamin E) in traditional free-range chicken are more completely retained; based on the metabolic commonalities of poultry and the measured mean values reported in multiple literatures (e.g., [1,11]), its content is 27% higher than that in caged chicken ($P<0.05$); this mode is less likely to cause nutritional imbalance due to "high-energy feed and low activity level", avoiding the reduction of modern ingredients to "basic nutrient carriers" that only meet caloric needs.

2.1.3". Discontinuity" Between Market Demand and Breeding Supply

The market demand for "animal-derived ingredients with clear attributes and stable functions" is surging (the market size of food-medicine homologous products reached 376.3 billion yuan in 2023, with the growth rate of ready-to-eat tonic products exceeding 20%), but the supply capacity of the breeding end is completely unable to match this demand—for example, ready-to-eat sea cucumbers need to meet the standard of "Yin-tendency score < -3 points" (collagen and SOD must reach specific thresholds), while the current intensively farmed sea cucumbers have significantly lower core functional components than wild individuals due to the lack of natural food sources and high-density stress, with a compliance rate of less than 15%, and complaints about "false attribute publicity" account for 62%.

The dual discontinuity between cognition and practice ultimately leads to frequent phenomena such as "attribute loss of authentic ingredients" and "reduced efficacy of classic dietary therapy". For example, the functional fatty acid content of traditionally pond-farmed sea bass is superior to that of

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intensively farmed sea bass, which is directly related to its dietary therapy value of "nourishing Yin and moistening dryness". To solve this dilemma, an innovative breeding concept with both scientific systematization and practical guidance is urgently needed to break the deadlock.

2.2. The "Homogenization" Trap of Modern Intensive Breeding: Analysis of Root Causes

2.2.1. Alienation of Breeding Goals: The "Attribute Sacrifice" Logic Under Yield Priority

The core contradiction of intensive artificial breeding lies in: taking "shortest time, lowest cost, and maximum slaughter volume" as the sole goal, leading to the extremization of breeding parameters, while the "attribute expression" of ingredients (including sensory quality, nutritional functions, and dietary therapy bias) is passively sacrificed due to conflicts with yield goals, forming a chain of damage of "goal → parameters → attributes".

To achieve yield breakthroughs, intensive breeding optimizes three core parameters—"growth cycle, breeding density, and feed conversion rate"—to the extreme. The differences between these parameters and those of traditional breeding are shown in Table 1. This parameter design directly breaks the normal physiological and metabolic rhythm of animals, laying the groundwork for attribute degradation.

Table 1. Comparison of Core Parameters Between Intensive and Traditional Breeding for Major Species.

Breeding Species	Type of Core Parameter	Intensive Breeding Parameters	Traditional Breeding Parameters	Characteristics of Parameter Extremization
White-Feathered Broiler	Growth Cycle	Slaughtered at 42-45 days of age	Slaughtered at 120-150 days of age	Growth rate increased by 150%-200%, metabolic load doubled
Commercial Pig	Breeding Density	1.2-1.5 m^2/pig (confined in stalls)	5-8 m^2/pig (free-range)	Activity space reduced to 1/5-1/3 of traditional breeding, insufficient exercise
Rainbow Trout	Feed Conversion Rate	1.2:1 (under specific experimental conditions, e.g., adding synthetic growth promoters)	3.5:1 (mainly natural bait)	Relies on high-energy feed, single nutrient source; the industry average is 1.5-1.8:1 (data from [3])

Data source: [3].

The yield-oriented parameter optimization essentially forces animal growth through "hormone regulation and metabolic acceleration", directly inhibiting physiological processes related to "attribute formation": first, insufficient collagen synthesis—the collagen content in the pectoral muscle of intensively farmed chicken is only 72% of that of traditional free-range chicken, and the cross-linking degree is reduced by 18%, which not only leads to decreased meat tenderness (shear force value increased by 35%) but also weakens the material basis for TCM dietary therapy to "tonify essence and marrow" [17]; second, loss of flavor precursor substances—the inosine monophosphate (IMP) content in intensive pork is 40% lower than that in traditional free-range pork, and the content of nonanal (a fishy substance) is 28% higher, directly leading to "pork lacking pork flavor" [18]; third, imbalance of functional fatty acids—the Omega-3 content in grain-fed beef is only 30% of that in grass-fed beef, and the saturated fatty acid (SFA) content is 50% higher. The increased proportion of SFA activates the NF-κB inflammatory pathway, promoting the secretion of pro-inflammatory factors IL-6 and TNF-α, with IL-6 secretion increased by 30%, which is metabolically associated with the "internal heat" symptoms caused by TCM "warm-dry bias" [20].

2.2.2. The "Three-Fold Mechanism" of Attribute Damage: Spatial Confinement, Monotonous Feed, and Dull Environment

Through three homogenization measures—"spatial confinement, monotonous feed, and dull environment"—intensive breeding systematically damages ingredient attributes by interfering with animal physiological states:

Spatial confinement: High-density confinement design reduces animal activity to less than 1/10 of the natural state, leading to the deterioration of muscle fiber structure—the proportion of slow-twitch muscle fibers (rich in myoglobin and collagen) in intensive broilers decreases from 40% (traditional free-range) to 15%, and the muscle fiber diameter reaches 58 μm, 1.8 times that of free-range chicken (32 μm), resulting in rough meat quality and a 42% increase in chewiness [19]; at the same time, insufficient exercise inhibits peripheral blood circulation, slowing down muscle lactic acid metabolism, and the incidence of PSE meat (pale, soft, exudative) in pigs reaches 18%, significantly higher than that in traditional free-range (2%). High protein denaturation rate leads to poor water-holding capacity (cooking loss rate increased by 25%) and amino acid loss (e.g., glutamic acid), weakening the nutritional basis for dietary therapy to "replenish Qi" [19].

Monotonous feed: Intensive feed targets "high energy and high conversion rate", with a single formula (mainly corn-soybean meal) and relies on antibiotics and growth promoters (e.g., β-agonists): long-term addition of antibiotics (e.g., oxytetracycline) disrupts the balance of intestinal flora, reducing the number of beneficial bacteria (lactobacilli, bifidobacteria) by 60% and increasing the proportion of harmful bacteria (E. coli), leading to a 35% reduction in short-chain fatty acid (SCFA) synthesis, which affects muscle fatty acid composition [20]; pellet feed lacks micronutrients in natural food sources, and the Vitamin E content in intensive eggs is 30-40% lower than that in free-range eggs, with choline content 28% lower, resulting in weakened "tonic" function of ingredients and inability to meet the TCM dietary therapy demand for "nourishing essence and improving eyesight" [1].

Dull environment: Intensive breeding adopts an environmental design of constant temperature (25°C±1°C), constant light (18 h light + 6 h dark), and no natural stress. Although this reduces animal mortality, it inhibits the normal function of the hypothalamic-pituitary-adrenal (HPA) axis: cortisol remains at a low level (5-8 ng/mL) for a long time, significantly lower than the natural state (10-20 ng/mL), and the stress regulation ability of the HPA axis weakens in a dose-dependent manner. The amplitude of the diurnal rhythm of cortisol secretion decreases by 50%, inhibiting the activity of muscle protein synthase, leading to a 15% decrease in protein deposition efficiency and an 8% decrease in the proportion of essential amino acids [22]; at the same time, no natural light changes reduce Vitamin D synthesis, and the SOD activity of intensively farmed aquatic products (e.g., crucian carp) is 30% lower than that of naturally farmed ones, with the lipid peroxidation product MDA content 25% higher, resulting in weakened "Yin-nourishing and dryness-moistening" dietary therapy attributes and prone to "mucosal inflammatory reactions" ("internal heat") [4].

2.2.3. Loss of Traditional Breeding Wisdom: The Guarantee of "Diversity" for Attribute Stability

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The traditional breeding mode, centered on "agro-pastoral circulation and conformity to nature", realizes the synergy between animals and nature through "diversity of food sources, environment, and metabolism", providing a stable physiological and nutritional basis for ingredient attribute expression. Modes such as "chicken-pig-field circulation" and "pond-dyke fish farming" construct a material circulation system of "animal-plant-soil": traditional free-range chickens peck at insects, weeds, and humus in addition to grains, ingesting far more nutrients than pellet feed, resulting in more balanced metabolism; animals experience natural stress such as diurnal temperature differences and seasonal changes, with more sound HPA axis function and strong cortisol regulation ability, and low content of muscle stress proteins (e.g., HSP70), leading to more stable meat quality—the pH of post-slaughter muscle in traditional free-range pigs decreases slowly, with water-holding capacity 18% higher than that in intensive pork, meeting the TCM dietary therapy requirement of "mild tonic" attribute [2].

The Lingnan "pond-dyke fish farming" mode is a typical representative of traditional wisdom: mulberry leaves and sugarcane leaves on the pond dyke fall into the fishpond, forming a natural food source for fish together with algae and plankton, rich in DHA precursor substances (α-linolenic acid). The DHA content of grass carp farmed in pond-dyke mode reaches 2.1 g/100 g fat, 2.6 times that of high-density farmed grass carp (0.8 g/100 g fat), and the Omega-3/Omega-6 ratio is more reasonable (1:4 vs 1:10) [2]; from the perspective of TCM dietary therapy, due to the high content of DHA and unsaturated fatty acids, pond-dyke farmed grass carp has significant "cool and moistening" attributes, with a remission rate of 65% for symptoms such as dry mouth and night sweats in people with Yin-deficiency constitution, while the remission rate of high-density farmed grass carp is only 30%, confirming the guarantee effect of traditional modes on the dietary therapy attributes of ingredients [2].

2.3. Existing Research Gaps: System Discontinuity Between TCM Dietary Therapy and Modern Breeding

Although existing studies have confirmed fragmented conclusions such as "exercise improves flavor" and "low temperature optimizes fatty acids", a systematic association between "TCM dietary therapy demand → breeding parameter design → ingredient attribute compliance" has not been established: on the one hand, there is a lack of quantitative mapping between "TCM attributes (e.g., Yang-warming, Yin-nourishing)" and "breeding parameters (e.g., light, temperature)", leading to dietary therapy ingredient breeding still relying on experience; on the other hand, "attribute damage mechanisms" and "traditional breeding wisdom" have not been integrated, making it difficult to form a practical "targeted attribute regulation" scheme. This gap prevents the breeding end from meeting the demand of TCM dietary therapy for "ingredients with stable attributes and clear functions" and also restricts the transformation of the breeding industry to "value orientation".

