The FBS-Free Journey In Cultivated Meat

by

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Understanding Cultivated Meat: From Science to Plate

Cultivated meat is a realistic solution to conventional meat and produced without the need for raising and slaughtering animals. This process addresses critical global challenges such as environmental impact, animal welfare, and food security.

Environmental Impact

Significantly reduces greenhouse gas emissions, land use, and water consumption compared to traditional livestock.

Animal Welfare

Eliminates the need for animal farming, promoting a more ethical approach to meat production.

Food Security

Offers a scalable and resilient food source, less susceptible to disease outbreaks and climate variability.

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Biokraft's Innovative Approach

Proprietary 3D Bioprinting

We create cultivated chicken meat using advanced 3D bioprinting. This technology ensures structural integrity and texture.

Clean Ingredients

Our process uses non-GMO, antibiotic-free, and GRAS (Generally Recognized As Safe) materials.

Controlled Environment

Meat is grown in a sterile, controlled environment. This minimizes contaminants and ensures safety.

Reduced Carbon Footprint

Our methods produce significantly lower carbon emissions compared to traditional meat production.

We aim to deliver meat with unparalleled purity and sustainability.

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Biokraft's Cultivation Process: A Step-by-Step Approach

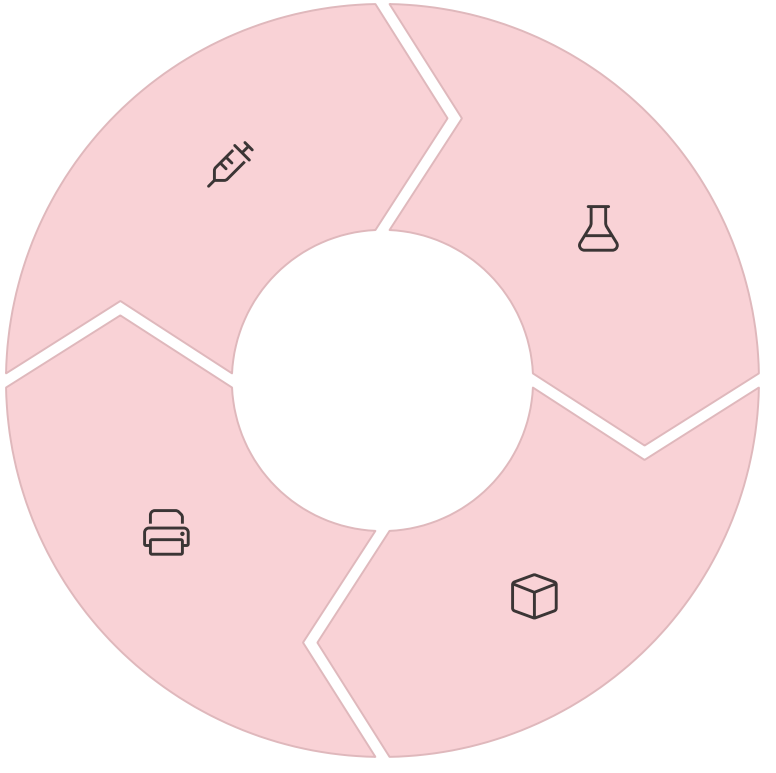
At BioKraft, we are pioneering a robust and scalable process for cultivated meat production. Our approach meticulously controls every stage, ensuring high-quality, sustainable meat.

1. Cell Sourcing

We have sourced a high-quality, species-specific immortalised chicken fibroblast cell line. These cells are ethically derived and capable of proliferating at higher passages, eliminating the need for repeated animal harvesting..

4. 3D Bioprinting

The prepared bioink is loaded into a 3D bioprinter and printed in defined patterns to recreate the look and texture of a chicken breast. The printed product is ready-to-cook.



2. Cell Cultivation

The cells are expanded in sterile conditions using a carefully optimized defined media. This cultivation process yields high-density cell cultures suitable for direct integration into food formulations.

3. Scaffolding

We formulate a hybrid bioink by combining the cultivated cells with proprietary algal and plant-based food-grade biomaterials. This blend serves as both the structural scaffold and nutritional matrix, ensuring printability, edibility, and the desired sensory properties.

Why FBS-Free Matters for Cultivated Meat

Ethical Imperative

Eliminating FBS aligns with our core cruelty-free mission.

