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Dr. Vaibhav Khandagale, Business Manager, Poultry, East Central Asia.

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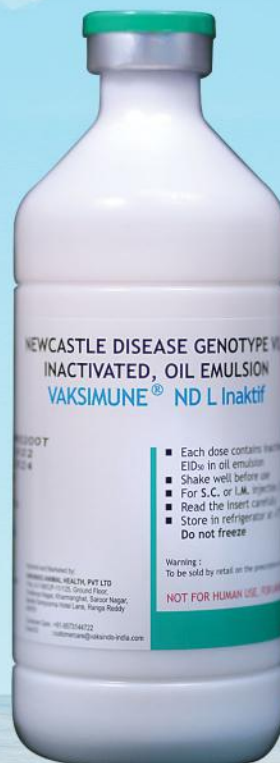
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05

Treating
Life **Naturally** 

The National Pests!

The CJP (Cockroach Janata Party), born out of myopic opportunistic gains - a result of which is dying an unnatural death. The struggle, which started using the Paper Leak as a cause for the students, was instantly hijacked by a congregation of anti-prime minister, anti-social, anti-political and also anti-national elements. A small minority that in no way represented the students and Gen Z was pushed into the war front by instigating them with all unconstitutional activities from the background. The floodgates of foreign funds through dubious channels were opened up, with money flowing literally like water to sabotage this Indian government. The current government is definitely different from the previous ones; the West still do not have a clear idea of modern India, which does not clandestinely surrender to personal gains- this ultimately backfired on those who plotted against India.

The CJP is now exposed as a fake organisation that has a group of people who are more interested in serving their own self-interest. The current ruling government has remained in the opposition for several decades before coming to power. They played a useful role in that capacity to help the nation grow in the correct direction. The current opposition has emerged as one of the weakest opposition in the history of independent India. Not allowing the parliament to function and making personal attacks on the ruling government, etc have only led to disruption of the normal functioning of the day-to-day affairs of the ruling government. People are obviously seeing this, and it is neither helping the ruling nor the opposition, as it is against the common interest of the country as a whole. A group identifying itself with a Cockroach mindset deserves to be treated like one! Cockroaches are considered pests and are also treated like one.

Democracy does not give the freedom to abuse and behave in an uncultured and uncivil way in society. The seasoned politicians and so-called seniors must set a good example to the younger generation. The recent Gen Z using highly filthy language is not acceptable in a democratic society. The freedom enjoyed in India is being abused instead of making the most of it for valued governance. Gen Z displayed misguided and improper behaviour, which would have had very severe consequences in any form of democracy or any other government. Let freedom not be abused, which is a great gift in a cultured democracy.

India with its Chanakya Niti has been successfully managing the foreign affairs of the nation. The trio of Modi-Doval-Jaishankar has demonstrated the true position of Bharat, which is yet to be fully understood by most of the world. The pathetic, intentionally painted image of Bharat by the paid and biased media has failed the world today. The trust in some, if not many, of the biased media has led to the loss of confidence by the masses against such media houses.

While the world struggles to maintain its balance in the global crisis at various levels, amazingly India seems to be comfortable with itself. Sustaining the highest GDP growth when most of the world is reeling under crisis; continuing to ensure cheaper energy sources from Russia, much against the wishes of the West. The BRICS is gaining importance due to the unstable global situation. The focus is not only on resolving the disputes and the war in Ukraine and Russia but also on continuing with Iran and Israel. This is not a good situation for global peace. India continues to join sides in this divide and maintains its position with the goals of global peace and development of the world.

The Battle of the clash of interests between the import of soya beans for Poultry versus the local producers has begun. The divide between the farmers of Agriculture of livestock has their own vested interests. A consensus needs to be arrived at on what is ultimately good for the nation.

Indian farmers have recently experienced an all-time high in prices and are advised to use a portion of it towards marketing, Sales promotion, and advertisement within their own capacity and region to add value for sustainable returns. Ensuring minimum assured quality and branding in a small way to start with will go a long way for their own survival and growth.

This 80th Independence Day is celebrated with a lot of pride for India, with great strides in the nation's growth by GDP, Foreign reserves, defence advancement and defence exports, scientists' achievements in technology and space, growing exports, managing inflation when compared to global markets and managing political stability against all odds.

Indians are proud today!

Editor



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Address:

1325-P, Second Floor,
Sector-32, Urban Estate
Near Hotel Noor Mahal
KARNAL-132 001 (Haryana) INDIA

E-mail

poultrytechno@gmail.com
dinesh@srpublication.com

Website

www.srpublication.com

Editor:

Dinesh Kumar Arora
+91-98965-23333, 86408-23333

Associate Editor:

Sudhir Aheriya
+91-70150-26527

Circulation Incharge

Rohit Arora
+91-87088-87028

Editorial Board

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No. of Chicks	4959	6160	4900	5050	5300
Date of Arrival of Chicks	01.04.2025	19.05.2025	02.07.2025	01.09.2025	30.11.2025
Weight of Chicks (Gm)	42	44	43	43	43
FCR at Approx. 2 Kg B/W	1.115	1.096	1.117	1.109	1.107
Total Weight of Sold Bird	10500	12450	12400	12127	12781
Total No. of Birds Sold	4200	5900	4600	4870	5088
Average Weight per Birds (Kg)	2.500	2.110	2.696	2.488	2.512
Total Feed Consumed (Kg)	14000	18500	17750	15100	16000
FCR (Kg)	1.333	1.486	1.431	1.245	1.252
CFCR (Kg)	1.208	1.457	1.266	1.115	1.124
REMARKS	LPAI* - Out Break occured on 8 th day, but checked on 9 th day, inspite of that progress was better than the standards.	Insipite of peak summer and rates, control feeding was done to delay the growth.	Flock was kept on control feed, due to poor rate to delay the production.	Flock was kept on control feed, due to poor rate to delay the production.	Mean age 35 Days.
PRODUCT USED					
Nutrigrow & Multimune	1-10 Days (50 Gm + 5 Gm) per 1000 Birds				
Respamune	SPRAY - 1 - 10 days every day than every 3-4 days 1 ml per litre water				
Readymune (Regular by)	Day 1 till Marketing @ 50 Gm Per 1000 Birds				
Calface	On achieving 1.2 Kg B/W @ 25 Gm per 1000 Birds X 5 Days				
Respafeed	@ 1 Gm Per Litre Water (Day 1 till Marketing Or 500 Gm per Ton Feed)				
Intermune	@10 Gm per 1000 Birds on 12,13,14 Day @20 Gm per 1000 Birds on 22,23,24 Day				

* NOTE - NO VACCINE OR ANTIBIOTIC WAS GIVEN AT ANY STAGE.



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- Aflatoxin impact on milk quality & feed safety
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- Represented Punjab Under-22 Team (1986–87)
- Qualified Umpire – Punjab Cricket Association (PCA) (1991–2006)

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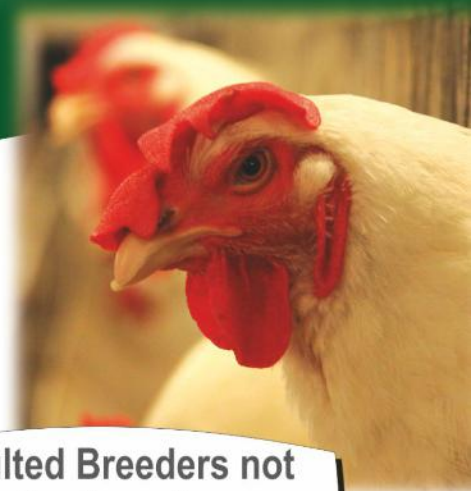
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एंकाउंटर नं 281:

पोल्ट्री में क्यों बीमारियां आती जाती रहती है? (भाग-1)

बहुत दिनों से दिमाग में यह सवाल उठता रहता था। ठोस जवाब नहीं मिल रहा था। बहरहाल जब भी इस सवाल का जवाब तलाश करता कुछ बातें ऐसी आती जिनको मैं नोट कर लेता। इस कारण एक बहुत लंबी चौड़ी लिस्ट बन गई। खाली वक्त में अब भी विचार करता हूं कुछ नए बिंदु और मुद्दे मिल जाते हैं। लिस्ट को बार-बार पढ़ता हूं कुछ बिंदु इसमें और जुड़ जाते हैं। इस लिस्ट के हिसाब से जो मुख्य बातें सामने आई उसी के हिसाब से हमारी कमियों पर पूरा लेख आधारित है।

1. बायो सिक्योरिटी

जब भी बायो सिक्योरिटी की बात आती तो हमारा ध्यान सीधे पोल्ट्री फार्म पर जाता है। फीड मिल की बायो सिक्योरिटी पर क्यों नहीं जाता? यह सबसे महत्वपूर्ण स्थान है जहां इस पर पूरा ध्यान देना होगा। ऐसा ना किया तो सुंदर पैक किए हुए फीड के साथ बीमारियां आपके शेड में फीडर के अंदर सीधे पहुंचेंगे। जब से पैलेट फीड आने लगा है निःसंदेह स्टर्लाईज्ड फीड पैक हो रहा है। इसके बावजूद बहुत से रास्ते खुले हुए हैं इसे रिकटेमीनेट करने के लिए। लगभग सभी फैक्ट्रियों में आपको जंगली पक्षी, कबूतर, फाख्ता, मैना एवं गोरिया इत्यादि आराम से विचरते मिलेंगे। जब तक बोरियों का मुंह नहीं सिलता उसमें दाना खाते और मुंह सिल जाने के बाद बोरियों पर खेलते कूदते बीठ करते मिल जाएंगे। जिस जगह अनाज स्टोर किया हुआ है वहां तो इन जंगली पक्षियों की बारात मिल जायेगी जहां जबर्दस्त कन्टेमिनेशन हो रहा होगा। फीड मिलर गर्दन झटक कर कह सकता है “हमने पैलेटिंग के समय भाप द्वारा सारे बैक्टीरियां, वायरस, प्रोटोजोया एवं वर्मस इत्यादि खत्म कर दिये।” बिल्कुल सही परन्तु जब बैक्टीरिया मरता है तो ‘अमीन्स’ छोड़ जाता है जो टॉक्सिक होता है। इसका निवारण कैसे करेंगे? वैसे सच्चाई तो यह है कि बायोसिक्योरिटी की अवहेलना खेत-खलियान से ही शुरू हो जाता है जो हमारी मजबूरी है।

