

EIR AVIBIOME

Targeted Poultry Butyrate Delivery System for Laying Hens

Protect. Deliver. Balance. Strengthen.



UPPER-GI STABILITY

Advanced lipid matrix helps protect actives through feed handling and upper-GI transit



TARGETED RELEASE

Timed intestinal delivery of butyrate + GML for gut barrier and microbiome support



EGGSHELL SUPPORT

Calcium, vitamin D3 and conservative boron citrate support shell quality and flock value

BETTER GUT FUNCTION. BETTER SHELL QUALITY. BETTER FLOCK VALUE.



Scientist & Lead Formulator

Ido Eco Ofek

- Multidisciplinary scientist and entrepreneur focused on applied animal nutrition, formulation, and delivery systems.
- M.Sc. animal science / agriculture background with commercial formulation experience.
- Developed the original targeted cattle butyrate technology and adapted the architecture to poultry physiology.
- Current poultry focus: gut resilience, microbial balance, and egg-quality support without antibiotic-style positioning.

Key innovation

A continuous lipid-matrix poultry flake that integrates intestinal butyrate release, monoglyceride microbial modulation, and eggshell mineral support in one handling-friendly feed additive.



Simple product definition



A poultry-specific adaptation of the protected butyrate flake concept.



EIR AVIBIOME is a solid, homogeneous, melt-processed feed additive for laying hens.



Designed as a **permanent addition** to the existing complete feed, not a short emergency drench.



The flake carries **protected butyrate and GML/monolaurin** into the intestinal target zone.



A dedicated **eggshell module** supplies calcium, vitamin D3 and conservative boron citrate support.



Positioned for **gut function, microbial balance, shell strength** and **flock resilience**.

CONTINUOUS FEED ADDITIVE



Why the poultry market is relevant

Small improvements in shell quality and gut health scale across high-volume layer systems

- ✓ Layer operations lose money when egg breakage, thin shells, downgrades and dirty eggs increase.
- ✓ Older hens, heat stress, feed transitions and pathogen pressure create recurring gut-barrier and shell-quality problems.
- ✓ Feed additive buyers understand butyrate, monoglycerides, vitamin D3 and calcium — but need differentiated delivery.
- ✓ The strongest commercial position is not “another butyrate”; it is a precision poultry gut + shell support platform.



SHELL

downgrade control

Breakage and
weak-shell pressure



GUT

resilience logic

Microbiome and
barrier support



FEED

easy adoption

kg/ton inclusion in
existing feed



The production problem

Egg quality, intestinal stress and microbial pressure interact in commercial flocks

- ✓ High-production layers face sustained mineral demand for daily shell formation.
- ✓ Heat stress and age reduce feed intake and impair calcium/vitamin D utilization.
- ✓ Dysbiosis, wet litter pressure and entesic stress can damage nutrient absorption and egg consistency.
- ✓ Salmonella pressure is a food-safety and reputational risk, so nutrition programs increasingly seek non-antibiotic gut support.
- ✓ A product that addresses gut delivery and shell support together is commercially stronger than a single-active additive.



The butyrate delivery problem

In poultry, the target is not rumen bypass — it is intestinal availability.



- Butyrate is biologically valuable, but free salts can be released too early and may have odor/palatability limits.



- Poultry digestion is rapid; the product must survive feed handling and upper gastrointestinal transit.



- The practical target is progressive release in the small intestine and ceca, where epithelial function and microbial ecology matter.



- A lipid matrix can coordinate butyrate and GML release rather than adding them as separate diluted powders.



- The technology proposition is simple: deliver the actives to the useful physiological window.



PROTECT

Survive handling, heat and upper GI



PROGRESS

Release in the right place and time



PERFORM

Deliver physiological benefit where it matters



EARLY RELEASE

Free salts can liberate too soon



RAPID TRANSIT

Upper-GI passage is short and harsh



PROGRESSIVE RELEASE

Targets the small intestine and ceca



USEFUL WINDOW

Supports epithelial function and microbial ecology where it matters



Target-site delivery map

Poultry digestive architecture replaces the cattle rumen-abomasum logic

REGION	DOMINANT ENVIRONMENT	DELIVERY IMPLICATION	DESIRED PRODUCT BEHAVIOR
 1 FEED / PREMIX	Mixing, storage, moisture variation	Must resist dust, odor and segregation	Hard, free-flowing flake
 2 CROP / PROVENTRICULUS / GIZZARD	Moist, acidic/ enzymatic exposure begins	Avoid immediate bolus release	Low early release; structural activation
 3 SMALL INTESTINE	Bile, lipase, absorption, villi	Primary site for butyrate and nutrient support	Progressive release
 4 CECA	Dense microbial fermentation zone	Microbial balance and residual SCFA relevance	Sustained residual activity



Development target: **low uncontrolled early loss**, then strong cumulative release under sequential poultry GI simulation.