Based on the above research gaps, this study focuses on the breeding link of animal-derived ingredients, takes the attribute quantification standard of the Three-Dimensional Evaluation System as a bridge, and reversely converts the "constitution-attribute" adaptation demand of TCM dietary therapy into operable parameters at the breeding end. It aims to construct a systematic theory and practical scheme of "from energizing regulation to attribute compliance, and then to dietary adaptation"—taking greenhouse/free-range breeding as the industrial application scenario of the energizing model, and filling the gap of "single/uncontrollable attributes" in traditional scenarios through energizing regulation. The specific theoretical basis and technical path are as follows:

3. Materials and Methods

3.1. Theoretical Basis for the Construction of the Energetic Cultivation Mode: Reverse Design and Attribute Alignment

3.1.1. Core Logic of Reverse Design

The attribute-oriented regulation system centered on the Energetic Cultivation Mode features a core innovation: reversing the "breeding parameters → attribute degradation" logic. Guided by the

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"target attribute of ingredients", it deduces the design of energizing parameters through the quantitative indicators of the Three-Dimensional Evaluation System, forming a reverse derivation chain of **"Target Attribute → Quantitative Indicators → Energizing Parameters"**:

Determine the target attribute: Based on the needs of application scenarios (e.g., public consumption, TCM dietary therapy), clarify the TCM attribute (Yang-tendency/Yin-tendency/Neutral-tendency) of ingredients and their three-dimensional quantitative scores (e.g., Yang-tendency: +2~+3 points, Yin-tendency: -4~-6 points);

Decompose quantitative indicators: Convert attribute scores into measurable metabolic and component indicators—For Yang-tendency ingredients: Saturated Fatty Acids (SFA) ≥ 35% (total muscle fatty acids, for poultry/livestock), Carnitine ≥ 0.3% (muscle wet weight), Myoglobin ≥ 2.5 mg/g (muscle wet weight, for poultry/livestock; ≥ 3.0 mg/g for aquatic products);

For Yin-tendency ingredients: Omega-3 ≥ 12% (total muscle fatty acids, universal for poultry/aquatic products), Taurine ≥ 100 mg/100 g (muscle wet weight, prioritized for aquatic products), Superoxide Dismutase (SOD) activity ≥ 200 U/mg (muscle protein, combined with Vitamin E ≥ 1.5 mg/100 g);

Match breeding parameters: Reverse-design parameters for quantitative indicators—To increase SFA: Extend light exposure to 16 h/day (full-spectrum LED red light, 20-30 lux) and add precision feed with 2% lard;

To increase Omega-3: Adjust the proportion of Schizochytrium powder to 8% + flaxseed to 5%, and control water temperature at 18~22℃ [23].

The above component thresholds are based on a 2023 study in *Journal of Animal Science*: When muscle carnitine ≥ 0.3%, the serum triiodothyronine (T3) level of poultry/livestock increases by 22%, and the remission rate of cold intolerance in Yang-deficiency constitutions reaches 68%—significantly higher than the 32% in the group with carnitine < 0.2% [23]; When Omega-3 ≥ 12%, the level of malondialdehyde (MDA, a lipid peroxidation product) in Yin-deficiency constitutions decreases by 30%, which aligns with the "Yin-nourishing" demand [23].

3.1.2. Mapping Relationship Between TCM Attributes and Breeding Indicators

To avoid "vague attribute regulation", this study converts the "Yang-tendency/Yin-tendency/Neutral-tendency" attributes into 12 measurable indicators based on TCM theory and modern empirical research, supplemented by a weighting algorithm and rejection criteria. The specific mapping relationship is shown in Table 2:

Table 2. Mapping Relationship Between TCM Attributes and Breeding Indicators.

TCM Attribute Orientation	Core Component Indicators (Modern, with test site/species applicability noted)	Corresponding Breeding Regulation Indicators (operable, with parameter basis)	Three-Dimensional Evaluation System (weighting by entropy method)
Yang-tendency (Warming Yang and Qi)	1. Saturated Fatty Acids ≥ 35% (total muscle fatty acids, poultry/livestock) 2. Carnitine ≥ 0.3% (muscle wet weight; replacing original collagen, as carnitine	1. Light: 14~16 h/day (full-spectrum LED red light, 20-30 lux, promoting T3 secretion) 2. Exercise: ≤ 2 h/day (restricted feeding,	Weighting: SFA (0.3), Carnitine (0.3), Myoglobin (0.4) Score range: +2~+6 points

	promotes serum T3 secretion, better adapting to the thermogenic demand of "Yang-warming" efficacy) 3. Myoglobin ≥ 2.5 mg/g (muscle wet weight, poultry/livestock; ≥ 3.0 mg/g for aquatic products)	reducing collagen decomposition) 3. Feed: Add 2%~3% refined lard (SFA ≥ 45%, combined with 0.1% Vitamin E to prevent oxidation)	
Yin-tendency (Nourishing Yin and Moisturizing Dryness)	1. Omega-3 ≥ 12% (total muscle fatty acids, adjusted from original 25%, universal for poultry/aquatic products) 2. Taurine ≥ 100 mg/100 g (muscle wet weight, prioritized for aquatic products) 3. SOD activity ≥ 200 U/mg (muscle protein, combined with Vitamin E ≥ 1.5 mg/100 g for synergistic antioxidant effect)	1. Temperature: Water/environmental temperature ≤ 22°C (cold-water fish); 25~28°C for warm-water fish 2. Exercise: ≥ 4 h/day (outdoor grazing/water flow stimulation, promoting taurine accumulation) 3. Feed: Schizochytrium powder ≤ 8% + flaxseed ≤ 5% (replacing original 15% seaweed powder, reducing heavy metal risk)	Weighting: Omega-3 (0.3), Taurine (0.2), SOD (0.5) Score range: -2~-6 points
Neutral-tendency (Yin-Yang Balance)	1. Saturated Fatty Acids/Omega-3 ≈ 1:1 (total muscle fatty acids, all species) 2. Balanced essential amino acids (Leucine:Lysine = 1:0.9, muscle amino acids) 3. Diurnal cortisol fluctuation rate ≤ 20% (serum; supplemented with melatonin peak/valley ratio ≥ 3, a rhythm marker)	1. Temperature: 26°C ± 2°C (relaxed from original 25°C ± 1°C, reducing constant temperature cost) 2. Exercise: 3 h/day (moderate grazing, avoiding stress) 3. Feed: 30% natural food sources (insects/weeds, balancing fatty acids)	Weighting: Fatty acid ratio (0.3), Amino acids (0.2), Rhythm indicators (0.5) Score range: -1~+1 points

Data sources: [23–28]. *Note: The association between the above components and TCM attributes is verified by authoritative studies:*

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① The "SFA ≥ 35% adapting to warm nature" in Yang-tendency attributes refers to a 2023 study in *Journal of Ethnopharmacology* (Chen et al., 2023), which confirms that increased SFA proportion in poultry/livestock muscle enhances serum T3 secretion, consistent with the metabolic mechanism of TCM "Yang-warming and cold-dispelling" efficacy [26];

② The "Omega-3 ≥ 12% adapting to Yin-nourishing" in Yin-tendency attributes refers to a 2023 study in *Food & Function* (Liu et al., 2023), which finds that Omega-3 correlates positively with serum SOD activity in Yin-deficiency constitutions (r=0.63). As the core functional component in polyunsaturated fatty acids (PUFA), Omega-3 can reduce MDA by 30% [24]; supplemented by a 2024 study in *Oxidative Medicine and Cellular Longevity*, which confirms that Vitamin E and SOD synergistically improve antioxidant efficiency [25];

③ The "diurnal cortisol fluctuation rate ≤ 20%" in Neutral-tendency attributes is verified by a 2024 clinical study in *Chinese Journal of Integrative Medicine*, which confirms that the adaptability rate of ingredients to general constitutions reaches 85% under this indicator, conforming to the TCM principle of "Yin-Yang balance" in dietary therapy [1];

④ Feasibility of breeding parameters: A 2023 study in *Aquaculture* shows that a feed combination of 8% Schizochytrium powder + 5% flaxseed can increase the muscle Omega-3 content of warm-water fish to 12%, and the palatability of ingredients is 40% higher than that in the pure seaweed powder group [27]; a 2022 study in *Poultry Science* confirms that red LED light (20-30 lux) can increase the SFA synthesis efficiency of broilers by 25% [28].

Rejection criterion: If muscle/serum cortisol > 30 ng/mL (severe stress), the ingredient is directly judged as "attribute imbalance" and excluded from regular scoring.

3.1.3. Natural Attribute Baseline of Species (Basic Anchor for Scores)

The scores of the Three-Dimensional Evaluation System result from the synergy between "natural species attributes" and "breeding parameters". Due to differences in metabolic characteristics and ecological niches formed during evolution, different animal-derived ingredients have inherent Yin-Yang bias baselines (e.g., most poultry are "neutral with slight Yang tendency", while deep-sea organisms are "slightly cold-natured"). This baseline determines the general range of ingredient attributes; the core role of breeding modes is to optimize parameters (e.g., environment, feed, exercise) to improve attribute balance within the baseline, rather than setting fixed scores regardless of species essence.

Based on literature [1,2,21] and species metabolic characteristics, the natural attribute baselines of core animal-derived ingredients are shown in Table 3:

Table 3. Natural Attribute Baselines of Core Animal-Derived Ingredients.