- पोल्ट्री इन्डस्ट्री या उद्योग की यह हकीकत है कि हम सबकुछ जानते हुये भी इस पर बिल्कुल महत्व नहीं देते। प्रायः पोल्ट्री मैगजीनों में इस पर काफी अच्छे लेख आते रहते हैं। पोल्ट्री टैक्नालाजी के प्रारंभिक महीनों में क्रम से इसपर लेख आता रहा। देश के प्रसिद्ध वैज्ञानिक डॉक्टर श्रीनिवास गौड़ा ने बायोसिक्योरिटी पर एक बहुत अच्छी पुस्तक लिख डाली। इन सबके बावजूद 90 प्रतिशत या इससे भी अधिक फार्म इसके सिद्धांतों का 75 प्रतिशत भी अनुसरण नहीं करते जब कि सही बायोसिक्योरिटी के लिये 100 प्रतिशत अनुसरण होना चाहिए।
- दुखःद है कि फीड मिल बायोसिक्योरिटी पर चर्चा होती ही नहीं या बहुत कम होती है, जबकि इसका बहुत महत्व है। चूहे तो बीमारी फैलाने का या अनाज की चोरी या डाका मारने का मुख्य कारण हो सकते हैं, उनका फीड मिल के साथ चोली-दामन का साथ है। इनके निवारण पर हमारा ध्यान शून्य है। आप कुछ अच्छी बिल्लियाँ पाल ले यह दिन-रात आपकी मदद करेंगी इनके निवारण के लिये।

- आम तौर से किसी भी फीड मिल का बजट डिसइन्फेक्टेन्ट या फन्जीसाईड का होता ही नहीं जब कि यह बहुत आवश्यक है। ऐसा प्रोडक्ट हो जो फीड मिल के लिये सुरक्षित हो। अच्छे फीड मिलर रात में सारे स्टोर का सप्ताह या 10 दिन पर फ्यूमीगेट भी कर देते हैं। हर एक फीड मिलर को उचित सुरक्षा कवच का उपयोग करते रहना चाहिये।
- अब बात करते हैं पोल्ट्री फार्म बायोसिक्योरिटी की। सच्ची बात तो यह है कि इसकी अधिकांश दशा ‘दयनीय’ है। शायद इसमें सबसे बड़ी गलती हम लोगों की है। जब भी कभी किसी ने फार्म बनाने की बात की हमने शेड का नक्शा दे दिया। यह नहीं कहा कि फार्म की फेन्सिंग बहुत जरूरी है। चरते-विचरते पशु-गाय-भैंस, भेड़, बकरी शेड के आस पास ना आ सके। कुत्ते कई तरह से पोल्ट्री को नुकसान पहुंचाते हैं। पड़ोसी की मरी हुई मुर्गी मुंह में दबा कर आपके फार्म पर लाकर आराम से बैठकर खाते मिलेंगे। इन सब बातों को देखते चारों तरफ से खुला होने के कारण आपके आस के बच्चे, बड़े, बूढ़े आपके शेड के पास जाकर अन्दर का नजारा लेंगे जो ना तो आपके पलाक की सेहत के लिये उचित है नाही आपके लिये। यह सब बायोसिक्योरिटी के सिद्धांतों का उल्लंघन है। अतः हर पोल्ट्री फार्म के लिये फेन्सिंग आवश्यक है जो हमारे यहां ना के बराबर है।
- आम किसान भाषा में बायोसिक्योरिटी का मतलब आप समझ लें – कोई भी बीमारी बाहर से अन्दर फार्म पर ना आ सकें और ना ही अन्दर आपके मिसमैनेजमेन्ट या किसी अन्य कारणों से पनप सकें। यहां एक महत्वपूर्ण बात आप समझ लें – यदि एक भी बैक्टीरिया आपके शेड के अन्दर पहुंच गया तो अगले 24 घण्टे में कितने बैक्टीरिया को जन्म दे देगा? मिसाल के तौर पर इकोलाई को ले लें। यह लाखों करोड़ों में नहीं ट्रिलियन्स में हो जायेगा। काश हमारे देश की इकोनॉमी इस प्रकार से बढ़ती। इस बात को देखते हुये आपको बहुत मजबूत बायोसिक्योरिटी रखनी होगी। इसके लिये फार्म छोटा हो या बड़ा, गेट पर पिट बनायें जिसमें उचित डिसइन्फेक्टेन्ट का पानी रखें एवं उसी से होकर अन्दर प्रवेश करें। शेड में प्रवेश करने से पहले शेड के बाहर जूता-चप्पल उतार दें और शेड का चप्पल जो अलग रखा हो उसको पहन कर अन्दर जायें। सिर के बाल सदैव हवा के बैक्टीरिया को ग्रहण कर सकते हैं। अतः सिर पर टोपी लगाये क्योंकि अन्दर एक भी बैक्टीरिया युक्त बाल गिर गया तो ट्रिलियन्स का खेल शुरू हो जायेगा जो दिन प्रति बढ़ता जायेगा। यह सब बायोसिक्योरिटी में कमजोरी के कारण है।
- जैसे फीड फैक्ट्री में जंगली पक्षियों के प्रकोप की बात की गई है यहां पोल्ट्री शेड में भी यह समस्या है, जिसे यहां आसानी से रोका जा सकता है। फार्मों के विजिट में देखा है कि पलाक के साथ दाना भी खा रहे हैं और पानी भी पी रहे हैं – कितना उचित या अनुचित है? यह दर्शाता है पोल्ट्री जगत कितना बायोसिक्योरिटी के प्रति जागरूक है या गम्भीर है? शायद बहुत कम, जबकि पोल्ट्री की सफलता में इसका सबसे महत्वपूर्ण योगदान है।

OVIGEN



The Synonym of Optimum Egg Production



BENEFITS :

- Improves egg production
- Help in getting high quality egg with well balance albumin and yolk content
- Improves egg shell thickness
- Improves immunity
- Reduces stress and discomfort for better egg laying.
- Increases fertility, Hatchability in breeders
- Improves digestion of feed and helps in better absorption of nutrients.

Dosage :

Layers- 500 gm to 1 kg per tonne of feed

Breeders - 2 kg per tonne of feed

- शेड के अन्दर मक्खियों की फौज जहां बिमारी फैलाने का महत्वपूर्ण योद्धा हैं वही तनाव (Stress) का भी कारण है। आपने देखा होगा अक्सर फलाक अपनी गर्दन बार बार झटकता रहता है जब मक्खी उनके चेहरे पर और विशेष रूप से कल्पी (Comb) पर बैठती है तो वह अपनी गर्दन झटकती है। यह क्रिया वह बेचारी दिन भर करती रहती है जो स्ट्रेस का कारण बनती है। विशेषरूप से ब्रायलर में और अक्सर लेयर में वेन्ट के आस-पास पेस्टी ड्रापिंग होती है जिसमें मक्खी के लारवा होते हैं जो बाद में अन्दर तक पहुंच जाते हैं – मॉर्टैलिटी होने लगती है। यह सब मक्खियों के कारण जब वह वेन्ट के चारों ओर चिपकी बीठ पर अण्डे दे देती है, अतः मक्खियों की रोकथाम को सुनिश्चित करें। इसके लिये कॉफी अच्छे प्रोडक्ट्स भारत में उपलब्ध हैं। इसमें हरबल प्रोडक्ट भी है जो शेड में छिडकना बिल्कुल सुरक्षित है।
- चूहों ने अपना घर ही शेड में बना रखा है। रात भर जश्न मनाते और तान्दव करते हैं। जैसे पहले कहा है, फीड खाते भी हैं और चोरी कर अपने घर-बिल में भण्डारण भी करते हैं। यह सब फलाक की खपत में रिकार्ड होता है। बीमारी फैलाने में अहम भूमिका है इनकी। इस प्रकार यह बायोसिक्योरिटी में सदैव संध लगाते रहते हैं। इन की रोकथाम आवश्यक है जिसे गम्भीरता से हमें लेना चाहिये। इसकी रोकथाम के उपाय सभी किसानों को मालूम है परन्तु इसके खिलाफ जेहाद नहीं छेड़ते।
- बायोसिक्योरिटी पर बहुत कुछ विस्तार से लिखा जा सकता है – पूरी पुस्तक इसके भिन्न भिन्न आयाम पर लिखी जा सकती है, परन्तु यहां जो बहुत ही आवश्यक है – बेसिक है उन्हीं पर प्रकाश डाला गया है

2. पीने का पानी :-



- यह एक ऐसा न्यूट्रिंट है जो फीड से मिलने वाले भिन्न भिन्न न्यूट्रिंट से भी महत्वपूर्ण है। बिना दाने के पोल्ट्री कई दिन तक जिन्दा रह सकती है परन्तु बिना पानी के नहीं।