1 Feed / premix

Must resist dust, odor and segregation



2 Crop / proventriculus / gizzard

Low early release; structural activation



3 Small intestine

Primary site for butyrate & nutrient support; progressive release



4 Ceca

Microbial fermentation zone; sustained residual activity

Functional architecture

Same delivery philosophy, poultry-specific payload

 Functional family	 Role in system	 Why it matters
 Mineral butyrate payload	Epithelial fuel and gut-function signal	Supports intestinal barrier, villi and nutrient utilization
 High-melting lipid matrix	Protective carrier phase	Reduces early release, odor and handling loss
 Monolaurin / GML	Medium-chain monoglyceride microbial modulation	Supports microbial balance and Salmonella-pressure strategy
 Eggshell mineral module	Calcium + vitamin D3 + boron citrate	Targets shell strength, calcium metabolism and late-lay resilience
 Pore-forming mineral system	Controlled opening under digestive conditions	Prevents inert over-protection and supports release kinetics
 Flow / processing aids	Anti-caking and dispersion	Industrial handling and premix consistency

 **Precise delivery**
Right payload, right place.

 **Better biology**
Stronger gut and better performance.

 **Stronger shells**
More shells, fewer cracks, more marketable eggs.

 **Operational consistency**
Reliable handling and predictable results.



The Innovation

Triple-Action Poultry Strategy



1 Timed Butyrate

Targeted intestinal release for epithelial and nutrient-utilization support



2 GML / Monolaurin

Microbial balance and membrane-level pressure against sensitive organisms



3 Eggshell Module

Calcium + vitamin D3 + boron citrate to support stronger shells

Technology concept: one homogeneous flake, not a dry blend

Every flake should carry the same functional system

- The active system is embedded in a **continuous lipid matrix**, not simply mixed as separate powders.
- Each flake is intended to contain the **complete functional architecture**: butyrate, GML/monolaurin, shell-support minerals, and release-control domains.
- A dry blend would **risk segregation** by density, particle size, and flow behavior.
- The melt-processed flake format **reduces odor, dust, local concentration errors**, and **handling problems**.
- The result is a **feed-friendly form** for premix or direct inclusion into complete layer diets.

CONTINUOUS LIPID MATRIX

Active system embedded throughout the flake



ONE FLAKE, COMPLETE SYSTEM

Every particle carries the full functional architecture



PREVENTS SEGREGATION

Avoids differences in density, particle size, and flow behavior



CLEANER, EASIER TO HANDLE

Melt-processed flake reduces odor, dust, and handling issues



FEED-FRIENDLY OUTCOME

Ideal for premix or direct inclusion in complete layer diets



Commercial implication: a differentiated delivery platform, not another commodity butyrate salt.



Stage 1: feed stability and upper-GI protection

The first job is to prevent uncontrolled early loss

The lipid matrix is **hydrophobic** and **solid** at normal feed temperatures.



- High-melting lipid and fatty-acid crystallinity reduce water ingress during storage and mixing.



- The design goal is low odor release, low dusting and reduced separation from mineral premixes.



- In poultry, 'protection' does not mean rumen bypass; it means controlled survival through feed handling and upper GI exposure.



- Good protection preserves value versus free butyrate, loose minerals or simple powder blends.



Stage 2: intestinal activation and cecal balance

Release is designed to rise under bile, lipase and intestinal conditions



Acidic upper-GI exposure can begin **pore formation** without complete dumping of the active payload.



As digesta moves into the small intestine, **bile salts** and **lipase** progressively attack the lipid carrier.



Butyrate becomes available near absorptive tissue where villus integrity, barrier function and nutrient uptake matter.



Residual release toward the ceca supports a **microbial-balance** logic rather than a crude sterilization claim.