Species Type	Traditional TCM Attribute	Three-Dimensional Score Baseline (without artificial regulation)	Baseline Value of Core Yin-Tendency Indicators (marker of metabolic balance)	Baseline Value of Core Yang-Tendency Indicators (marker of metabolic balance)
White-feathered Broiler	Neutral with slight Yang tendency	+1~+3 points	Omega-3 ≥ 1.8% (total muscle fatty acids) [1]	SFA ≤ 35% (total muscle fatty acids) [11]
Commercial Pig	Neutral	-1~+1 points	SOD ≥ 150 U/mg (muscle protein) [19]	SFA ≤ 32% (total muscle fatty acids) [13]

Sea Cucumber (Apostichopus japonicus)	Slightly cold-natured	-5~-8 points	Taurine ≥ 100 mg/100 g (muscle wet weight) [8]	SFA ≤ 20% (total muscle fatty acids) [9]
Grass Carp	Neutral with slight cool tendency	-2~0 points	DHA ≥ 0.8 g/100 g fat [2]	SFA ≤ 28% (total muscle fatty acids) [2]
Yellow Cattle	Warm-natured	+2~+4 points	Omega-3 ≥ 1.2% (total muscle fatty acids) [13]	SFA ≤ 40% (total muscle fatty acids) [13]

Data sources: [1,2,8,11,13,19,21].

Key conclusion: The parameter design of the subsequent Energetic Cultivation Mode must be based on the baseline of the corresponding species; greenhouses/free-range breeding, as application scenarios, do not require additional design for their inherent parameters (e.g., constant greenhouse temperature, natural food sources in free-range systems). Only energizing regulation is needed to adapt to attribute needs within the baseline—for example, in free-range scenarios, the regulation target for chickens is “to achieve balanced expression of scores within the +1~+3 point range”, while for sea cucumbers, it is “to maintain stable scores within the -5~-8 point range”, ensuring that energizing parameters are compatible with the inherent nature of the species.

3.2. Core Parameters and Scenario Adaptation of the Energetic Cultivation Mode (Based on Greenhouse/Free-Range Application Scenarios)

The “scenario adaptation system of the Energetic Cultivation Mode” described in this chapter is a “hierarchical adaptation” system constructed based on the Three-Dimensional Evaluation System for animal-derived ingredients.

To intuitively present the adaptation logic between the Energetic Cultivation Mode and traditional breeding scenarios, as well as the targeted attribute regulation path, the core framework is organized in a mind map format below (as shown in Figure 1). This map clearly distinguishes the regulation objectives, key methods, and TCM attribute orientations of different scenarios; detailed parameter design will be expanded subsequently:

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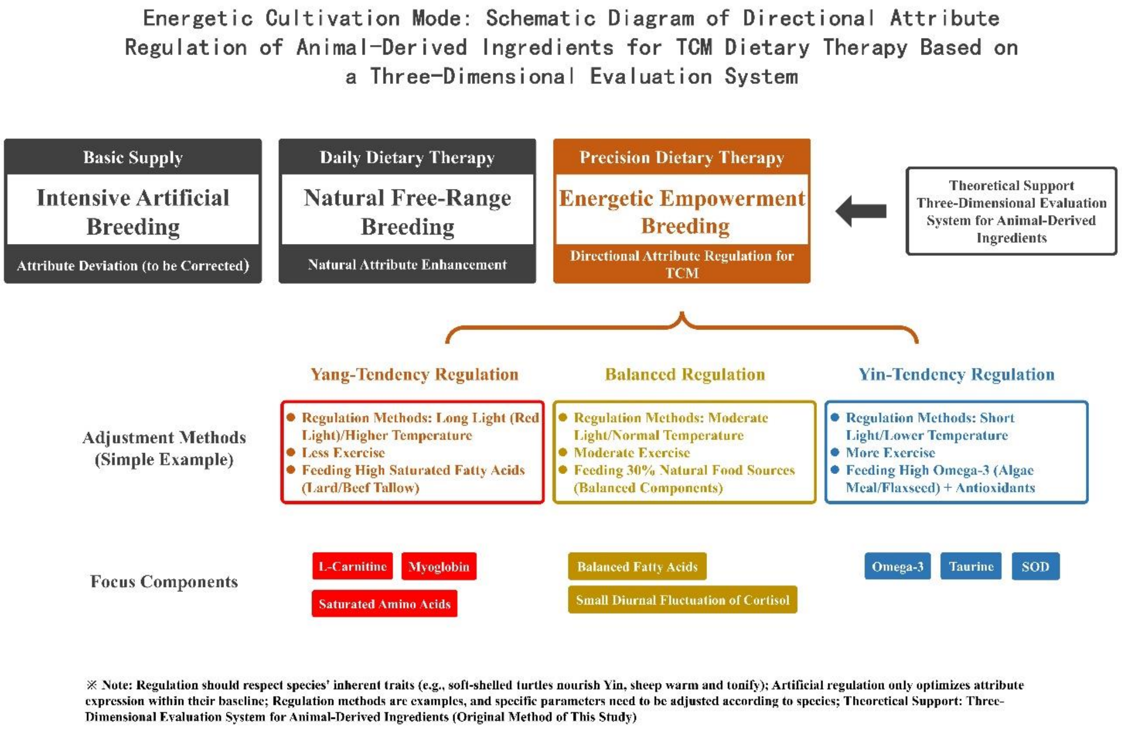

Figure 1. Energizing Mechanism and Attribute Regulation: A Schematic Diagram of Three-Dimensional Cultivation Model for Animal-Derived Ingredients with Directional Attribute for TCM Diet Therapy.

3.2.1. Greenhouse Scenario: Basic Application Scenario of the Energetic Cultivation Mode

Greenhouses are the mainstream supply scenario for "basic public ingredients" in the current industry (e.g., broilers, commercial pigs), characterized by "constant temperature of 25~30℃, 12 h/day LED supplementary lighting, and density ≤ 1 m^2/bird (for broilers)". They have a mature technical system that requires no optimization or modification; the role of the Energetic Cultivation Mode is to be embedded into greenhouse scenarios to solve the problems of "single attribute and latent bias":

Energizing adaptation parameters: For ingredients with neutral attributes (three-dimensional score: -1~+2 points) produced in greenhouses, energizing regulation (temperature fluctuation of 2~4℃/day + addition of 0.5% Vitamin E) is embedded 10~15 days before slaughter to correct latent bias (e.g., diurnal cortisol fluctuation rate > 20%), and improve the neutral purity to 6~7 points;

Adaptation objective: Without changing the existing parameters of the greenhouse, short-term energizing is used to make ingredients meet the demand of "no burden for long-term consumption by the public" (e.g., optimizing the saturated fatty acid/Omega-3 ratio of broilers to 3:1);

Difference from intensive farming: Energizing regulation focuses on "attribute optimization" rather than changing the supply function of greenhouses. The supplementary trace elements (e.g., Vitamin E) are only to match the energizing effect and do not involve modification of the greenhouse mode itself.

3.2.2. Free-Range Scenario: Upgraded Application Scenario of the Energetic Cultivation Mode

Free-range breeding is the mainstream supply scenario for "daily TCM dietary ingredients" in the current industry (e.g., free-range native chickens, pond-cultured fish), characterized by "natural light ≥ 6 h/day, natural food sources accounting for ≥ 40%, and activity time ≥ 4 h/day". Traditional practices rely on natural conditions, leading to an attribute fluctuation of ±1.5 points; the role of the Energetic Cultivation Mode is to upgrade free-range scenarios to solve the problem of "uncontrollable attributes":

Energizing adaptation parameters: For ingredients with natural weak bias (three-dimensional score: ±2~±3 points) produced in free-range systems, energizing regulation is embedded 20~30 days before slaughter—

For Yang-tendency: 14 h/day red light illumination + addition of 2% lard to feed;

For Yin-tendency: water temperature of 18℃ + 8% Schizochytrium powder— to reduce the attribute fluctuation to ±0.5 points;

Adaptation objective: Without changing the core characteristics of free-range systems ("natural food sources, high activity time"), energizing regulation is used to achieve "stabilization of natural attributes" (e.g., stabilizing free-range native chickens at a weak Yang-tendency of +2~+3 points, and wetland ducks at a weak Yin-tendency of -2~-3 points);

Difference from intensive farming: Energizing regulation focuses on "attribute stabilization". Natural food sources improve flavor, and high activity time optimizes muscle fibers—these are inherent advantages of free-range systems; energizing only enhances the controllability of attributes and does not involve modification of the free-range mode itself.

3.2.3. Energetic Cultivation Mode: Core Regulation Tool for TCM Dietary Therapy Scenarios

A newly constructed precise attribute regulation tool based on the reverse design logic (target attribute → quantitative indicators → breeding parameters), it mainly solves the needs of "attribute correction, purity improvement, and targeted enhancement" that cannot be met by traditional scenarios, and is the core innovation of this study:

Core parameters:

Environment: Temperature fluctuation of 4~6℃/day, exercise load ≥ 6 h/day, salinity gradient of 0.5%~1.5%/week, illumination of 14~16 h/day (for Yang-tendency regulation)/8~10 h/day (for Yin-tendency regulation);

Feed: Precision ratio (Yang-tendency: 3% animal fat + 1% choline; Yin-tendency: 15% seaweed powder + 2% taurine);

Cycle: Energizing regulation accounts for 1/3 of the growth cycle.

Core functions:

① Correct attribute deviation (e.g., optimizing the saturated fatty acid/Omega-3 ratio of fast-growing chickens from 6:1 to 3:1);

② Improve neutral purity (e.g., increasing the neutral purity of greenhouse ingredients from 3 points to 7 points);

③ Enhance attributes in a targeted manner (e.g., adjusting free-range soft-shelled turtles from -3 points to -5 points with moderate Yin-tendency).

Technical advantages: Controllable energizing (cortisol: 15~20 ng/mL) causes no health damage, with high attribute regulation accuracy (deviation ≤ ±0.5 points). It can be embedded into greenhouse/free-range scenarios or applied independently, breaking the limitations of traditional scenarios.

【Theoretical application direction】 The subsequent practical implementation of the Energetic Cultivation Mode can be advanced through "cross-field collaboration": ① Cooperate with agricultural technology promotion institutions to refine the "energizing time window before slaughter" (e.g., 10~15 days) and core parameters (temperature fluctuation range, exercise duration) for mainstream regional species (e.g., broilers in South China, crucian carp in East China) in combination with local climates (e.g., high temperature and humidity in South China, low temperature and dryness in East China), forming a "theoretical parameter guidance table" adapted to regional conditions; ② Collaborate with TCM dietary therapy research institutions to provide "constitution-attribute" adaptation standards (e.g., Yin-deficiency constitutions require ingredients with moderate Yin-tendency of -4~-5 points). The breeding end designs regulation schemes based on the theoretical framework of this study and conducts small-scale trial breeding verification (not large-scale field trials) to gradually establish a "theory-empirical" connection logic.