Sustainability Goals

An animal-free process enhances our environmental benefits.

Industry Leadership

Pioneering FBS-free solutions sets new industry standards.

Achieving a truly animal-free product is our ultimate goal. This commitment drives every step of our research and development.

The FBS Dilemma: Towards Serum-Free Cultivation

Fetal Bovine Serum (FBS) has traditionally been used in cell culture due to its rich composition of growth factors. However, its use presents ethical, cost, and consistency challenges. BioKraft is committed to transitioning to FBS-free media.

Feature	FBS-Based Media	FBS-Free Media (SFM)
Source	Animal-derived	Chemically defined
Ethical Concerns	High	Minimal
Cost	Low but fluctuating	Comparatively high to FBS
Consistency	Variable batch-to-batch	Highly consistent
Regulatory Hurdles	More complex for food products	Simplified for food applications
Scalability	Limited by animal sourcing	Highly scalable

Navigating Challenges in FBS-Free Media Adaptation

Our journey to fully serum-free cultivation involves overcoming significant hurdles, particularly regarding cell adaptation and media optimization.

Sequential Adaptation

We've implemented a sequential adaptation process, gradually transitioning cells from adherent to suspension culture under serum-free conditions.

Media Evaluation

Extensive evaluation of over five serum-free media samples led us to select the most effective formulation for our specific cell lines.

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Nutrient Deficiency

We discovered that many SFMs have significantly lower concentrations **(35-40% less)** of essential components compared to FBS, making cell nutrition challenging.

Optimization Imperative

While serum usage is significantly reduced, a minimal amount is still incorporated as we continue to optimize media chemistry for complete independence.

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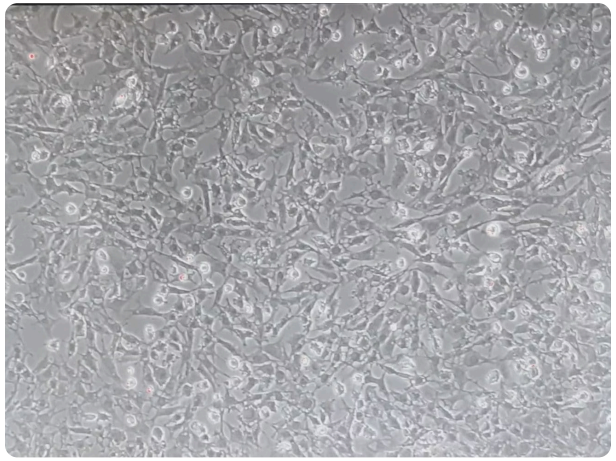
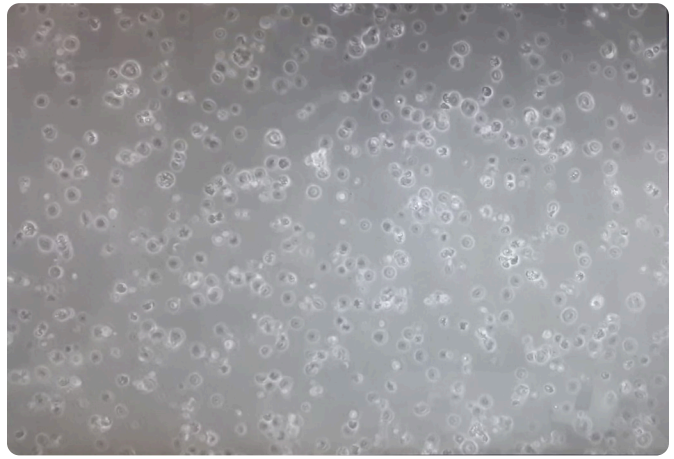
Our Progress Towards FBS-Free



With 10% FBS

FBS contains adherent factors stopping the transition of cells to suspension conditions, but the growth of cells is excellent



With 1% FBS + 5% SFM

Cells adapted to suspension culture show good morphology and proliferation. Without FBS, the proliferation speed is reduced, and doubling time is increased, citing the necessity of FBS.

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Our Progress Towards FBS-Free

FBS Reduction

We have significantly reduced FBS usage in our process. Our current reliance is minimal.

Commitment

Our commitment to complete FBS elimination is unwavering. We are on the verge of achieving this milestone.