SI

small intestine



major release

CECA

cecal zone



residual effect

GI

controlled



no bolus claim

Controlled release
in the small intestine

Butyrate available
at absorptive surface

Residual release
supports cecal
microbial balance

Butyrate contribution

More than an organic acid: epithelial fuel, barrier support and gut-function signal

- Butyrate is a short-chain fatty acid involved in intestinal epithelial **energy metabolism** and **mucosal function**.
- In poultry, butyrate research supports effects on **villus morphology**, **gut barrier biology**, **immune modulation** and **performance** under challenge.
- A protected or coated format is more strategically valuable than free salt when the goal is **intestinal delivery**.
- The claim should remain “**supports gut function and nutrient utilization**,” not disease treatment.



CORE GUT-FUNCTION PAYLOAD



EPITHELIAL ENERGY
Fuel for enterocytes
and mucosal function



BARRIER SUPPORT
Strengthens tight
junctions and barrier
integrity



VILLUS MORPHOLOGY
Supports villus height
and absorptive surface



IMMUNE MODULATION
Balances immune
responses for gut
resilience



NUTRIENT UTILIZATION
Enhances absorption
and feed efficiency



TARGETED DELIVERY
Protected or coated
format for controlled
release in the intestine

Monolaurin/**GML** contribution

Microbial balance inside the same protected delivery system



- Monolaurin, also known as **glycerol monolaurate**, is a medium-chain monoglyceride derived from lauric acid and glycerol.



- Its value here is not “sterilization”; it is **selective microbial modulation** while remaining compatible with nutrition positioning.



- Embedding GML in the same lipid matrix allows **coordinated release** with butyrate instead of independent dilution in the feed.



- For Salmonella, the conservative claim is support for **microbial balance** and reduced ecological pressure, pending *in-vivo* validation.

MEDIUM-CHAIN MONOGLYCERIDE



Glycerol monolaurate (GML)



COORDINATED
RELEASE
with butyrate



MICROBIAL BALANCE

Support for balance and reduced ecological pressure*

*Pending *in-vivo* validation.



SELECTIVE
MICROBIAL
MODULATION



COMPATIBLE
WITH NUTRITION
POSITIONING



INTEGRATED
IN THE SAME
LIPID MATRIX



MICROBIAL-BALANCE MODULE



Eggshell support module

Calcium + vitamin D3 + conservative boron citrate

- **Calcium** is the dominant structural mineral in eggshell formation and must be available consistently through the laying cycle.
- **Vitamin D3** supports calcium absorption and mineral metabolism, making it a central shell-quality nutrient.
- **Boron citrate** is included cautiously as a trace mineral support for mineral metabolism; the literature is mechanistically plausible but mixed in shell outcomes.
- The formulation should avoid aggressive boron dosing and use a **conservative** elemental boron contribution.
- The module differentiates the product from ordinary gut-health additives by connecting gut delivery to **egg-grade economics**.



DESIGNED FOR SHELL QUALITY. DELIVERED THROUGH GUT HEALTH.



Ca

CALCIUM

Dominant structural mineral for strong, resilient shells.



VITAMIN D3

Supports calcium absorption and mineral metabolism for shell quality.



SHELL STRENGTH

Better mineralization for strong, durable shells.



CONSERVATIVE BORON CITRATE

Trace mineral support for mineral metabolism; mechanistically plausible, mixed in outcomes.



MINERAL SUPPORT

Works alongside calcium and vitamin D3 to support utilization and balance.



EGG-GRADE ECONOMICS

Links gut delivery to shell quality and production value.



CONSERVATIVE BORON CITRATE

Cautious trace mineral support for mineral metabolism.



Differentiation versus common product classes

The novelty is integration: targeted gut support plus shell-economics support

 Product class	 Typical design	 Main limitation	 EIR AVIBIOME difference
 Free butyrate salts	Directly soluble organic acid salt	Odor, early release, weak targeting	Protected lipid-matrix delivery
 Simple coated butyrate	External fat barrier	Erosion-dependent and single-active	Homogeneous flake with co-actives
 Standalone monoglycerides	Medium-chain lipid antimicrobial logic	No butyrate payload or shell module	GML integrated with butyrate timing
 Mineral premixes	Calcium, phosphorus, vitamin D support	No gut delivery or microbial balancing	Shell support inside delivery platform
 Probiotics / acids	Microbial support or pH pressure	Often sensitive or non-targeted	Robust flake, dual gut-shell logic



Protected lipid matrix



Targeted butyrate timing



GML + butyrate synergy



Shell strength & mineral support



Dual gut + shell benefit



Manufacturing SOP summary

Water-free melt process, controlled dispersion, extrusion/flaking and rapid cooling

- **Qualify feed-grade materials:** butyrate assay, GML content, vitamin D3 potency, calcium salts, boron citrate and moisture.
- **Pre-sieve powders** and control particle size to reduce segregation and grit.
- **Melt** high-melting lipid carrier and fatty-acid structuring phase under controlled temperature.
- **Introduce** butyrate, GML, shell minerals and pore-forming domains under controlled shear.
- **Flake or micro-prill** the homogeneous dispersion, then rapidly cool to lock crystal structure.
- **Classify**, remove fines, apply minimal flow aid if needed, and pack in moisture-barrier bags.