- मौसम के हिसाब से कुछ घण्टे या अधिक से अधिक 24 या 35 घण्टे तक। शरीर के वजन का लगभग 70 प्रतिशत भाग पानी है। जिसका भण्डारण कोशिकाओं में होता है। कहते हैं दाने की खपत से लगभग पानी दुगुना एक स्वस्थ फलाक पीता है परन्तु यह भी हकीकत है कि वातावरण में तापमान बढ़ने के साथ-साथ पानी की खपत चार से पांच गुणा तक हो जाती है।
- पानी न्यूट्रिंट्स के वाहन के तौर पर तो काम करता ही है साथ ही शरीर के तापमान को नियंत्रित भी करता है।
- किसी भी कारण से आवश्यकता से कम पानी पीने पर या पूरा ना मिलने से डिहाईड्रेशन की पूरी सम्भावना है – अनायास मॉर्टैलिटी भी हो सकती है। उत्पादन का घटना और वजन में कम बढ़ोतरी आम बात है। फीड की खपत घटने लगेगी, अण्डे का वजन भी घटेगा।
- पानी की बायोसिक्योरिटी अपनी पोल्ट्री मैनेजमेंट का मुख्य भाग है। इसमें कोई भी कमी बीमारी फैलने का कारण बनेगी—विशेष रूप से गर्मी में जब पानी की खपत काफी बढ़ जाती है।
- आमतौर से हमारे फार्मर पानी पर विशेष ध्यान नहीं देते— शायद यह महत्वपूर्ण न्यूट्रिंट मुफ्त है, इस लिये। वास्तव में जितना ध्यान हमारा फीड की क्वालिटी पर है उससे अधिक ध्यान पानी की गुणवत्ता पर देना चाहिए। फीड के कारण कोई समस्या आई हम तुरन्त उसे पकड़ लेते हैं परन्तु पानी के द्वारा अगर बीमारी आई जो तेजी से फैलती है, हमारा ध्यान कभी उस पर जाता ही नहीं।
- साथ में हम कितनी बार पानी का लैब टेस्ट करवाते हैं? शायद एक बार भी नहीं। बहुत से किसान तो जब फार्म शुरू करते हैं तब भी पानी का टेस्ट नहीं करवाते हैं। अपने देश में तीन मौसम हैं जाड़ा-गर्मी और बरसात। विशेष रूप से बरसात और गर्मी में पानी की गुणवत्ता पर बहुत असर पड़ता है। जो हमारा स्रोत है जहां से पानी निकल रहा है वहीं अच्छा या बुरा परिवर्तन पानी की गुणवत्ता पर पड़ सकता है। अतः कम से कम बरसात के मध्य और गर्मी के मध्य में अवश्य करवायें। जहां बहुत से पैरामीटर चैक होंगे वहीं बैक्टीरियल लोड अवश्य चैक करवाए विशेष रूप से इकोलाइ का।
- चलिये रिपोर्ट सही आ गई परन्तु आगे फलाक के पानी पीने तक बहुत से बिन्दु ऐसे हैं जहां बैक्टीरिया इत्यादि पनप सकता है और समस्या कर सकता है।
- पहला सोर्स है ट्यूबवेल से पानी के स्टोरेज तक की पाइप लाइन यदि इसमें कहीं लीकेज है। यह सीधे कन्टेमिनेटड पानी स्टोर तक पहुंचेगा जो समस्या का कारण बनेगा।
- अक्सर पाया गया है स्टोरज टैंक का ढक्कन गायब है और धूल-मिट्टी, पत्तियां आदि सब टंकी में जा रही है। यह भीषण समस्या पैदा करता है।
- हम मान लें ऊपर सब कुछ ठीक है अब यह पानी पाइप लाइन द्वारा शेड में ऑटोमैटिक ड्रिन्कर, निप्पल्स इत्यादि में जा रहा है। इससे कोई खतरा नहीं होना चाहिये परन्तु ऐसा है नहीं। जिन ट्रांसपेरेन्ट प्लास्टिक के टुकड़ों से पाइपलाइन और ड्रिन्कर को जोड़ा गया है उसके अन्दर कुछ दिनों बाद लगेगा कि हरा-पन दिख रहा है, यह खतरे की घण्टी है। इसकी सफाई करना जरूरी है।

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Bursal Disease-Marek's Disease Newcastle Disease Vaccine, Serotype 3, Live Marek's Disease Vector

Vaxxitek HVT-IBD+ND

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Composition: Each dose of vaccine contains: MD vectored IBD & ND recombinant virus, Serotype 3- At least 5696 pfu, DMSO/Freezing Solution- 7.5 %, Freezing Media-1 dose q.s., Penicillin <= 30.0units/mL, Streptomycin <= 30.0 mcg/mL, Amphotericin B <= 2.5mcg/mL, calf serum 15 % **Indication:** This product has been shown to be effective for the vaccination of healthy 18 to 19-day-old chicken embryos and one-day-old chickens against standard and variant bursal disease, Newcastle disease and Marek's disease. **Dosage and administration:** In ovo Administration: Use two hundred (200) mL of sterile diluent is used for each 4,000 doses of vaccine to be administered in ovo. Dilute the vaccine only as directed. Inject a 0.05 mL dose into each embryonated egg. Use entire contents of the vaccine container within one hour after mixing the vaccine with diluent. Subcutaneous injection: Use 200 mL of sterile diluent for each 1,000 doses of vaccine to be injected subcutaneously. Inject chickens under the loose skin at the back of the neck (subcutaneously), holding the chicken by the back of the neck just below the head. The loose skin in this area is raised by gently pinching with the thumb and forefinger. Inject 0.2 mL per chicken. Avoid hitting the muscles and bones in the neck. Use entire contents of the vaccine container within one hour after mixing the vaccine with diluent. **Age:** Day old chickens and 18 days embryonated eggs. **Pregnancy and Lactation:** Not applicable. **Contraindications:** Do not vaccinate diseased embryonated eggs or diseased birds. **Special warnings and precautions:** Do not mix the vaccine with other vaccines or veterinary medication. Use the entire contents of the vaccine container within one hour after mixing the vaccine with diluent. Use entire contents when first opened. Do not vaccinate diseased embryonated eggs or diseased chickens. Avoid contact with eyes, hands and clothes when using the vaccine. **Adverse reactions:** None known. **Shelf Life and Storage:** Shelf life is 18 months. **AMPULES:** Store in liquid nitrogen container. **DILUENT:** Store at room temperature. **MAH Holder:** - Boehringer Ingelheim India Pvt Ltd, Unit No. 202 and part of Unit no. 201, 2nd Floor Godrej 2, Prajsha Nagar, Eastern Express Highway, Vikhroli (E) | Mumbai 400079.

Last review date: 09/08/2024

Additional information is available on request.

PREVENTION WORKS

Shaping the future of poultry health

- शेड के स्टोरेज टैंक से लेकर शेड के अन्दर की सारी पाईप लाईन की फ्लशिंग की बात बार-बार कही जाती है, क्यों? आपकी तरफ से सबकुछ ठीक है परन्तु टैंक और पाईप लाईन की फ्लशिंग जब किसी अच्छे फ्लशर से करते हैं तो आमतौर से पानी गन्दगी के साथ जिसमें रंग बिरंगी बायोफिल्म के छोटे छोटे टुकड़ों के साथ निकलता है। यह बायोफिल्म है क्या? वास्तव में यह बैक्टीरिया के छुपने का कवच है। जिसे बैक्टीरिया अपने बचाव के लिये यह कवच स्वयं बना लेता है। अतः यह बात साबित हो गई कि पीने के पानी की पूरी सप्लाय लाईन की सफाई और सेनीटाइजेशन जरूरी है।
- बकेट ड्रिन्कर या चैनल ड्रिन्कर सुबह-शाम साफ करने के बाद सेनीटाइज करना आवश्यक है।
- हमें नियम बना लेना चाहिये कि हर पीने का पानी सदैव किसी अच्छे वाटर सेनीटाइजर से युक्त होना चाहिए। इसके लिए कई अच्छी कम्पनियां अच्छे प्रोडक्ट्स ले आई हैं। आप ब्लीचिंग पाऊडर टेबलेट्स यदि वह WHO द्वारा प्रमाणित हो, प्रयोग कर सकते हैं। ध्यान रहें वैक्सीनेशन के समय इन सबका उपयोग 2-3 दिन ना करें।
- पीने के पानी के तापमान पर विशेष ध्यान दे। मौसम के हिसाब से बदलता रहता है। गर्मी में ठण्डे से ठण्डा और जाड़े में शेड के तापमान से कम ना हो।
- इस प्रकार पानी के विषय में आपको अधिकांश जानकारी दे दी गई है। इसमें पानी की बायोसिक्योरिटी पर भी चर्चा की गई है जो बहुत महत्वपूर्ण है। इसमें कोई भी कमी प्रत्यक्ष या अप्रत्यक्ष रूप में फ्लाक में समस्याएं खड़ी करती रहेंगी और नुक्सान होता रहेगा।

3. फीड एवं फीडिंग



- फीड दिन प्रति दिन मंहगी होती जा रही साथ में चूजे का रेट भी बढ़ता जा रहा है। सदियों से हम कहते आ रहे हैं उत्पादन के कुल खर्च का 70 प्रतिशत अकेले फीड है। क्या इस मंहगाई में भी यह 70 प्रतिशत पर टिकी है? दुखद है जब इस प्रकार फीड अचानक मंहगी होती है अड़गों की मात्रा जैसे DDGS एलकोहल फैक्टरी, या DDGS

एथेनाल की फैक्टरी की निश्चित रूप से बढ़ेगी। इनकी बहुत कम ऐसी फैक्टरीयां जो आपको इसकी सेफ क्वालिटी की गारन्टी दे सकती हैं। अधिकांश नहीं दे सकती है अतः समस्याओं का जोखिम बना रहेगा। आगे आने वाले समय में फीड की क्वालिटी के लिये सदैव सतर्क रहना होगा।