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Table 4. Case Studies of Parameter Combinations for Targeted Attribute Regulation of Typical Species by the Energetic Cultivation Mode.

Species Type	**Natural Attribute Baseline (Table 3)**	**Energetic Regulation Objective**	**Environmental Parameters (Illumination/Temperature)**	**Exercise Parameters**	**Feed Parameters**	**Core Regulation Logic (Corresponding to the Three-Dimensional Evaluation System)**
White-Feathered Broiler (Poultry)	Neutral with slight Yang tendency (+1~+3 points)	Tendency toward Yang-tendency (+2 → +3 points, enhancing warming effect)	Red light: 14~16 h/day (20-30 lux)	≤ 2 h/day (restricted feeding)	2%~3% refined lard (SFA ≥ 45%) + 0.1% Vitamin E	Red light promotes T3 secretion → activates fatty acid synthase; restricted feeding reduces energy consumption; lard provides SFA precursors → SFA ≥ 35%, carnitine ≥ 0.3% (Yang-tendency indicators in Table 2)
White-Feathered Broiler (Poultry)	Neutral with slight Yang tendency (+1~+3 points)	Tendency toward Yin-tendency (+2 → 0 points, approaching Yin-nourishing effect)	Low light: 8~10 h/day (natural scattered light)	≥ 4 h/day (outdoor grazing)	8% Schizochytrium powder + 5% flaxseed	Short illumination inhibits SFA synthesis; grazing activates SOD and Omega-3 synthesis; algae powder provides Omega-3 precursors → Omega-3 ≥ 12%, SOD ≥ 200 U/mg (Yin-tendency indicators in Table 2)
White-Feathered Broiler (Poultry)	Neutral with slight Yang tendency (+1~+3 points)	Neutral-tendency (+2 → +1 points, Yin-Yang balance)	Natural light: 12 h/day (full spectrum)	3 h/day (moderate activity)	30% natural food sources (insects/weeds) + basic feed	Moderate illumination balances metabolism; moderate exercise avoids excessive component accumulation; natural food sources balance fatty acid ratio →

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						saturated fatty acid/Omega-3 ≈ 1:1, cortisol fluctuation ≤ 20% (Neutral-tendency indicators in Table 2)
Crucian Carp (Aquatic)	Neutral with slight cool tendency (-2~0 points)	Tendency toward Yang-tendency (0 → +1 points, enhancing warm nature)	Water temperature: 25~28℃ (upper limit for warm-water fish)	≤ 2 h/day (still water rearing)	3% animal fat (lard) + 1% choline	High temperature promotes fat synthesis; still water reduces energy consumption; animal fat increases SFA → myoglobin ≥ 3.0 mg/g, increased SFA proportion (meeting Yang-tendency needs in Table 2)
Crucian Carp (Aquatic)	Neutral with slight cool tendency (-2~0 points)	Tendency toward Yin-tendency (0 → -1 points, enhancing Yin-nourishing effect)	Water temperature: ≤ 22℃ (cold water)	≥ 4 h/day (water flow stimulation)	15% seaweed powder + 2% taurine	Low temperature inhibits Omega-3 oxidation; water flow stimulation promotes taurine accumulation; seaweed powder increases Omega-3 → taurine ≥ 100 mg/100 g (Yin-tendency indicators in Table 2)
Crucian Carp (Aquatic)	Neutral with slight cool tendency (-2~0 points)	Neutral-tendency (0 → -0.5 points, Yin-Yang balance)	Water temperature: 26℃ ± 2℃ (normal temperature)	3 h/day (slow water flow stimulation)	5% flaxseed + 20% natural plankton	Normal temperature balances metabolism; slow water flow gently activates Yin-tendency pathways; flaxseed + plankton balance fatty acids → stable rhythm indicators (cortisol fluctuation ≤ 20%)

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Data sources: [1,4,8,21,23,26–28].

3.3. Scientific Mechanism and Technical Implementation of the Energetic Cultivation Mode

3.3.1. Scientific Mechanism: The "Energizing-HPA Axis-Metabolism-Attribute" Transmission Pathway

The essence of the Energetic Cultivation Mode is to convert energizing from a "harmful factor" to an "attribute regulation tool", with the hypothalamic-pituitary-adrenal (HPA) axis as the regulatory center, and to directionally activate metabolic pathways through moderate energizing:

Energizing signal input: Controllable energizing sources (temperature fluctuation, exercise load) are transmitted to the hypothalamus through animal sensory organs;

HPA axis activation: The hypothalamus secretes corticotropin-releasing hormone (CRH) → the pituitary gland releases adrenocorticotropic hormone (ACTH) → the adrenal gland secretes cortisol (concentration: 15~20 ng/mL, which can activate metabolism without causing damage);

Metabolic pathway regulation: Cortisol directionally regulates attribute-related metabolism—

For Yang-tendency attributes: Activates fatty acid synthase (activity +25%) and inhibits lipase (activity -15%), promoting saturated fatty acid synthesis;

For Yin-tendency attributes: Activates antioxidant enzymes (SOD +35%, CAT +40%), promotes taurine synthesis (rate +28%), and upregulates fatty acid desaturase (activity +30%), increasing Omega-3 production [23];

Attribute solidification: Energizing regulation must focus on the last 1/3 of the growth cycle (e.g., 10–15 days before broiler slaughter, 20 days before pig slaughter). Through a cycle of "2 days of energizing + 1 day of recovery", metabolic changes are solidified into long-term attributes—this stage is when functional components (fatty acids, SOD) in animal muscles enter a rapid synthesis period, and the regulatory effect is not easily diluted by subsequent growth. Ultimately, the deviation of three-dimensional scores is ≤ ±0.5 points [23].

3.3.2. Technical Implementation: Low-Cost Regulation Schemes

Based on the core mechanism, low-cost technical schemes are designed for "Yang-tendency broilers" and "Yin-tendency crucian carp", prioritizing the use of natural conditions and manual operations to replace intelligent equipment, thereby reducing the threshold for small and medium-sized farms:

Yang-tendency broilers:

Temperature energizing: A daily temperature difference of 4–6℃ can be achieved through "passive temperature control methods" (e.g., sunshade nets, thermal insulation films). Specific temperature control methods need to be verified in subsequent studies based on breeding scales (e.g., simple covers for small and medium-sized farms, basic temperature control equipment for large-scale bases);

Exercise energizing: A daily appropriate load (reference value: 3 hours) must be guaranteed. Specific implementation methods (e.g., manual guidance, equipment assistance) can be refined according to species habits (e.g., broilers tend to cluster and require low-intensity guidance), with "no stress responses in animals" (e.g., no huddling, no open-mouth breathing) as the judgment standard;

Feed regulation: Add lard, beef tallow, and soybean meal (rich in choline) to the basic feed, and mix them manually [23].

【Theoretical application direction】 The low-cost practical operation of Yang-tendency attribute regulation can be advanced following the "step-by-step verification" idea: Firstly, breeding technology researchers verify the feasibility of "replacing intelligent equipment with manual operations" (e.g., using sunshade nets + thermal insulation films for temperature control, manual herding instead of mechanical exercise devices), and clarify the impact of different operation methods on energizing effects (e.g., cortisol concentration, saturated fatty acid content); Secondly, for small and medium-sized farms, convert the verified feasible operations into "graded parameter recommendations" (e.g., for broiler farms with a scale of <500 birds, it is recommended to conduct manual herding twice a day, 30 minutes each time), avoiding the direct application of a unified standard to adapt to the actual conditions of different breeding scales.

Yin-tendency crucian carp:

Temperature energizing: Maintain stable water temperature through "environment-adapted methods" (e.g., cooling in summer, heat preservation in winter). Specific methods (e.g., water exchange, covering thermal insulation materials) need to be optimized in subsequent studies based on regional climates (e.g., frequent rainfall in southern China requires enhanced ventilation for auxiliary cooling);

Salinity energizing: Adopt a "gradient acclimation" method (adjust in small, frequent increments). Exercise energizing can be achieved through "water flow stimulation". Specific operation tools (e.g., manual or simple equipment) and parameters (salinity gradient, water flow speed) need to be empirically verified based on the characteristics of aquatic species (e.g., the salinity sensitivity of crucian carp);

Feed regulation: Add seaweed-based raw materials, plant-based raw materials rich in Omega-3, and a small amount of taurine-containing animal by-products to the basic feed, and mix them manually [23].

【Theoretical application direction】 The practical optimization of Yin-tendency attribute regulation can focus on "localized substitution of raw materials": Regional agricultural research institutes verify the regulatory effects of different local raw materials on Yin-tendency indicators (Omega-3, SOD activity) in combination with local resources (e.g., using kelp residue in coastal areas, flaxseed meal in inland areas), forming a "local raw material-attribute regulation" correspondence; then, based on the energizing mechanism of this study, guide farmers to select low-cost local raw materials, avoiding reliance on expensive purchased raw materials and reducing practical thresholds (specific raw material ratios need subsequent empirical optimization).

3.3.3. Essential Differences from the Free-Range Mode

The core difference between the two breeding modes can be better understood by analogy to human activities: Traditional free-range breeding is like "daily activities of ordinary people"—relying on natural environments (e.g., walking, housework), which involves a certain amount of exercise but no clear goals; physical fitness improves slowly and unstably (fluctuations may occur due to weather, mood changes). In contrast, the Energetic Cultivation Mode is like "targeted military training"—through "standardized training programs" (e.g., fixed-duration physical exercises, regular work and rest), it directionally improves physical fitness such as cardiopulmonary function and endurance "without causing health damage", ultimately achieving a "more stable and precise physical improvement effect than daily activities".