Serum-free media isn't a plug-and-play solution-it's a journey that every cultivated meat company is investing in, including us at Biokraft.

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The Scientific Hurdle: Understanding FBS Chemistry

Complex Composition

FBS contains over 100+ components, including growth factors and proteins. Replicating this complexity is a major scientific challenge.

Lab-to-Scale Discrepancies

Successful lab-scale SFM often falters during large-scale production. This sometimes necessitates reintroducing FBS.

The core problem lies in fully understanding and precisely synthesizing these external components.

The Path to FBS Replacement: Innovations and Alternatives

Replacing FBS is a crucial step for the cultivated meat industry to achieve ethical and scalable production. Several promising alternatives and strategies are being explored.

Plant-Based Hydrolysates

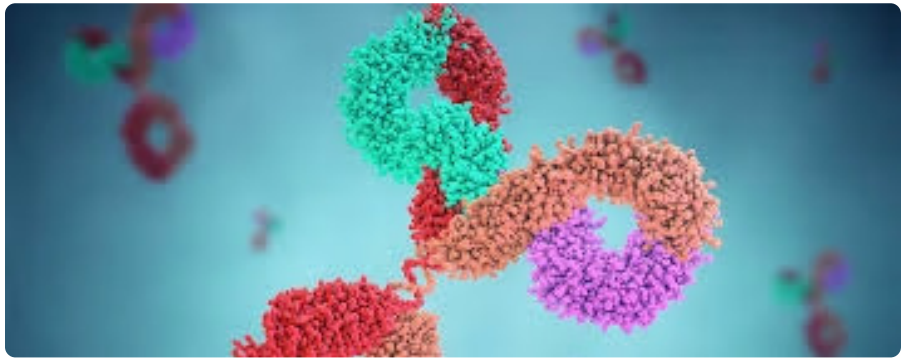
Derived from soy, wheat, or yeast, these provide a rich source of amino acids and peptides.

Recombinant Proteins

Specific growth factors and proteins can be produced using microbial fermentation, offering high purity and consistency.

Algae Extracts

Certain algae species can produce beneficial compounds that support cell growth and proliferation.



These substitutions aim to provide all necessary nutrients for cell growth without the ethical and supply chain complexities of animal-derived components.

Current Challenges: Navigating the Transition

Media Availability

Perfect serum-free media (SFM)is still under development. Existing SFM lacks a full spectrum of components.

Cost Constraints

Recombinant proteins, crucial for SFM, remain expensive. This makes SFM pricier than traditional FBS.

R&D Intensity

Extensive R&D trials are needed. Each species requires unique optimization.

The transition is not easy, requiring time, patience, and significant investment. We are making steady progress.

A Collaborative Path Forward

Shared Learnings

Greater transparency and data sharing benefits everyone.

Cross-Sector Insights

Insights from other industries can accelerate solutions.

Policy Alignment

Supportive policies can make serum-free the industry norm.

No single company can solve this alone. Collective effort is essential for success.

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Next Steps: Scaling Up and Commercialization

BioKraft is poised to lead the cultivated meat revolution. Our next steps focus on scaling production, achieving cost parity, and navigating regulatory pathways to bring our sustainable products to market.

Media Optimization and Scale-Up

Complete the transition to fully FBS-free media and optimize large-scale bioreactor operations for efficient production.

Cost Reduction Strategies

Implement process efficiencies and source cost-effective, food-grade ingredients to achieve price competitiveness with conventional meat.

Regulatory Approvals

Engage proactively with regulatory bodies to secure necessary approvals for market entry in key regions.

Product Diversification

Expand our product portfolio beyond ground meat to include structured cuts, catering to diverse consumer preferences.

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A Moral Responsibility for Global Impact

With over 100 companies in cultivated meat, we share a collective moral responsibility. Developing FBS-free solutions will have a profound positive global impact.

Planetary Health

Sustainable food systems are crucial for our planet's future.

Animal Welfare

Complete animal-free production elevates ethical standards.

Food Security

Scalable, sustainable meat production enhances global access.

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Our Vision: Real Meat, Without Compromise

Our mission is simple: to deliver real meat, without slaughter and without compromise. Being truly cruelty-free is not just a claim; it's a fundamental goal. We are closer every day.

Learn More About Biokraft

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