- फ्लाक की बढ़िया परफार्मेंस का सारा दारोमदार उम्र और मौसम के हिसाब से फीड फार्मूलेशन और उसकी गुणवत्ता पर ही आधारित हैं। इसमें कोई भी कमी या गलती प्रत्यक्ष या अप्रत्यक्ष रूप से काफी नुक्सान पहुंचा सकता है। यदि प्रत्यक्ष हुआ तो उसका निवारण कर सुधार ला सकते हैं। यदि अप्रत्यक्ष हुआ तो शायद आपको पता ही न चले कि यह 'शरारत' फीड की है। यदि आगे पता भी चला तो काफी देर हो चुकी होगी — काफी नुक्सान हो चुका होगा किसी बैक्टीरिया या वायरस बीमारी के कारण।
- इसीलिये बार-बार कहा जाता है कि प्रतिदिन फीड की खपत, अण्डे का प्रतिशत उत्पादन, ब्रेकेज और सबसे बड़ी बात अण्डे का वजन रिकार्ड करते रहें।
- भले ही फीड की खपत ना घटे परन्तु उत्पादन ब्रेकेज एवं अण्डे का वजन घट रहा है तो समझ जाये कि आपके फीड के नये बैच में कोई समस्या है।
- जब भी फीड का नया बैच आता है — पहला काम करें उसमें हाथ डाल कर देख ले वह गर्म तो नहीं, यदि है तो यह फीड जोखिम भरा है। अगर ठीक है तो भी जब फीड लगाये तो इसी प्रकार हाथ अन्दर डालकर तापमान चेक कर ले—यदि कोई भी बोरी गर्म निकले तो इस बोरी को ना लगायें।
- फीड भले ही बहुत अच्छी आपके फार्म पर आती है परन्तु अगर आपका रखरखाव-स्टोर करने का ढंग सही नहीं है तो आप स्वयं स्टोरेज मैनेजमेंट के कारण फीड की सारी अच्छाईयों पर 'पानी' फेर रहे हैं। फीड स्टोर हवादार हो और फीड की बोरीयां जमीन पर न फँकी जायें। इसे लकड़ी या एंगल के स्लेट पर रखा जाये। यह स्लेट फर्श से लगभग डेढ़ फिट उंचा हो दीवार से हर तरफ से डेढ़ फिट की दूरी पर हो। इस प्रकार उन्हें चारों तरफ से हवा लगेगी।
- भण्डारण सही ना होने पर आप स्वयं फीड में फंगस की भिन्न 'फसल' बोरी के अन्दर पैदा करेंगे जो आपको अलग रूप से तंग करता रहेगा। तंग आप होंगे और आपका फ्लाक बरबाद होता रहेगा।
- अब चलिये शेड के अन्दर हम एक अच्छी फीड को बर्बाद-खराब कर सकते हैं। सिद्धांत कहता है कि लेयर हो या ब्रायलर हो, हर 24 घण्टे में मौसम के हिसाब से 1 घण्टे से 4 घण्टे के लिये फ्लाक पूरा फीड खा कर फीडर को खाली कर दे, उसके बाद उसमें नया फीड लगायें। ओपन शेड में यह आवश्यक है। अगर आप फीड के उपर फीड लगायें तो नीचे बची फीड कुछ ही दिनों में खराब होना शुरू हो जायेगी। फफून्ड भी जन्म लेगी—पपड़ी या 'केक' बनना शुरू हो जायेगी। एक प्रकार से यह नीचे की फीड माईकोटॉक्सिन का भण्डार बन जायेगी। इसके बाद फ्लाक का कितना बुरा हाल होगा, हम और आप अन्दाजा नहीं लगा सकते।
- कन्ट्रोल इनवायरमेंट शेड में भी 1 घण्टे के लिये फीडरों को खाली रखना आवश्यक है।

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- यदि इस सिद्धांत की अवहेलना करते हैं तो आप स्वयं एक अच्छी फीड में जहर उत्पन्न कर रहे हैं।
- फीड में लगभग सभी फीड मिक्सर्स टॉक्सिन्स बाईन्डर डालते हैं। टॉक्सिन बाईन्डर भी तरह तरह के आते हैं। कुछ टॉक्सिन बाईन्डर इतने अच्छे हैं जो लगभग सभी टॉक्सिन पर तो काम करते ही हैं, साथ में कैमीकल टॉक्सिडी पर भी काम करते हैं। मध्य श्रेणी और निम्न श्रेणी के भी आते हैं। कोशिश करें कि आप उच्च श्रेणी वाला ही टॉक्सिन बाईन्डर डालें। यदि आप के पास टॉक्सिन टेस्टिंग का प्रावधान है, निर्णय उसके अनुसार करें।
- पीने के पानी को सेनीटाईज करके हमने बैक्टीरिया आदि के खिलाफ सुरक्षा कवच बना दिया, इसी प्रकार फीड का एसिडीफिकेशन करके यहां भी सुरक्षा कवच प्रदान कर दें। इस प्रकार दो वाहनों पर बन्दिश लगा दी।
- सम्पूर्ण उत्पादन खर्च में सबसे अधिक भाग लगभग 70 प्रतिशत फीड का अकेले है अतः इसको बर्बाद होने से हर प्रकार से बचायें। कुछ बर्बादी हम स्वयं करते हैं और कुछ बर्बादी पोल्ट्री के सबसे बड़े दुश्मन चूहे करते हैं। दुर्भाग्य से यह दोनों बर्बादी भी लेयर या ब्रायलर की खपत में दर्ज होता है।
- मुर्गी जहां चोंच मार कर दाना खाती हैं वहां उपर का 2 हिस्सा खाली रहना चाहिये और नीचे के एक हिस्से में सदैव दाना बना रहना चाहिये। जितना उपर की ओर फीड होगा उतना अधिक फीड बर्बाद होगा। अगर बिल्कुल उपर तक भर दिया तो खाते समय यह मुर्गी या ब्रायलर 30 प्रतिशत तक फीड बर्बाद कर सकते हैं, अतः सदैव सचेत रहे।
- चूहों की पूरी कहानी आप जानते हैं— वह कितना बर्बाद करता है, कितना खाता है और कितना चोरी कर अपने बिल में जमा करता है, भविष्य के लिये। अतः उनके खिलाफ सदैव 'जेहाद' जारी रखिये। जहां फीड का नुकसान हो रहा है वहीं चूहे बीमारिया भी फैलाते हैं।

4. तनाव — STRESS

- पोल्ट्री मैनेजमेंट में तनाव का जिसे आप स्ट्रेस के नाम से भी जानते हैं बहुत ही महत्वपूर्ण अंग है। यह दबाव जितना कम होगा उतना ही लाभदायक होगा। किसी भी तरह की 'हैण्डलिंग' स्ट्रेस का कारण बनती है और जिस कार्य के लिये किया उसका स्ट्रेस, कम या ज्यादा उस कार्य पर निर्भर है।
- एक या दो स्ट्रेस ब्रायलर, लेयर या ब्रीडर झेल सकता है परन्तु जहां इससे अधिक 5—6—7 या 8 स्ट्रेस पड़ा तो फ्लाक बहुत अधिक तनाव में आ जाता है, सेहत गिर जाती है और वापस आने में समय लग जाता है— इस बीच कोई बैक्टीरिया या वायरस बीमारी की आउटब्रेक भी हो सकती है। अक्सर देखा है 'गर्मी' में शेड के अन्दर टीकाकरण चल रहा है—साथ ही क्रेट में डालकर बाहर खड़ी गाड़ी पर लोड होकर 9—10 किलोमीटर दूर फार्म पर जा रहा है जहां उसे नये इनवायरमेंट में छोड़ा जा रहा है। इसमें कम से कम 7—8 स्ट्रेस एक साथ पड़ेगा। बताइये फ्लाक इस स्ट्रेस को कैसे सहन करेगा? तगड़ा रीएक्शन होगा—प्रतिक्रिया होगी और किस शक्ल में होगी यह समय ही बतायेगा।



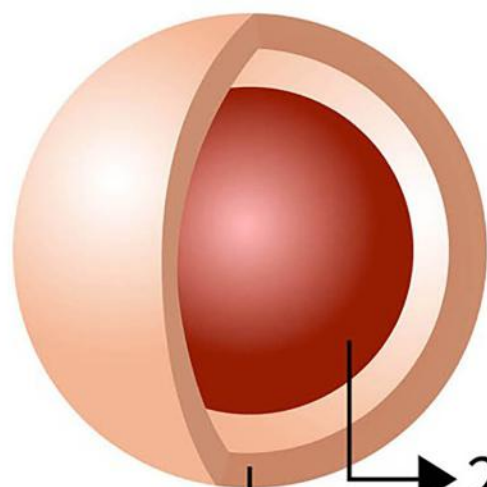
- दुर्भाग्य से पोल्ट्री में हैण्डलिंग या आप्रेशन बहुत अधिक है। कुछ बहुत ही आवश्यक है, कुछ कम आवश्यक हैं और कुछ निम्न स्तर के हैं।
- जो बहुत आवश्यक हैं उनमें प्रमुख है समय पर स्पेस बढ़ाना, समय पर वैक्सीनेशन और समय पर डीबीकिंग करना। इन सबमें हैण्डलिंग तो होगी जो स्ट्रेस करती है — साथ में वैक्सीन लगेगी जिसका प्रत्यक्ष या अप्रत्यक्ष प्रतिक्रिया — रीएक्शन होगा जो भारी स्ट्रेस फ्लाक पर डालेगा। इसी लिये कहते हैं जब भी आप वैक्सीनेशन करें या डीबीकिंग करें 5—7 दिन एन्टी स्ट्रेस फीड या पानी में दें। यह एन्टी स्ट्रेस हर आप्रेशन के लिये कुछ अलग अलग होगा। यहां तक कि शिफ्टिंग या जगह बढ़ाने में 'एन्टी स्ट्रेस' का उपयोग करें।
- जैसे लिखा है कि हर आप्रेशन में हैण्डलिंग होनी है। यह हैण्डलिंग यदि 'जेन्टिल और लविंग केयर' के साथ की जाये तो आप स्ट्रेस के असर को काफी कम कर सकते हैं। प्रायः देखा गया है कि पूरे पेन में चिक्स या ग्रोअर को एक प्रकार से दौड़ा कर और 'झपटा' मार कर पकड़ा जाता है। वैक्सिन लगाने वाला या डीबीकिंग करने वाला वैक्सिनेशन या डीबीकिंग के बाद उसको फेंकता है — यह प्रैक्टिस बिल्कुल गलत है, आराम से छोड़िये, इतना निर्दयी मत बनियें।
- किसी भी फ्लाक की 'जेन्टिल और लविंग केयर' के साथ हैण्डलिंग करने के लिये वह भी कम परिश्रम के साथ, एक बड़ा सुगम तरीका है। पेन के अन्दर जरूरत पड़ने पर जाली का एक घेरा किसी भी कोने में बना लें और उस छोटे घेरे में बर्ड्स को हंकाल कर ले जायें। यहां आप उन्हें आसानी से पकड़ सकते हैं। आवश्यकता पड़ने पर पकड़ने के लिये आप कैचिंग हुक का उपयोग कर सकते हैं। जिसे आप स्वयं बना सकते हैं।
- एक बात का सदैव ध्यान रखें विशेष रूप से गर्मी और बरसात में। किसी भी आप्रेशन का समय 24 घण्टे के सबसे ठण्डे समय में ही रखे — भले ही रात के 3 बजे से सुबह 7—8 बजे तक, क्योंकि यह अधिक तापमान के कारण स्वयं दुखदाई स्ट्रेस का मौसम है। इस विषय पर विस्तार से पोल्ट्री टेक्नोलॉजी में प्रकाशित हो चुका है, अधिक जानकारी के लिये आप मांग सकते हैं।