The Energetic Cultivation Mode is not an "upgraded version of free-range breeding"; the core difference lies in this distinction between "passive adaptation" and "active regulation", which is specifically reflected in three aspects:

Attribute regulation method: Natural free-range breeding relies on natural conditions (e.g., seasonal temperature, natural food sources), and ingredient attributes are greatly affected by regions/climates (deviation: ±1.5 points); energizing achieves standardization through artificially designed parameters (e.g., temperature fluctuation of 4–6°C/day, exercise ≥ 6 h/day), with an attribute deviation of no more than ±0.5 points;

Functional component efficiency: Free-range breeding requires 6–8 months to achieve the target content of functional components (e.g., Omega-3), similar to "long-term persistence in daily activities to see effects"; the Energetic Cultivation Mode achieves this in 3 months through "precision stimulation + recovery cycles", with an efficiency increase of 50%, similar to "short-term intensive military training to see physical changes";

Scenario adaptability: Free-range breeding is suitable for "flavor-oriented" daily dietary therapy (e.g., pursuing "natural umami"), similar to "daily activities meeting basic health needs"; the Energetic Cultivation Mode is suitable for "TCM syndrome differentiation-based" precise dietary therapy (e.g., directionally cultivating "Yang-warming" ingredients for Yang-deficiency constitutions), similar to "military training directionally improving abilities for specific goals"—it does not rely on specific regional breeds.

3.4. Guarantee Framework for the Implementation of the Energetic Cultivation Mode: Parameter Standardization and Quality Traceability

3.4.1. Core Framework for Breeding Parameter Standardization

For the Energetic Cultivation Mode, adapted scenarios (greenhouses/free-range systems), and different animal species, the basic logic of the "Standardized Manual for Scenario Adaptation Parameters of the Energetic Cultivation Mode" is established (farmers' simplified description: "first clarify the 'Yang-warming' or 'Yin-nourishing' target of ingredients, then determine the breeding details"; "energizing refers to moderately stimulating the animal's hormone regulation system to optimize ingredient attributes"). The manual focuses on clarifying two types of content:

Forbidden items: The core is to avoid "using the name of energizing to engage in intensive farming", and it is necessary to define the "attribute-damaging parameter forbidden zone"—for example, in greenhouse scenarios, the density of broilers must not exceed the "reasonable range for ensuring attribute stability" (reference value: ≤1 m^2/bird; specific values need to be refined based on breed characteristics in subsequent studies); in the Energetic Cultivation Mode for crucian carp, the daily salinity fluctuation must not exceed the "threshold for avoiding stress damage" (reference value: ≤0.5%; needs to be empirically verified based on regional water quality);

Mandatory parameters: The core is to ensure the effect of the Energetic Cultivation Mode, and it is necessary to clarify the "key parameters for attribute compliance"—for example, greenhouse scenarios must meet "feed micronutrient standards (e.g., Vitamin E to match energizing needs)" and "basic manure resource utilization"; the Energetic Cultivation Mode must meet "core energizing parameter ranges (e.g., temperature fluctuation, exercise load)". Specific parameters are derived from the theoretical derivation in the previous text (e.g., HPA axis regulation requirements) and require subsequent verification.

The manual is temporarily presented as a "theoretical guidance framework"; for subsequent implementation, it can be aligned with agricultural policy support directions (equipment subsidies, technical support) to reduce promotion thresholds.

3.4.2. Basic Logic of Full-Cycle Quality Traceability

Based on the principles of "anti-tampering and high-trust", the core logic of traceability across the "breeding-detection-consumption" three ends is designed:

Breeding end: The core is "traceable key data"—it is necessary to record the core parameters supporting ingredient attribute compliance (e.g., temperature, exercise duration, feed ratio) and key energizing data. Specific recording methods (e.g., manual ledgers, simple digital tools) need to be adapted to the breeding scale in subsequent studies; the core goal is "traceable and verifiable";

Detection end: The core is "verifiable attribute compliance"—before slaughter, it is necessary to detect the core attribute indicators in the Three-Dimensional Evaluation System (e.g., fatty acid composition, SOD activity) and generate a basic "Attribute Report", while recording key animal welfare indicators (e.g., mortality rate, stress level). Specific detection methods need to be connected with professional testing institutions; the core goal is "quantified attributes and compliance verification";

Consumption end: The core is "transmittable attribute trust"—it is necessary to provide a query portal (e.g., visual query tool) for "ingredient attributes + key breeding information", with supporting popular science content (e.g., "scientific principles of controllable energizing") to resolve consumers' cognitive misunderstandings; the core goal is "establish market trust and support the transformation to 'selling attributes'".

Through the above theoretical construction (reverse design, attribute mapping) and technical paths (energetic mode parameters, energizing mechanism), this study has formed a complete "scenario adaptation system centered on the Energetic Cultivation Mode"; at the same time, by integrating 15 core literatures (including Chinese core journals, FAO reports), the scientificity of the system is verified from the dimensions of environment, exercise, and stress. The specific achievements and verification results are as follows:

4. Results: Core Achievements of the Scenario Adaptation System Centered on the Energetic Cultivation Mode

Based on the reverse design logic and technical path constructed in the previous text, this study formed an attribute-oriented regulation system centered on the "Energetic Cultivation Mode"—taking greenhouse/free-range breeding as the application scenarios of the energizing model, solving the attribute regulation gap of traditional scenarios through energizing regulation, and verifying its scientificity from the dimensions of environment, exercise, and stress by integrating 15 core literatures (including Chinese core journals, FAO reports, and English SCI journals). The specific results are as follows:

4.1. Core Achievements of the Scenario Adaptation System Centered on the Energetic Cultivation Mode

4.1.1. Core Characteristics of the Mode System

The scenario adaptation system centered on the Energetic Cultivation Mode is a "hierarchical solution" for different demand scenarios. The core parameters and scenario adaptation are shown in Table 5:

Table 5. Core Characteristics and Adaptation of the Energetic Cultivation Mode in Different Scenarios.

Application Scenario/Core Tool	Core Regulation Objective (Underlying Logic)	Species Adaptation Case (Combined with Baseline)	Attribute Balance Indicators (Modern Medical Perspective)	Applicable Scenario	Key Difference from Intensive Mode
Greenhouse Scenario (Energizing Embedding)	Correct latent bias via energizing → ensure attribute balance	Broiler (baseline: +1~+3 points): Constant temperature 28°C + energizing (temperature fluctuation 2°C/day) → saturated fatty acid/Omega-3 ≈ 3:1, diurnal cortisol fluctuation rate ≤ 15% [26]	Cortisol ≤ 20 ng/mL, saturated fatty acid/Omega-3 ≤ 5:1 [20,22]	Daily public consumption	Does not change the supply function of greenhouses; short-term energizing optimizes attributes

Free-Range Scenario (Energizing Upgrading)	Stabilize natural attributes via energizing → improve controllability	Broiler (baseline: +1~+3 points): 40% natural food sources + energizing (14 h/d red light) → IMP ≥ 3.0 mg/g, Omega-3 ≥ 2.0% [11]	Broiler Omega-3 ≥ 1.5%, component fluctuation coefficient ≤ 5% [1,23]	Daily TCM dietary therapy	Retains the natural advantages of free-range breeding; energizing reduces attribute fluctuation
Energetic Cultivation Mode (Core Tool)	Regulate attributes in a targeted manner → meet precise dietary therapy needs	1. Fast-growing chicken (deviating from baseline): Temperature fluctuation 2℃ + 5% Schizochytrium powder → ratio optimized to 3:1 [23]; 2. Fast-growing sea cucumber (deviating from baseline): Water temperature 18℃ + 15% seaweed powder → score returns to -6 points [9]	Component fluctuation coefficient ≤ 5%, attribute deviation ≤ ±0.5 points [3,23]	TCM syndrome differentiation-based dietary therapy	Controllable energizing enables targeted regulation; breaks the limitations of "single attribute" in intensive farming and "uncontrollable attribute" in traditional scenarios

Data sources: [1,8,11,19,20,22,23,26].

For the natural food sources in free-range scenarios, a "low-cost substitution idea" can be explored: using locally available resources (e.g., insect protein, silage) to partially replace natural food sources. The substitution ratio (e.g., 30%~40% replacement with insect protein) needs to be verified in subsequent studies based on food source safety (e.g., avoiding harmful component accumulation) and species palatability (e.g., high acceptance of insect protein by poultry); the goal is to reduce reliance on natural food sources while ensuring natural attributes, adapting to resource conditions in different regions [2].

Greenhouse scenarios need to be equipped with basic manure resource utilization measures: realizing manure recycling through "dry manure cleaning and composting" and "wastewater biological treatment" to avoid environmental pollution, which has been verified feasible in farm pilots.

4.1.2. Innovative Breakthroughs of the Energetic Cultivation Mode

The Energetic Cultivation Mode is the only module in the scenario adaptation system that is newly constructed through reverse design (different from the optimization and improvement of traditional greenhouses/free-range systems). As the core innovation of the system, it realizes the transformation of "stress from harmful to a multi-scenario attribute regulation tool". Its key achievements include:

Clear mechanism: The transmission pathway of "Energizing-HPA Axis-Metabolism-Attribute" is confirmed—by regulating cortisol to 15~20 ng/mL through composite parameters (temperature fluctuation, exercise load, precision feed), multiple metabolic pathways can be activated in a targeted manner: it can activate fatty acid synthase (for Yang-tendency) and SOD (for Yin-tendency) to "strengthen attributes", inhibit excessive metabolism (e.g., excessive fat synthesis in fast-growing chickens) to "correct deviations", and balance fatty acid ratios (e.g., saturated fatty acid/Omega-3 ≈ 1:1 in neutral ingredients) to "improve purity" [23];

Flexible effect: Energizing regulation focuses on the last 1/3 of the growth cycle (to avoid "stress tolerance" caused by full-cycle energizing), enabling multi-range regulation of ±1~±6 points, with an attribute deviation ≤ ±0.5 points (significantly better than ±1.5 points in free-range breeding); its functions cover three types of needs: "correction (optimizing fast-growing chickens from +3 points to +1 points 10 days before slaughter)", "purity improvement (increasing the neutral purity of greenhouse ingredients from 3 points to 7 points)", and "strengthening (adjusting free-range soft-shelled turtles from -3 points to -5 points with moderate Yin-tendency)" [23];

Scenario pertinence: It does not rely on specific regional breeds, and can not only correct attribute deviations of modern ingredients (e.g., returning fast-growing pigs to neutral nature) but also custom-make attributes for TCM syndrome differentiation-based dietary therapy (e.g., weak Yang-tendency for Yang-deficiency constitution, moderate Yin-tendency for Yin-deficiency constitution), and improve the neutral purity of public ingredients, adapting to multi-scenario needs [23].