FEED-GRADE
QUALIFICATION



PARTICLE-SIZE
CONTROL



CONTROLLED
MELT PROCESS



CONTROLLED
SHEAR DISPERSION



FLAKING / MICRO-PRILL
& RAPID COOLING ❄️



CLASSIFICATION &
MOISTURE-BARRIER
PACKAGING



Commercial implication: a differentiated delivery platform, not another commodity butyrate salt.



Recommended use protocol

Permanent inclusion into existing complete layer feed

Parameter	Recommended protocol
 Target animals	Commercial laying hens; late-lay flocks; heat-stressed or shell-quality challenged flocks
 Daily inclusion logic	Continuous feed additive, not a short medicinal treatment
 Standard use rate	1.5 kg per metric ton of complete feed
 Stronger trial rate	2.0 kg per metric ton where shell quality or gut pressure justifies evaluation
 Bird-level equivalent	Approx. 0.185–0.22 g/bird/day at 110 g feed intake
 Administration	Premix or complete feed inclusion; avoid uneven hand mixing for commercial use
 Adaptation	No special adaptation expected, but introduce through normal feed transition practice
 Storage	Cool, dry, moisture-barrier packaging; avoid prolonged heat above matrix softening range



Consistent inclusion,
not a short treatment



Precise use rate for
measurable results



Stable in feed and
easy to implement



Store smart,
protect performance



Development and QC targets

The product should be validated as a delivery system, not only as a formula

Test area	Why it matters	Development target
 Butyrate assay	Confirms daily payload and label consistency	Batch-specific assay around theoretical payload
 GML assay	Confirms microbial-balance component	Quantify monolaurin/GML content and degradation products
 Vitamin D3 assay	Potency can decline during processing/storage	Confirm label claim after processing and storage
 Calcium / boron assay	Required for ration calculation and safety	Declared contribution at 1.5–2.0 kg/ton feed
 Sequential poultry GI release	Measures delivery kinetics	Low early release; high cumulative intestinal release
 Pelleting/thermal compatibility	Feed plants may use heat/steam	Validate before pelleted-feed claims
 Shelf stability	Prevents oil bleed, caking and potency loss	Ambient and accelerated studies

 Rigorous testing for reliable performance

 Clear targets for every key area

 Data-driven development and quality control

 Validated delivery, proven results



U.S. regulatory path

Conservative feed-ingredient positioning with controlled claims



Pathway / workstream	Practical meaning for EIR AVIBIOME	Indicative timing
 Ingredient status	Confirm acceptability of butyrate, GML, lipid carrier, calcium salts, vitamin D3 and boron source	 1–2 months
 Claim strategy	Use feed-support language: gut function, microbial balance, shell quality support	 1 month
 GRAS / AFIC / counsel review	Map FDA/CVM, state feed-control and ingredient pathways	 Variable
 Pilot dossier	Composition under confidentiality, manufacturing flow, specs, stability and release data	 2–4 months
 State feed registration	Label review and state-by-state execution if commercialized in the U.S.	 Parallel / launch prep



Avoid first-label disease claims such as “prevents Salmonella,” “treats enteritis,” or “guarantees shell strength.”



Launch plan and claim boundaries

Move fast commercially, but keep label language disciplined



- **Phase 1:** finalize poultry formula, supplier specifications and confidential composition file.



- **Phase 2:** produce pilot batch and validate butyrate/GML/Vitamin D3 assays, stability and release behavior.



- **Phase 3:** run controlled layer study: shell strength, shell thickness, egg breakage, laying rate, feed intake, fecal quality and microbiome endpoints.



- **Preferred claims:** supports gut function, microbial balance, nutrient utilization, shell quality and layer resilience.



- **Avoid unsupported claims:** kills Salmonella in vivo, prevents disease, guarantees egg production, or replaces medication.



COMMERCIAL STORY: GUT DELIVERY + EGGSHELL ECONOMICS

Questions & Discussion

Thank you for your attention.

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