5. जेनेटिक रिजिस्टेन्स या ब्रीड रिजिस्टेन्स

- हर ब्रीड के बीमारियों से लड़ने की क्षमता और मौसम की मार से बचने की क्षमता अलग अलग है। इस सन्दर्भ में विज्ञान ने बहुत विस्तृत जानकारी दे रखी है — आज भी इस पर काम चल रहा है। हम यहां वहीं बातें करेंगे जो फील्ड में या आम किसान के लाभ में हो और प्रैक्टिकल हो।



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- देश में सरकारी नस्लों को छोड़कर जो विश्वविख्यात नस्लें भारत में उपलब्ध हैं उनमें लेयर्स के लिये 5 ब्रीड हैं और ब्रायलर्स के लिये 3 ब्रीड उपलब्ध हैं। इनमें से लेयर की एक नस्ल जो MD वैक्सीन के आने के बाद सबसे ज्यादा डिमान्ड में रही और दशकों तक उसका अधिपत्य रहा वह है B.V. 300। आज भी सबसे अधिक बिक रही है परन्तु बोवन्स के आने के बाद धीरे धीरे उसके शेयर में कमी आने लगी। अब तो फील्ड में हाई लाईन और लोहमान लेयर भी आ गई है। जिस कारण 'महारानी' ब्रीड का शेयर तो कम हो रहा है परन्तु अब भी सबसे अधिक है। एक नई लेयर ब्रीड "नोवोजेन" भारत में आ गई है परन्तु फील्ड में आने में कुछ समय लगेगा। इसकी भी अच्छी परफार्मेंस की उम्मीद है।
- अब आपके पास कई नस्लें लेयर की मौजूद हैं। आप किन पैरामीटर्स के आधार पर नया रिप्लेसमेंट लेगें? सबसे पहले हमें देखना है कि डिजीज रिजिस्टेन्स कैसा है? मौसम के प्रति कैसा व्यवहार है—विशेष रूप से गर्मी? हेन हाउस्ड प्रोडक्शन (H.H.P) कैसा है? फीड कन्जम्पशन कितना है एवं अण्डे का वजन और शैल की मजबूती कैसी है? इन सब बिन्दुओं को देखते हुये आप ब्रीडर्स से बात करते हैं—उसने तो सबकुछ अच्छा ही बताया है जिसने सबसे अधिक झूठ बोला और लच्छेदार बातों की उसे आपने अपने फार्म के लिये बुक करवा दिया। वास्तव में आपको फील्ड रिपोर्ट जरूर स्टडी करनी चाहिये।
- दुर्भाग्य से अपने देश में इन सब ब्रीड की तुलनात्मक स्टडी किसी ने की ही नहीं। एक बहुत अच्छी ब्रीड है जिसमें यदि प्रारंभ में 'चिकन एनेमिया' की समस्या नहीं आई तो उसके परफार्मेंस का कोई तोड़ नहीं पर इस वायरल बीमारी के कारण उसमें 'अगर-मगर' लग जाता है।
- जब देश में पहली बार साउथ में एक नई बीमारी का शोर-शराबा हुआ तो प्रारम्भ में उसे फीड के कारण 'हेमोरेजिक सिन्ड्रोम' कहा गया। इसमें चिक्स और ग्रोअर में 60–70 प्रतिशत तक की मॉर्टैलिटी दर्ज हो रही थी। अचम्भे की बात थी सरकार ने दो प्राइवेट कंपनियों को गम्बोरो की वैक्सीन बनाने का लाइसेन्स दे रखा था। उन्होंने जब वैक्सीन बनाई तो उसी इलाके में लगाया गया था। इसके बाद इस वैक्सीन ने आउट ब्रेक की शक्ल ले ली। देश में और किसी जगह यह वैक्सीन नहीं लगी थी — बहुत तेजी से फैली—हर जगह हाहाकार मच गया। लेयर चिक्स और ग्रोअर में आमतौर से 50 प्रतिशत से उपर और ब्रायलर में 15–20 प्रतिशत तक की मॉर्टैलिटी रिकार्ड होती रही। इसका कोई इलाज नहीं था—टोटके लगाते रहे ब्रायलर में तो कुछ फायदह नजर आया परन्तु चिक्स और ग्रोअर में कोई खास फायदह नहीं हुआ।
- इसी बीच एक बड़े ब्रीडर ने साहस दिखाया और 5 सितारा होटल दिल्ली में 'गम्बोरो' पर सेमीनार रखा जहां USA से दो वैज्ञानिक आये। उन्होंने स्क्रीन पर कुछ मुद्दे लिखे जिसपर उन्होंने बोलना था। एक महत्वपूर्ण मुद्दा था 'ब्रीड रिजिस्टेन्स'। मैं बहुत उत्सुक था इस पर क्या बोलते हैं? परन्तु जब इस प्वाइंट पर आये तो इसको छोड़कर आगे बढ़ गये। अन्त में जो वैक्सीन लगाने को उन्होंने बताया वह भारत में उपलब्ध ही नहीं थी।



- मैं एक बड़े लेयर फार्मर के साथ उस मिटिंग में गया था। वह कुछ उदास थे क्योंकि उनके यहां इस बीमारी के कारण मॉर्टैलिटी अपने चरम सीमा पर थी। मैंने ब्रीड रिजिस्टेन्स का मुद्दा उठाया "क्यों वह इस मुद्दे को छोड़ कर आगे बढ़ गये?" चिक्स मर रहे थे, फार्मर को चिन्ता थी अण्डा कहां से आयेगा अतः इतनी अधिक मॉर्टैलिटी के बावजूद वह रिप्लेसमेंट डालना चाहते थे। मैंने सुझाव दिया "अपने देश में तीन अच्छी लेयर ब्रीड उपलब्ध हैं क्यों ना हम तीनों डालें?" तैयार हो गये। हर एक के 10000 चिक्स मंगवाये। 5 सप्ताह पर एक ब्रीड में मॉर्टैलिटी शुरू हो गई और 60 प्रतिशत पर रुकी। दो ब्रीड जो बची उनमें लगभग 6 सप्ताह पर मॉर्टैलिटी शुरू हुई और 20 प्रतिशत एवं 25 प्रतिशत पर रुक गई। यही कारण था कि वह अमरीकन ब्रीड रिजिस्टेन्स के मुद्दे को गोल कर गये। बहरहाल इससे एक बात तो सिद्ध हो गई कि ब्रीड रिजिस्टेन्स या जेनेटिक रिजिस्टेन्स का बहुत बड़ा महत्व है। ध्यान रखें।
- इसी प्रकार सन् 70 के दशक के प्रारम्भ की बात है, भारत में मैरिक्स डिजीज की बीमारी नहीं थी। आई या लाई गई तो पूरे भारत में तहलका मच गया — 7–8 हफ्ते पर शुरू होती और प्रोडक्शन प्रारम्भ होने तक चलती रहती और 10–25 प्रतिशत मॉर्टैलिटी हो जाती थी। उस समय इसकी विश्व में कोई वैक्सिन नहीं थी। इसका कोई कारगर इलाज भी नहीं था। उस समय की ऑलइन्डिया पोल्ट्री एसोसिएशन (AIPA) ने नॉर्थ-ईस्ट-साउथ-वेस्ट से एक आदमी को कहा कि अपने इलाके की विस्तर से रिपोर्ट बना कर दे। नार्थ की मुझे देना था। उस समय की 7 आयतित लेयर ब्रीड थी। सर्वे के मुताबिक एक ब्रीड की कुल मॉर्टैलिटी 5–8 प्रतिशत और एक ब्रीड की सबसे ज्यादा 20–25 प्रतिशत तक रही और बाकी सब 5–25 प्रतिशत के बीच में रही। कुछ ही महीनों में इसकी वैक्सिन USA में बन गई जिसका भारत में आयात शुरू हो गया। बीमारी निल हो गई और जिसकी मॉर्टैलिटी सबसे अधिक थी वह फील्ड में अपने कुल परफार्मेंस के कारण चमक उठा। इस सर्वे से भी सिद्ध होता है कि हर ब्रीड का अपना 'जेनेटिक रिजिस्टेन्स' है।