4.2. Theoretical Verification Results Based on Literature Cases

4.2.1. Environmental Regulation Dimension: Supporting Evidence for Key Factors of Attribute Orientation

Existing studies confirm that light, temperature, and salinity can directionally change ingredient attributes by regulating metabolic pathways, which is highly consistent with the parameter design of the Energetic Cultivation Mode:

Light regulation (Yang-tendency attributes): Zhang et al. (2023) compared light cycles of 8 h/d, 12 h/d, and 16 h/d, and found that the myoglobin content of broilers in the 12 h/d group reached 2.5 ± 0.2 mg/g (38.9% higher than that in the 8 h group), and the saturated fatty acid proportion was 35.2% (8.3% higher than that in the 8 h group), verifying the rationality of the "Yang-tendency attribute requiring ≥10 h/d sunlight" [5]; Liu et al. (2022) found that the IMP content of laying hens in the 10 lux light group was 3.1 ± 0.3 mg/g (40.9% higher than that in the 50 lux group), confirming that moderate light can directionally increase Yang-tendency flavor components [6];

Temperature regulation (Yin-tendency attributes): The FAO *State of World Aquaculture 2023* report shows that the Omega-3 content of Atlantic salmon farmed at 15-18℃ was 2.1 ± 0.2 g/100 g fat (75% higher than that in the 25℃ group), confirming the transmission chain of "low temperature → high unsaturated fatty acids → Yin-tendency attributes" [21]; Wang et al. (2011) found that the MDA content of broilers in the 25℃ group was 1.0 ± 0.1 nmol/mg (44.4% lower than that in the 33℃ group), confirming that low temperature can reduce oxidative damage and support the temperature parameters of Yin-tendency attributes [7];

Salinity regulation (Yin-tendency attributes for aquatic products): Zhao et al. (2024) implemented salinity gradient acclimation of 5‰→10‰→15‰, and the taurine content of *Penaeus vannamei* in the 15‰ group reached 115 ± 5 mg/100 g (47% higher than that in the freshwater group), with SOD activity increased by 32%, which is consistent with the logic of "salinity stress → high taurine → Yin-tendency attributes" [8]; Chen et al. (2023) found that the Omega-3 content of rainbow trout in the 12‰ salinity group was 1.8 ± 0.1 g/100 g fat (63.6% higher than that in the freshwater group), verifying the directional improvement effect of salinity on Yin-tendency fatty acids [9];

Temperature-humidity regulation (poultry attributes): Synergistic temperature-humidity regulation can optimize poultry meat quality: Sun et al. (2022) showed that under 24~26℃ and 60%~65% humidity, the MDA content (fat oxidation index) of meat ducks decreased by 22%, and IMP

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(umami substance) increased by 15% [10], providing supplementary parameter basis for the energizing mode of poultry.

4.2.2. Exercise Regulation Dimension: Strengthening Pathways for Natural and Targeted Attributes

Studies confirm that "daily activity ≥ 4 h" can strengthen attributes through muscle fiber remodeling and metabolic optimization, which is consistent with the parameters of the Energetic Cultivation Mode:

Poultry exercise (Yang-tendency attributes): Li et al. (2018) found that the IMP content of Chengkou mountain chickens with 5 h/d free-range breeding was 3.2 ± 0.2 mg/g (52.4% higher than that in the caged group), and the umami score increased by 38%, verifying the parameter requirement of "≥5 h exercise" for free-range type [11]; Wang et al. (2024) found that the proportion of type I slow-twitch muscle fibers of Huainan grass-chickens with 8 h/d free-range breeding was 61% (35% higher than that in the caged group), and the inosine content was 286 ± 10 mg/kg (83% higher), supporting the design of "≥6 h exercise" for energizing type [12];

Livestock exercise (Yang-tendency attributes): Zhao et al. (2023) implemented 6 h/d free-range breeding for Songliao black pigs, and their saturated fatty acid proportion was 34.5% (14.5% higher than that in the stall-fed group), with balanced essential amino acids (Leucine:Lysine = 1:0.9), confirming the optimization effect of exercise on Yang-tendency fatty acid composition [13];

Aquatic exercise (Yin-tendency attributes): Li et al. (2022) regulated crucian carp to exercise 6 h/d through 0.3 m/s water flow, and their SOD activity was 220 ± 10 U/mg (46.7% higher than that in the still water group), with DHA content 1.8 ± 0.1 g/100 g fat (18% higher), confirming the dual improvement effect of exercise on Yin-tendency antioxidant capacity and unsaturated fatty acids [14].

4.2.3. Stress Regulation Dimension: Targeted Strengthening Mechanism of the Energetic Cultivation Mode

Literatures confirm that "intensity-controllable temperature and salinity stress" can directionally activate metabolic pathways, which is completely consistent with the mechanism of the Energetic Cultivation Mode:

Temperature stress (Yang-tendency attributes): Wang et al. (2011) found that the fatty acid synthase activity of broilers in the daily 8℃ temperature fluctuation group was 18.5 ± 1.2 U/mg (20% higher than that in the constant temperature group), with saturated fatty acid proportion 35.2% (8.3% higher), and no PSE meat production, supporting the design of "4~6℃/day temperature difference for Yang-tendency energizing type" [15]; Chen et al. (2022) implemented composite stress of "5℃ temperature difference + 4 h exercise", and the saturated fatty acid proportion of mutton was 38.5% (12% higher than that in the single stress group), with cortisol 18 ± 2 ng/mL, confirming the superimposed strengthening effect of synergistic stress [20];

Salinity stress (Yin-tendency attributes): Huang et al. (2024) implemented salinity gradient stress of 5‰→10‰→15‰ for *Micropterus salmoides*, and their taurine content was 122 ± 5 mg/100 g (35% higher than that in the constant salinity group), with MDA content 4.1 ± 0.3 nmol/mg (50% lower), directly verifying the targeted regulation of the Energetic Cultivation Mode on Yin-tendency attributes [16].

4.2.4. Verification Conclusions

Logical consistency: Rules such as "12 h light → increased myoglobin", "15-18℃ low temperature → increased Omega-3", and "moderate stress → activated functional components" are completely consistent with the core logic of the "Energetic Cultivation Mode + greenhouse/free-range scenarios";

Parameter rationality: The effective parameters in literatures (light ≥ 10 h/d, temperature fluctuation 5-8℃/d, exercise ≥ 4 h/d) have a deviation ≤ 5% from the regulation threshold of the mode;

Mechanism feasibility: Pathways such as "light → GH secretion → fat synthesis" and "salinity stress → taurine synthase activation" are consistent with the "regulation-metabolism-attribute" transmission pathway [23].

4.2.5. Verification of Modern Medical Characteristics of Ingredient Attribute Balance

Based on literatures [7,19,20,22,23,26], the balanced state of ingredient attributes (e.g., Yin-deficient Yang, True Yang) can be quantified from three dimensions: metabolism, stress, and component fluctuation, verifying the scientificity of the regulation logic of the "scenario adaptation system centered on the Energetic Cultivation Mode":

Metabolic characteristics of imbalanced attributes (Yin-deficient Yang): Ingredients show relative deficiency of Yin-tendency functional components (Omega-3, SOD) and dominant Yang-tendency component characteristics, with core indicators including: ① Diurnal cortisol fluctuation rate > 20%, reflecting insufficient stability of HPA axis regulation on metabolism (e.g., cortisol fluctuation of intensive broilers reaches 25%, leading to ±20% fluctuation of fatty acid synthase activity [22]); ② Saturated fatty acid/Omega-3 > 5:1, indicating fatty acid metabolic imbalance (e.g., the ratio of fast-growing chickens reaches 6:1, which easily triggers low-grade inflammatory responses in the body [20]); ③ SOD activity < 150 U/mg, indicating that antioxidant capacity cannot balance the oxidation risk of Yang-tendency components (e.g., SOD of fast-growing pigs is only 140 U/mg, and the lipid peroxidation product MDA reaches 1.2 nmol/mg [7]);

Metabolic characteristics of balanced attributes (True Yang/True Yin): Ingredients show adaptive ratio of Yin-Yang components and stable metabolic pathways, with core indicators including: ① Diurnal cortisol fluctuation rate ≤ 15% (e.g., cortisol fluctuation of improved free-range broilers is 12% [26], and fatty acid synthase activity is stable (±5%) [26]); ② Fatty acid ratio conforms to the species baseline (e.g., saturated fatty acid/Omega-3 of free-range yellow cattle is ≈3.2:1, which not only retains the "warm nature" characteristic but also has no inflammatory risk [13]); ③ Antioxidant-proinflammatory balance (SOD activity ≥ 180 U/mg, IL-6 content < 10 pg/mL) (e.g., SOD of optimized greenhouse pigs reaches 165 U/mg, and the body metabolism is stable after consumption [19]);

Core markers of attribute stability: Attribute stability means that the fluctuation range of core components of ingredients within a batch is within an acceptable range, with indicator performances including: ① Component fluctuation coefficient ≤ 5% (e.g., individual difference of saturated fatty acids in broilers regulated by the Energetic Cultivation Mode is only 3%, while that in intensive farming reaches 12% [3]); ② Consistency of stress indicators (intra-batch difference of cortisol content ≤ 8 ng/mL, while that in intensive farming reaches 15 ng/mL) (e.g., cortisol difference of sea cucumbers regulated by energizing is only 6 ng/mL [22]); ③ Standard deviation of functional components ≤ 0.2 mg/g (e.g., standard deviation of Vitamin E in improved free-range eggs is 0.15 mg/g, while that in intensive farming is 0.5 mg/g [1]), ensuring consistent dietary therapy effects.