Mr. Shabbir Ahmad Khan

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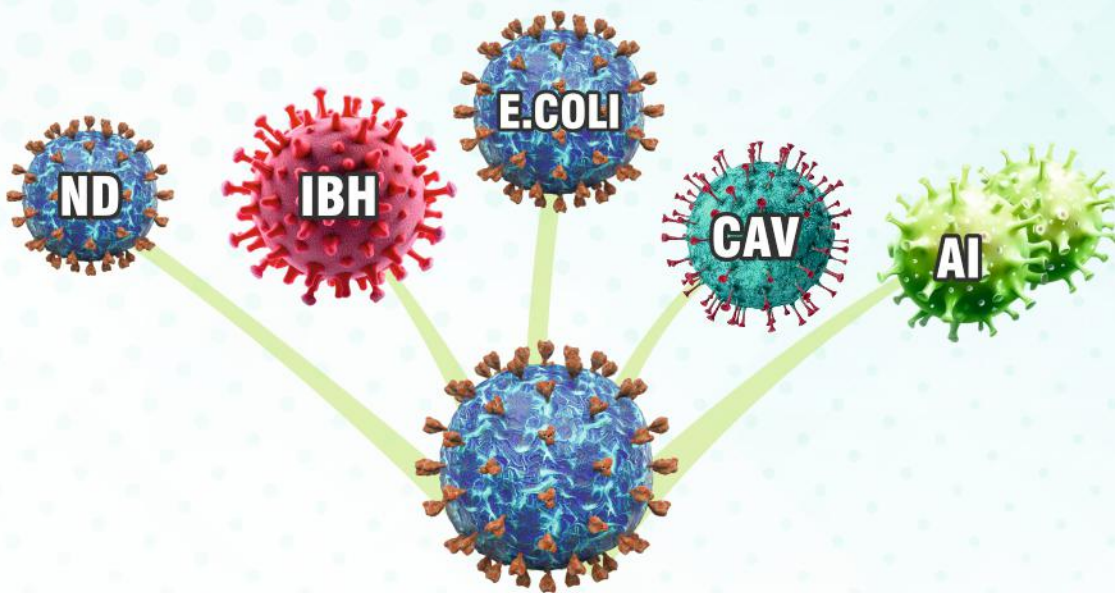
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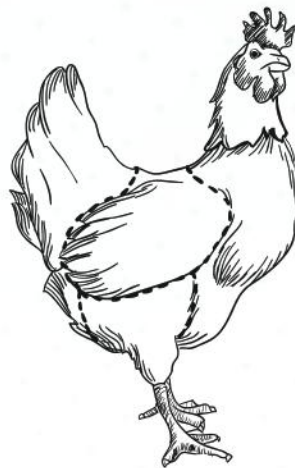
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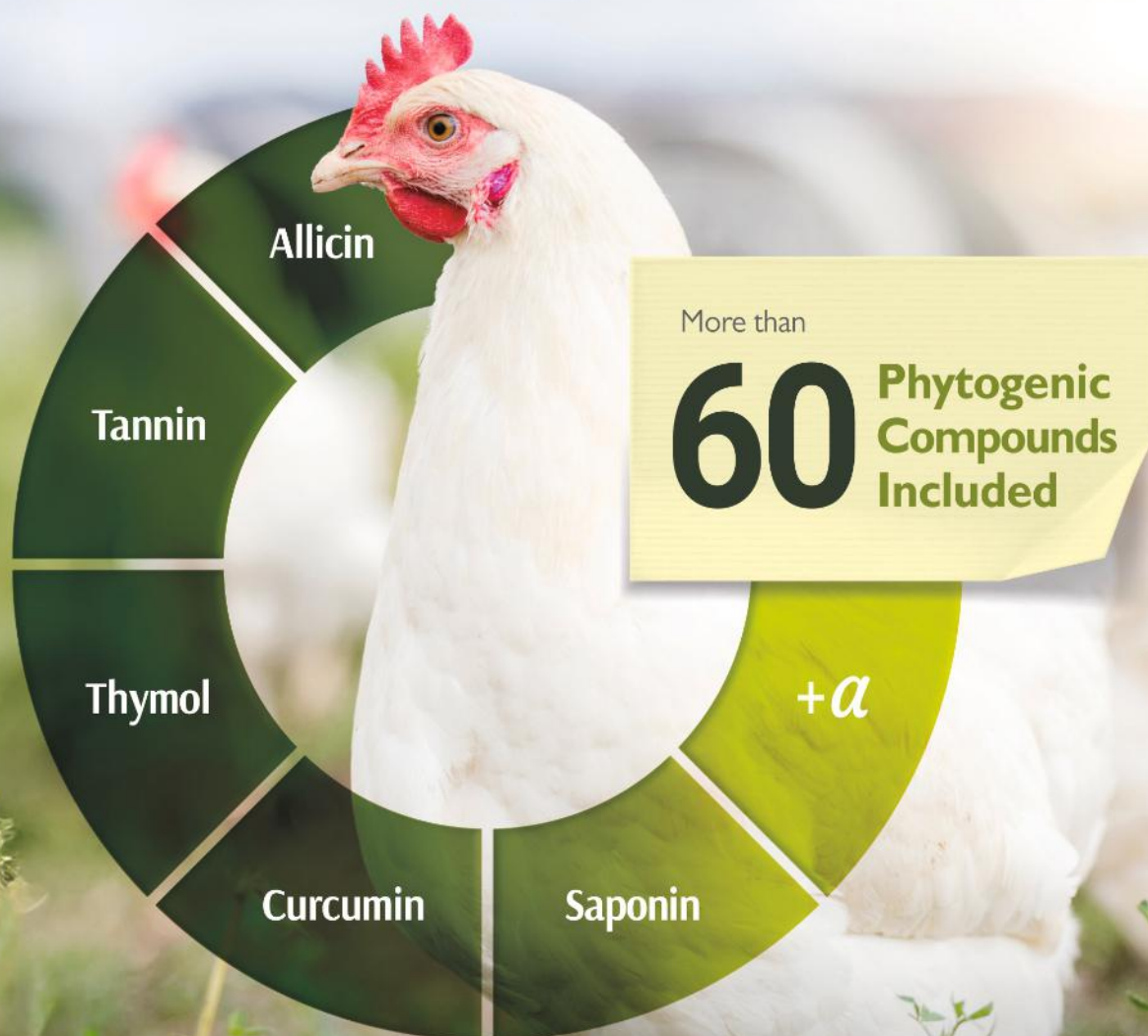
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Fowl Cholera

Most ignorant and undiagnosed Disease in the field. I have diagnosed and treated a number of cases in the field which were not diagnosed properly and confused with Viral Diseases.

Also Known As

- Avian Cholera
- Avian Pasteurellosis
- Avian Hemorrhagic Septicemia

Fowl Cholera is a Bacterial Disease Caused by *Pasteurella Multocida*, A Small Gram Negative Rod



Dr. H.K. Rohila

Poultry Consultant, Ex-Technical Head,
Broiler Breeder, VH-Group, North India
Mobile: 8195940099
Email: drrohilla1947@gmail.com
Contact for free Telephone Consultancy
Morning 8 to 10 am



Fowl cholera



Pin Point Haemorrhages

Most Important Sources of Infection

- Chronically Infected Birds
- Asymptomatic Carriers
 - Birds
 - Rats
 - Older Flocks

Nb : Incubation Period 5 To 8 Days

More Prevalence In :

Late Summer (June to September)

Fall (September, October, November & Winter
(December, January & February)

Because of Suboptimal Climatic Conditions in Poultry Houses

Nb : No Vertical Transmission

No Hatchery Problem

Cases Are Seen When

- Sudden Change of Feed
- Withdrawal of Feed & Water
- Any Abrupt Change in Microenvironment

Forms of Disease

- Peracute Form
- Acute Form
- Chronic Form
- Localised Form

NB : Laying Flocks More Susceptible to Fowl Cholera.

Per Acute Form

- No Symptoms & A Large Number Of Birds In The Flock Are Found Dead In Good Bodily Condition, 50% Or More Birds May Die.
- Birds Between 12 to 18 Weeks ,more Susceptible to the Disease.

Acute Form

- Depression
- Fever
- Loss of Appetite
- Mucus Discharge
- Comb & Wattles, Bluish Discolouration
- Foul Smelling Diarrhoea First Watery & Whitish, then Greenish with Mucus

SEASON-READY SOLUTIONS



• Biotin 2% (Premix)	-	25 KGS/BAG
• Bambermycin 8% (Granular)	-	25 KGS/BAG
• Chlortetracycline 15% (Granular)	-	25 KGS/BAG
• Clopidol 25% (Premix)	-	25 KGS/BAG
• Diclazuril 0.5% (Premix)	-	25 KGS/BAG
• Enramycin 8% (Premix)	-	25 KGS/BAG
• Nosiheptide 1% (Premix)	-	25 KGS/BAG
• Robenidine HCL 10% (Premix)	-	25 KGS/BAG
• Tiamulin Hydrogen Fumarate 10% (Granular)	-	25 KGS/BAG
• Tylosin Phosphate 10% (Granular)	-	25 KGS/BAG
• Vitamin E 50% (Granular)	-	25 KGS/BAG



Chronic Form

- Depression
- Difficult Breathing
- Lameness
- Torticollis (Twisting of Neck)
- Swelling of the Wattles
- Lacrimation

NB : Chronically Infected Birds May Die, remain Infected for Long Periods or Recover.

Localised Form

- Arthritis
- Oophoritis

PM Findings

- Marked Congestion of Carcass
- Numerous Pinpoint Haemorrhages throughout the Internal Organs.
- Necrotic Foci in the Liver
- Liver May be Enlarged /show Small Haemorrhages on the Surface
- Free Yolk May be Seen in the Abdominal Cavity.
- Acute Oophoritis & Hypermic Ovarian Follicles
- Peritoneal & Pericardial Fluid

Bacterial Isolation

- Bone Marrow
- Heart Blood
- Liver



Diagnosis of Fowl Cholera

1. Bacterial Isolation
2. Bipolar Staining
3. PCR Through FTA Cards

Line Of Treatment

- Sulpha Drugs, Bacteriostatics
- Terramycin LA
- Streptomycin

NB : Treatment Should be on the Basis of Bacterial Isolation & Antibiotics Sensitivity Test.

Control of Fowl Cholera

- Monthly Rat Control Programme
- Sick Birds Isolation
- Proper Vaccinations

VH-FC 3 at 8 WK & 12 WK XI/M x Legs

Differential Diagnosis

- Viral Infections
 - New Castle / Ranikhet Disease
 - Button Ulcers In Intestine
 - Pin-point Haemorrhages on Proventricular Glands
 - Linear Haemorrhages in trachea
 - Linear Rectal Haemorrhages

Low Pathogenic Influenza (LPI)

Haemorrhagic Trachitis

Pin Point Haemorrhages on Deep & Superficial Pectoral Muscles

Haemorrhages On Internal Visceral Organs

Egg Peritonitis, Flacid Ova Etc



LPI



ND/RD

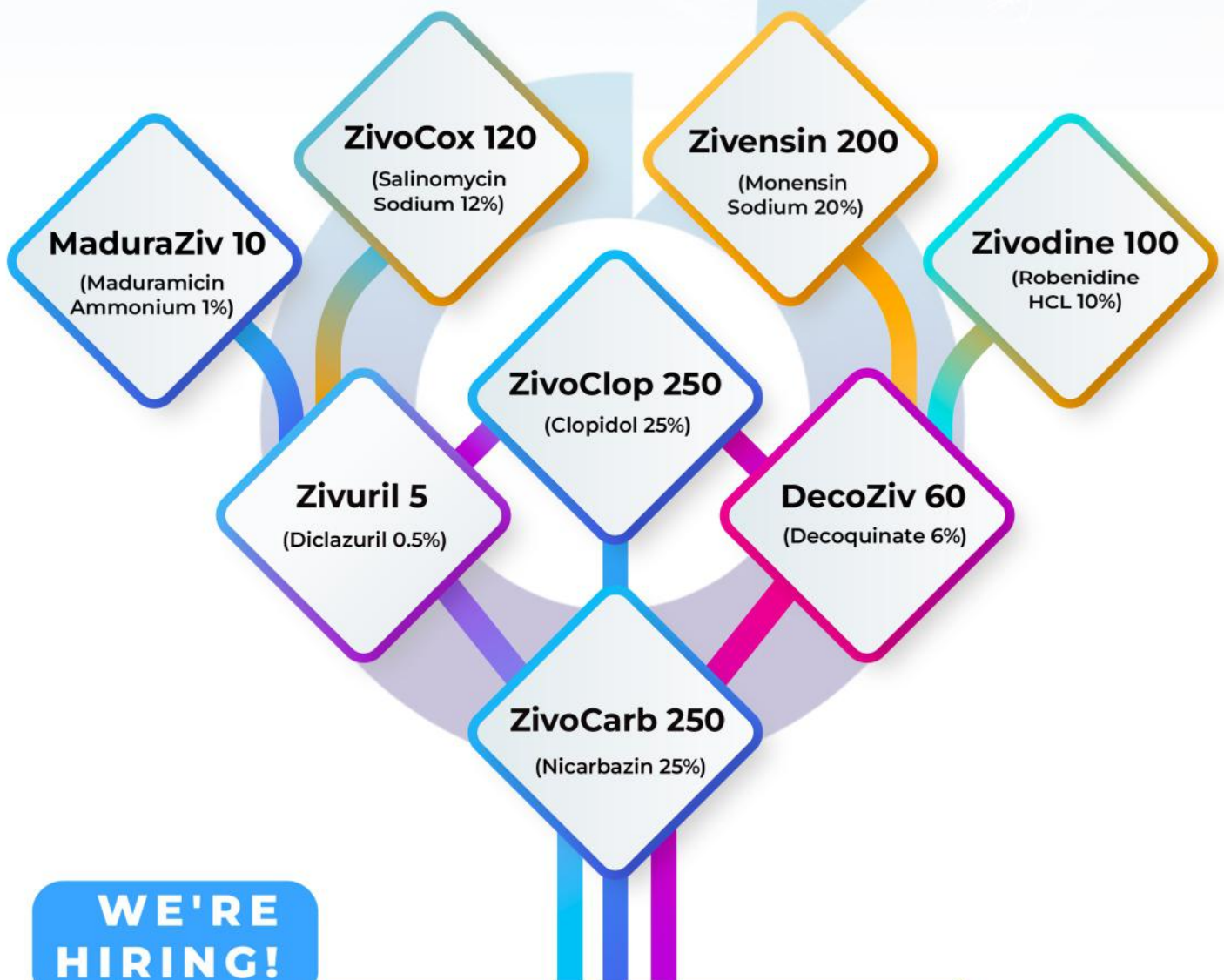
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Better use FC killed vaccine at 32 weeks also in all Male and Female Birds

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Botanical Phytochemicals and Yeast β -Glucans as Gut-Function Modulators in Poultry

A mechanistic review of herbal and microbial actives supporting intestinal integrity, digestion and disease resistance in broilers, layers and breeders

Dr. Manish Mukherjee

1. Introduction

Gut health drives nearly every production outcome in poultry farming. The intestinal epithelium absorbs nutrients, holds back a dense microbial population, and hosts much of the bird's immune tissue. When this balance is disturbed – by pathogens such as *E. coli*, *Salmonella*, *Clostridium perfringens* or *Eimeria*, by mycotoxins, or by high-density rearing stress – the result is villus blunting, protein leakage, poor absorption, wet litter and depressed growth.

A growing body of pharmacological research shows that specific medicinal plants and yeast-derived compounds counter this cascade through several complementary mechanisms at once: repairing the epithelial barrier, excluding or neutralising pathogens and toxins, calming excess motility, and tuning mucosal immunity. Rather than acting on a single target the way a conventional antimicrobial might, these actives tend to work in combination, which is part of why they are so often formulated together rather than used singly. This article reviews the evidence behind eight such actives – seven Ayurvedic gut-modulatory herbs and brewer's yeast – commonly combined in intestinal-support feed formulations for broilers, layers and breeders.

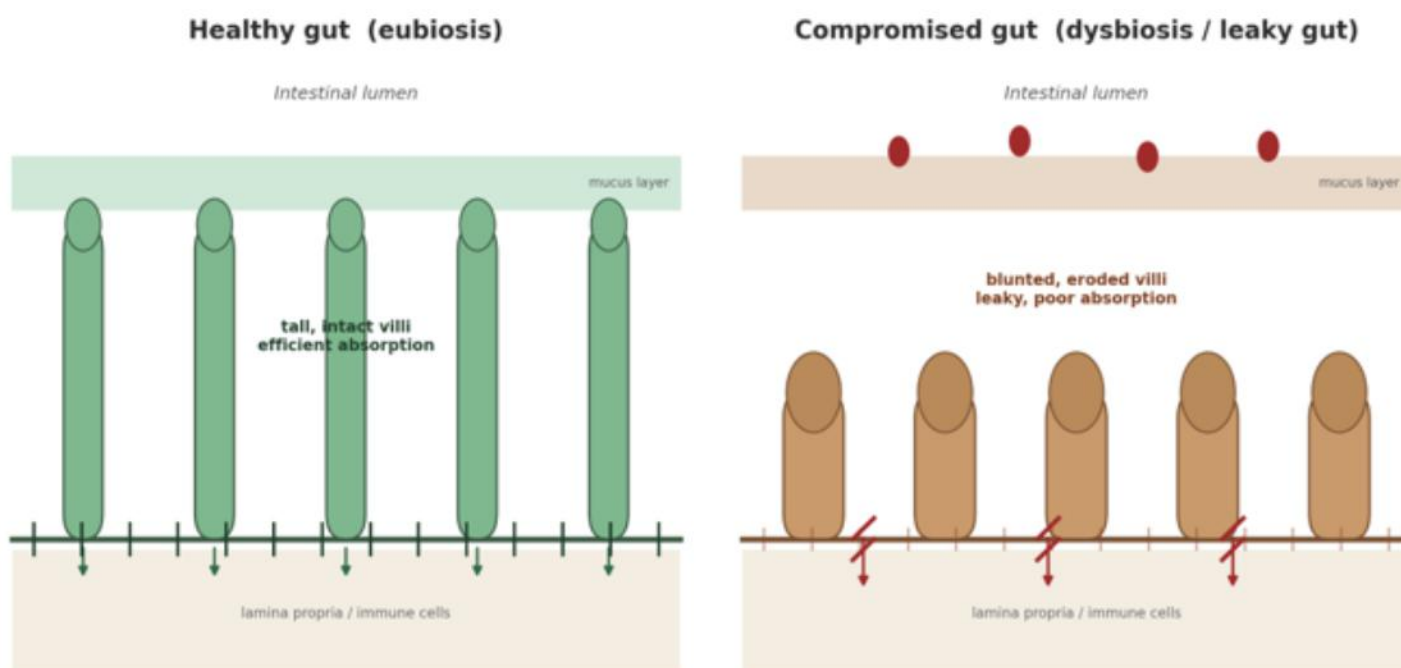


Figure 1. A healthy gut has tall, intact villi and a closed barrier (left); challenge and dysbiosis blunt villi and open gaps that let pathogens and toxins cross into tissue (right).

2. Indicators of poor gut health

- Disturbed gut integrity – protein leakage and reduced absorption as tight junctions and villus architecture deteriorate.
- Enteric challenge – colonisation by *E. coli*, *Salmonella*, *Clostridia* (necrotic enteritis) and coccidia.
- Compromised immunity – reduced mucosal cytokines and immunoglobulins (IgA, IgM, IgG).
- Poor performance – lower digestibility, slower growth and worse feed conversion.