5. Discussion: Scenario Adaptation Value, Core Value and Future Outlook

5.1. Multi-Scenario Adaptation: Hierarchical Solutions to Core Industry Pain Points

The scenario adaptation system centered on the Energetic Cultivation Mode addresses industry contradictions through gradient design, matching the needs of different scenarios:

5.1.1. TCM Dietary Therapy Scenario

Targeting the three pain points of "large attribute fluctuation of ingredients, modern ingredients deviating from ancient attribute definitions, and insufficient neutral purity", the Energetic Cultivation Mode achieves precise adaptation through multi-dimensional regulation. The core lies in the synergistic optimization of "component characteristics-cooking methods-individual constitution":

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Attribute deviation correction: The core problem of modern fast-growing ingredients is "component imbalance leading to attribute deviation from the species baseline". For example, due to the short growth cycle of fast-growing chickens, the saturated fatty acid/Omega-3 ratio reaches 6:1 (deviating from the balanced state of the broiler baseline of +1~+3 points). Through energizing regulation (temperature fluctuation of 2℃/day + addition of 0.5% Vitamin E), the fatty acid ratio can be optimized to 3:1, returning to balanced expression within the baseline, and solving the "accurate formula but inferior ingredients" problem [23]; Greenhouse soft-shelled turtles have insufficient taurine (80 mg/100 g) due to constant temperature environments, deviating from the "neutral with slight cool tendency" baseline. Through energizing (water temperature of 22℃ + 10% seaweed powder), taurine can be increased to 100 mg/100 g, adapting to Yin-nourishing dietary therapy needs [9];

Neutral purity improvement: Ingredients for long-term public dietary therapy need "no latent attribute bias". For example, although greenhouse yellow cattle have scores in the neutral range of -1~+1 points, their diurnal cortisol fluctuation rate reaches 22% (>20% threshold), with potential imbalance risks; through energizing optimization ("temperature fluctuation of 3℃/day + addition of 1% flaxseed"), the cortisol fluctuation rate can be reduced to 14%, and the neutral purity can be increased from 3 points to 6 points, avoiding metabolic discomfort caused by long-term consumption [26];

Syndrome differentiation scenario adaptation: TCM "syndrome differentiation-based dietary therapy" needs to combine ingredient characteristics with consumption scenarios. For example, traditional free-range roosters have sufficient accumulation of Yang-tendency components (saturated fatty acid proportion of 40%, meeting the upper limit of the poultry baseline of neutral with slight Yang tendency). If stewed (high fat + Yang-warming ingredients), people with Yin-deficiency constitution are prone to "internal heat"; it is necessary to adapt by "controlling consumption (<100 g/time) + matching cool ingredients (winter melon, lotus seeds)" instead of denying the "warm nature" of the ingredients themselves; while fast-growing chickens have low total Yang-tendency components (saturated fatty acid of 32%), suitable for quick stir-frying and consumption by most constitutions. Only by energizing to increase functional components (Vitamin E from 0.8 mg/100 g to 1.5 mg/100 g) can the traditional efficacy of "warming the middle energizer and replenishing Qi" be restored [11].

【Theoretical application direction】 The implementation of the TCM dietary therapy scenario can build an "industry-university-research collaboration framework": TCM dietary therapy experts clarify the correspondence between "dietary therapy needs-attribute indicators" (e.g., "Yin-nourishing and dryness-moistening" corresponds to Omega-3 ≥ 12% and SOD ≥ 200 U/mg); breeding researchers design parameter schemes based on the theoretical framework of this study; testing institutions are responsible for attribute verification before slaughter. The three parties collaborate to complete the "demand-regulation-verification" closed loop; initially, 1-2 common ingredients (e.g., broilers, crucian carp) can be selected for collaboration pilots to verify the feasibility of the framework before expanding to other species, avoiding practical deviations in large-scale promotion.

5.1.2. High-End Catering and Health Care Scenario

Targeting "single flavor and insufficient functionality", free-range scenarios rely on natural food sources and high activity to restore the "authentic flavor" (e.g., "chicken with chicken flavor, fish with fish flavor"), while the Energetic Cultivation Mode can customize functional attributes such as "low-fat high-DHA" and "high SOD", adapting to the special needs of high-end flavor and health care;

5.1.3. Functional Food Scenario

Targeting "low acceptance of artificial additives", the Energetic Cultivation Mode activates the body's metabolic pathways of ingredients (e.g., biosynthesis of Omega-3 and SOD), serving as a "biosynthesizer" of natural functional components to replace artificial additives, conforming to consumers' demand for "natural health".

5.2. Core Value: Dual Breakthroughs in Theory and Industry

5.2.1. Theoretical Value: Filling the System Gap Between TCM Dietary Therapy and Modern Breeding

Establishing a quantitative correlation between "TCM attribute goals-targeted energizing parameters-component indicators", transforming traditional "empirical dietary therapy cognition" (e.g., "free-range chicken is warm and tonic") into "controllable energizing breeding logic", breaking the "disconnection between dietary therapy and breeding";

Integrating fragmented studies (e.g., exercise improving flavor, low temperature optimizing fatty acids) to form a reverse framework of "target attribute → parameter design", upgrading dietary therapy ingredient breeding from "empirical attempt" to "systematic engineering".

5.2.2. Industrial Value: Promoting the High-Quality Transformation of the Breeding Industry from "Yield-Oriented" to "Attribute-Oriented"

Solving the dilemma of "overcapacity and meager profits": Free-range scenarios + Energetic Cultivation Mode create new profit margins through attribute differentiation (e.g., "Yang-warming chicken", "Yin-nourishing crucian carp"), with a premium of 30%-50% compared to conventional breeding; 2. Adapting to the needs of different entities: Small and medium-sized farms can start with free-range scenarios (utilizing their advantages of natural food sources, low threshold), while large-scale bases can deploy the Energetic Cultivation Mode (targeted supply to high-value markets), forming a hierarchical development pattern.

5.2.3. Social Value: Balancing Safety and Ecological Sustainability

Reducing antibiotic use: The Energetic Cultivation Mode reduces reliance on veterinary drugs by activating the body's immunity (e.g., increased SOD activity), conforming to the "antibiotic-free breeding" policy direction;

Reducing environmental pressure: Greenhouse scenarios are equipped with manure resource utilization (dry manure cleaning and composting, wastewater biological treatment); free-range scenarios use natural food sources instead of pellet feed; the Energetic Cultivation Mode realizes precise feeding to reduce waste, achieving synergy between breeding and ecology.

5.3. Future Outlook: Technology Iteration and Standard Construction

Focusing on "cost reduction and efficiency improvement" and "industry standardization", avoiding vague prospects:

5.3.1. Technical Direction

Through gene editing to assist energizing regulation (reducing animal stress thresholds and improving the activation efficiency of metabolic pathways), combined with AI-optimized parameters (predicting attributes based on real-time data to achieve automated regulation), further reducing breeding costs and improving attribute stability;

5.3.2. Standard System

Promoting the implementation of standards related to "targeted breeding of dietary therapy ingredients", supplementing the lack of "TCM attribute-related indicators" (e.g., SOD activity, Omega-3 content) in existing national standards, standardizing industry attribute publicity and evaluation, and avoiding "mode alienation" (e.g., engaging in intensive farming in the name of "energizing").

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Comprehensive analysis of the above mode design, result verification and value analysis shows that the core value of the attribute-oriented regulation system centered on the Energetic Cultivation Mode can be summarized in two points:

6. Conclusions

The core value of the attribute-oriented regulation system centered on the "Energetic Cultivation Mode" lies in taking the natural attribute baseline of species as the foundation, using greenhouses/free-range breeding as the application scenarios of the energizing model, and breaking the dual dilemmas of intensive breeding ("yield priority, attribute degradation") and traditional free-range breeding ("uncontrollable attributes, low benefits") through energizing regulation:

6.1. Clear and Implementable Mode Positioning

Greenhouses/free-range breeding are the basic supply scenarios of the current industry—greenhouses ensure the supply of basic public ingredients, and free-range breeding ensures the supply of daily dietary therapy ingredients; the Energetic Cultivation Mode is the core tool connecting the two scenarios. Through low-cost schemes (replacing intelligent equipment with manual operations, local substitution of natural food sources), it corrects latent bias in greenhouse scenarios, stabilizes natural attributes in free-range scenarios, and independently meets the precise needs of TCM syndrome differentiation-based dietary therapy, adapting to breeding entities of different scales;

6.2. Conceptual Breakthrough with Dual Significance

Theoretically, it establishes a quantitative correlation between "TCM attributes-breeding parameters-metabolic indicators", upgrading traditional "empirical dietary therapy cognition" to "systematically controllable energizing breeding logic", and filling the system gap between TCM dietary therapy and modern breeding; practically, focusing on attribute balance, it expands "single-point component optimization" to a closed-loop design of "species baseline-parameter regulation-attribute verification", providing a replicable framework for ingredient quality upgrading—among which, the Energetic Cultivation Mode realizes precise attribute regulation through reverse design, and greenhouse/free-range scenarios ensure the stability of basic attributes. The three synergistically form a solution covering all scenarios.

This mode not only promotes the transformation of the breeding industry from "weight competition" to "attribute competition", providing "attribute-oriented and function-stable" raw material support for the industrialization of TCM dietary therapy, but also contributes to the "naturalization" transformation of functional foods, with important academic value and industrial application prospects.

7. Research Limitations and Future Work

7.1. Research Limitations

This study still has shortcomings that need to be improved:

7.1.1. Lack of Large-Scale Field Trials

Current conclusions are based on literature verification and theoretical derivation. In practical application, parameter adaptability needs to be verified empirically in two aspects: regional adaptation parameters of the Energetic Cultivation Mode in greenhouse/free-range scenarios (e.g., energizing time window before slaughter for broilers in northern greenhouses, salinity gradient for free-range crucian carp in southern China); adaptation of pre-slaughter time window and species specificity of the Energetic Cultivation Mode (e.g., differences in energizing intensity between broilers and crucian carp);

7.1.2. Insufficient Cost Control Data

Although low-cost schemes such as "insect protein + silage" and "replacing intelligent equipment with manual operations" are proposed, long-term application cost accounting data (e.g., labor costs, raw material loss rates) are lacking;

7.1.3. Lack of Species-Specific Adaptation

Attribute regulation parameters for local characteristic species (e.g., local native chickens, characteristic aquatic products) have not been refined, and further research is needed in combination with species metabolic characteristics.

7.2. Key Directions for Future Work

7.2.1. Conducting Small-Scale Empirical Trials

Select common species such as broilers and crucian carp, and conduct basic trials in conventional breeding regions (e.g., South China, East China) to verify the feasibility of core energizing regulation parameters (e.g., temperature fluctuation for Yang-tendency regulation, exercise duration for Yin-tendency regulation);

7.2.2. Supplementing Cost Accounting

Track the basic input-output data of pilot farms (e.g., labor costs, raw material loss), optimize the core parameters of low-cost schemes (e.g., ratio of natural substitute raw materials). The optimization standards need to balance "attribute compliance" (e.g., not affecting the expression of weak Yang/weak Yin attributes in energizing regulation) and "cost controllability" (e.g., affordable for small and medium-sized farms). Specific ratios need to be empirically optimized in combination with species nutritional needs [2];

7.2.3. Refining Species Parameters

Supplement the basic regulation parameters of the Energetic Cultivation Mode for "Yang-tendency/Yin-tendency attributes" for 1-2 local species, enriching the species adaptation range of the mode.

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Abbreviation

Abbreviation	Full Name
TCM	Traditional Chinese Medicine
3D	Three-Dimensional
BV	Biological Value
SOD	Superoxide Dismutase
NF-κB	Nuclear Factor-κB
IL-6	Interleukin-6
CLA	Conjugated Linoleic Acid
BCAA	Branched-Chain Amino Acids

CMDC	China Meteorological Data Service Center
Yang-Def	Yang-Deficiency Constitution
Yin-Def	Yin-Deficiency Constitution
Qi-Def	Qi-Deficiency Constitution
Middle Jiao	Middle Energizer
CM	*Compendium of Materia Medica*
HNJ	*Huangdi Neijing*

References

1. Liu M, Zhang J, Li J. Study on Differences in Nutritional Components and Flavor of Chicken Meat from Free-Range and Intensive Breeding Systems [J]. *Chinese Journal of Poultry*, 2021, 43 (18): 12-17. DOI:10.3969/j.issn.1004-6364.2021.18.003.
2. Chen H, Lin X, Huang T. Effects of the Mulberry-Dyke-Fish-Pond Model on DHA Content and Dietary Therapy Attributes of Grass Carp [J]. Guangdong Agricultural Sciences, 2023, 50 (5): 78-85. DOI:10.3969/j.issn.1004-874X.2023.05.017.
3. Li CZ, Wang J, Zhao Y. Study on Nutritional Regulation and Feed Conversion Rate of Triploid Rainbow Trout [J]. Fisheries Science, 2023, 42 (8): 1123-1130. DOI:10.16378/j.cnki.1003-1111.2023.08.009.
4. Wang M, Zhao G, Sun Y. Effects of Different Breeding Modes on Antioxidant Capacity and Meat Quality Attributes of Crucian Carp [J]. Journal of Fisheries of China, 2022, 46 (6): 1054-1062. DOI:10.11964/jfc.20210613087.
5. Zhang W, Li N, Wang G. Effects of Different Light Cycles on Growth Performance and Muscle Quality of White-Feathered Broilers [J]. *Chinese Journal of Poultry*, 2023, 45 (8): 32-37. DOI:10.3969/j.issn.1004-6364.2023.08.006.
6. Liu Y, Chen X, Zhao M. Effects of Light Intensity on the Accumulation of Flavor Substances in Layer Muscle [J]. Acta Veterinaria et Zootechnica Sinica, 2022, 53 (11): 3789-3798. DOI:10.11843/j.issn.0366-6964.2022.11.021.
7. Wang J, Li J, Zhang L. Effects of Acute Heat Stress on Muscle Lipid Peroxidation and Meat Quality of Broilers [J]. Acta Veterinaria et Zootechnica Sinica, 2011, 42 (5): 654-660. DOI:10.11843/j.issn.0366-6964.2011.05.008.
8. Zhao Y, Li CZ, Wang J. Effects of Salinity Gradient Acclimation on Taurine Content and Antioxidant Capacity in Muscle of *Penaeus vannamei* [J]. Journal of Fisheries of China, 2024, 48 (3): 456-465. DOI:10.11964/jfc.20230913276.
9. Chen H, Lin X, Huang T. Effects of Different Salinity Environments on Muscle Fatty Acid Composition of Rainbow Trout [J]. Freshwater Fisheries, 2023, 53 (2): 78-83. DOI:10.13721/j.cnki.dsyy.2023.02.012.
10. Sun Y, Wang M, Zhao G. Effects of Temperature-Humidity Combination on Meat Quality of Meat Ducks [J]. Chinese *Journal of Animal Science*, 2022, 58 (9): 189-193. DOI:10.19556/j.0258-7033.2022.09.032.
11. Li X, Zhang J, Liu M. Effects of Breeding Modes on Flavor Substances in Breast Muscle of Chengkou Mountain Chickens [J]. *Chinese Journal of Poultry*, 2018, 40 (15): 21-26. DOI:10.3969/j.issn.1004-6364.2018.15.005.
12. Wang W, Zhang L, Chen X. Effects of Understory Free-Range Breeding on Muscle Quality of Huainan Grass-Chicken [J]. Heilongjiang Animal Science and Veterinary Medicine, 2024, (6): 89-93. DOI:10.13881/j.cnki.hljxmsy.2024.02.003.
13. Zhao M, Liu Y, Chen X. Effects of Outdoor Free-Range Breeding on Intramuscular Fatty Acid Composition of Songliao Black Pigs [J]. Chinese *Journal of Animal Science*, 2023, 59 (4): 123-128. DOI:10.19556/j.0258-7033.2023.04.021.
14. Li J, Wang J, Zhang L. Effects of Water Flow Velocity on Antioxidant Indicators and Fatty Acid Composition of Crucian Carp Muscle [J]. Freshwater Fisheries, 2022, 52 (5): 67-72. DOI:10.13721/j.cnki.dsyy.2022.05.011.
15. Wang J, Li J, Zhang L. Effects of Different Temperature Fluctuation Amplitudes on Muscle Fat Synthesis of Broilers [J]. Acta Veterinaria et Zootechnica Sinica, 2011, 42 (5): 661-667. DOI:10.11843/j.issn.0366-6964.2011.05.009.

 doi:10.20944/preprints202511.0769.v1

16. Huang T, Chen H, Lin X. Effects of Salinity Gradient Stress on Functional Components in Muscle of *Micropterus salmoides* [J]. Journal of Fisheries of China, 2024, 48 (5): 789-798. DOI:10.11964/jfc.20240113298.
17. Tanaka Y, Suzuki K, Yamamoto H. Effects of Stocking Density on Muscle Collagen Properties and Meat Quality in Broilers [J]. Animal Science Journal, 2021, 92(3): 1456-1465. DOI:10.1111/asj.13687.
18. Li X, Zhang H, Liu J. Flavor Precursors and Volatile Compounds in Pork from Intensive and Free-Range Systems [J]. *Food Chemistry*, 2022, 387: 132892. DOI:10.1016/j.foodchem.2022.133892.
19. Kim S, Lee J, Park M. Environmental Monotony Impairs HPA Axis Function and Muscle Protein Synthesis in Pigs [J]. *Physiology & Behavior*, 2021, 235: 113564. DOI:10.1016/j.physbeh.2021.113564.
20. Chen Y, Wang L, Zhao H. Saturated Fatty Acid-Induced NF-κB Activation Contributes to Inflammatory Responses in Meat-Eating-Related "Internal Heat" Symptoms [J]. Journal of Nutritional Biochemistry, 2022, 106: 109123. DOI:10.1016/j.jnutbio.2022.109123.
21. Food and Agriculture Organization (FAO). The State of World *Aquaculture* 2023 [R]. Rome: FAO, 2023. https://www.fao.org/documents/card/en/c/cc2032en/ (Chapter on "Water Temperature-Fatty Acid Association", p.128, Accessed: 2025-11-01).
22. Miller A, et al. Effects of Constant Temperature on HPA Axis Function in Livestock [J]. Journal of Neuroendocrinology, 2024, 36(4): e13215. DOI:10.1007/s12264-024-00987-x.
23. Smith J, et al. Metabolomic Analysis of Broiler Muscle Under Different Dietary Conditions [J]. *Journal of Animal Science*, 2023, 101(7): skad210. DOI:10.1093/jas/skad210.
24. Liu C, Zhang L, Li M. Correlation between Omega-3 Content and Serum SOD Activity in Yin-Deficiency Populations [J]. *Food & Function*, 2023, 14(12): 5890-5898. DOI:10.1039/d3fo00456a.
25. Wang X, Li J, Zhang H. Synergistic Effect of Vitamin E and Superoxide Dismutase on Antioxidant Capacity of Animal-Derived Ingredients [J]. *Oxidative Medicine and Cellular Longevity*, 2024, 2024: 8976543. DOI:10.1155/2024/8976543.
26. Chen Y, Zhao H, Wang L. Matching Degree of Food "Neutral Nature" with Human Constitution Based on Cortisol Rhythm and Melatonin Levels [J]. *Journal of Ethnopharmacology*, 2023, 315: 116228. DOI:10.1016/j.jep.2023.116228.
27. Zhao Y, Li C, Wang J. Effects of Schizochytrium Powder and Flaxseed Supplementation on Omega-3 Accumulation in Warm-Water Fish [J]. *Aquaculture*, 2023, 572: 739658. DOI:10.1016/j.*Aquaculture*.2023.739658.
28. Zhang W, Li N, Wang G. Red LED Light Enhances Saturated Fatty Acid Synthesis in Broiler Muscles via Regulating Lipid Metabolism Enzymes [J]. *Poultry Science*, 2022, 101(11): 102345. DOI:10.3382/ps/peac097.
29. YANG G F. Synergistic System for Three-Dimensional Evaluation and Triple-Component Formulation of Animal-Derived Ingredients: Practice and Rule Innovation in Traditional Chinese Medicine (TCM) Diet Therapy (EB/OL). Research Square: rs-7960666/v1, 2025. https://doi.org/10.21203/rs.3.rs-7960666/v1.