Because these problems reinforce one another, an effective strategy must act on more than one at once –

the pattern seen in combinations of gut-modulatory herbs and yeast cell-wall components.

3. The actives and their mechanisms

Each herb has a distinct phytochemical fingerprint, but recurring compound classes – alkaloids, tannins, flavonoids and volatile oils – carry documented antimicrobial, antispasmodic, anti-inflammatory or antioxidant activity. Brewer's yeast contributes a different, structural mode of action: its cell wall β -glucans and mannan-oligosaccharides (MOS) preserve villus height, act as decoy binding sites for pathogen lectins, adsorb mycotoxins, and stimulate innate and humoral immunity.



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Active	Key constituents	Principal Mechanism
Bael (Aegle marmelos)	Coumarins, alkaloids, tannins, flavonoids	Reduces E. coli adherence and toxin action; antidiarrhoeal, spasmolytic
Kutaja (Holarrhena antidysenterica)	Conessine, holarrhenine, tannins	Antimicrobial, inhibits efflux pumps; normalises gut motility
Marorphali (Helicteresisora)	Tannins, triterpenoids, flavonoids	Astringent, reduces fluid loss; antioxidant
Daru Haldi (Berberis aristata)	Berberine, berbamine	Antispasmodic, anti-inflammatory, shapes gut flora
Dhaiphool (Woodfordia fruticosa)	Hydrolysable tannins, flavonoids	Astringent protein precipitation; gastroprotective
Kattha (Acacia catechu) Ginger (Zingiber officinale)	Catechins, flavan-3-ols Gingerols, shogaols, volatile oils	Antimicrobial and strongly antioxidant Carminative, normalises peristalsis; anti-inflammatory
Brewer's yeast (S. cerevisiae)	B-glucans, mannan-oligosaccharides	Binds toxins/pathogens (decoy lectins), stimulates immunity

Mechanisms of Active Compound Combination

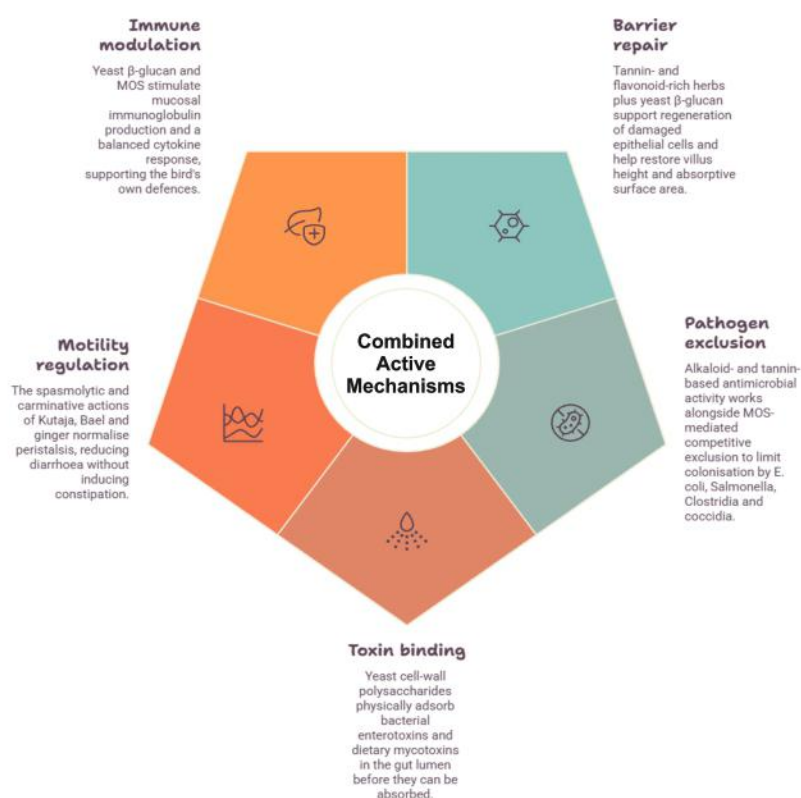


Figure 2. The herbal actives and brewer's yeast converge on five complementary mechanisms rather than a single mode of action.

4. How the mechanisms converge

- Barrier repair – tannin/flavonoid-rich herbs plus yeast β -glucan support villus and epithelial regeneration.
- Pathogen exclusion – antimicrobial herbs work alongside MOS-mediated competitive exclusion against E. coli, Salmonella, Clostridia and coccidia.
- Toxin binding – yeast cell-wall polysaccharides adsorb enterotoxins and mycotoxins before absorption.

- Motility regulation – Kutaja, Bael and ginger normalise peristalsis without inducing constipation.
- Immune modulation – yeast β -glucan and MOS support mucosal immunoglobulin and cytokine responses.

Because enteric disease, dysbiosis, barrier damage and immune suppression are interdependent, addressing all five mechanisms together – rather than any one alone – is what lets this class of formulation support digestibility, growth, feed conversion and litter quality under routine and challenge conditions.

5. Conclusion

The literature on Aegle marmelos, Holarrhena antidysenterica, Helicteres isora, Berberis aristata, Woodfordia fruticosa, Acacia catechu, Zingiber officinale and Saccharomyces cerevisiae cell-wall components independently supports each as a gut-protective agent. Their pharmacology is complementary: alkaloids and tannins give direct antimicrobial and astringent action,

flavonoids and volatile oils give anti-inflammatory and motility-normalising effects, and yeast β -glucans/MOS give toxin binding, pathogen exclusion and immune stimulation – together offering a multi-target approach to intestinal integrity, nutrient utilisation and flock performance under both routine and challenge conditions in broilers, layers and breeders.

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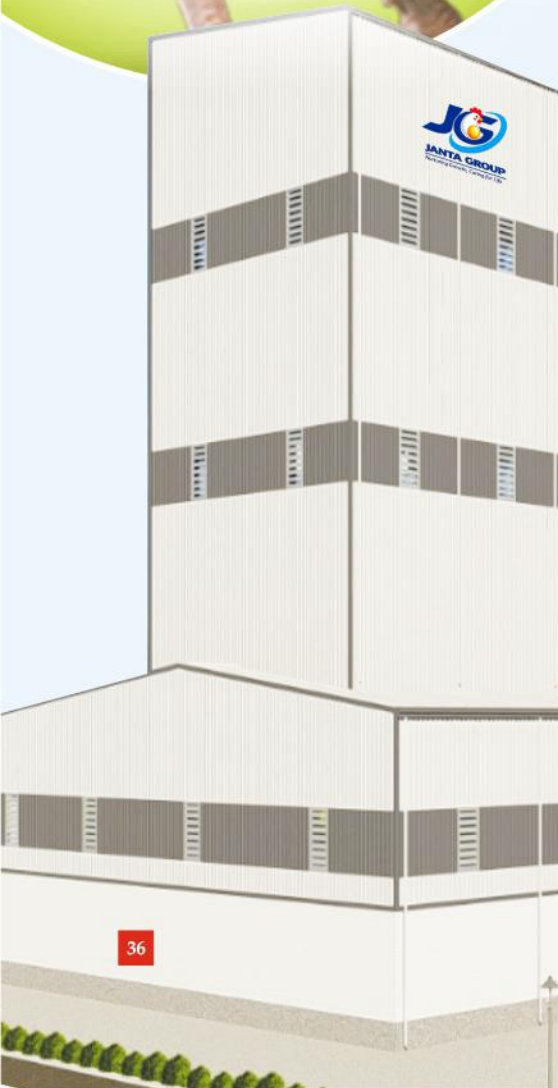
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NUQO Connect Brings Global Expertise to Raipur, Strengthening Technical Collaboration with India's Poultry Sector



NUQO Animal Nutrition India successfully hosted another edition of **NUQO Connect** in Raipur, bringing together leading poultry breeders, industry professionals, nutritionists, and business partners for an insightful knowledge-sharing platform focused on advancing poultry gut health, nutrition, and sustainable performance.

The event reflected NUQO's continued commitment to empowering the poultry industry through scientific innovation, technical excellence, better ROI and meaningful customer engagement.

The program was moderated by **Ms. Reena Rani, Head of Marketing - South Asia**, who steered the event and facilitated engaging discussions throughout the technical sessions. The event commenced with a welcome address by **Mr. Ajay Tiwari, Regional Sales Manager - West & Central India**, followed by the keynote address from **Mr. Neeraj Kumar Srivastava, Managing Director - South Asia**, who highlighted NUQO's vision of partnering with customers through innovation, science-driven solutions, and long-term collaboration. He also emphasized about NUQO's commitment and interest towards the Indian Poultry & Dairy market because of its huge potential and growth opportunities.

The technical sessions featured two of NUQO's global experts:

- **Dr. Stephanie Ladirat, Global R&D & Technical Director**, presented the latest global research on gut health, next-generation micro-encapsulated phytogenics & phycogenics innovation, and next-generation feed additive technologies, highlighting how science-based nutritional strategies can improve poultry health, productivity, and sustainable performance.
- **Dr. Maria Luiza, Global Technical Support Manager**, shared practical insights from international markets, demonstrating how innovative nutritional solutions can help poultry producers improve production efficiency, bird health, and overall farm profitability.

The interactive sessions encouraged meaningful dialogue between customers and NUQO's global technical experts, providing participants with the opportunity to discuss field challenges, exchange experiences, and gain practical insights into emerging nutritional technologies for commercial poultry production.

Speaking on the occasion, **Mr. Neeraj Kumar Srivastava, Managing Director - South Asia**, said:

"At NUQO, we believe that knowledge sharing is one of the strongest drivers of innovation. Through NUQO Connect, we aim to bring global scientific expertise closer to our customers, enabling them to make informed decisions that improve productivity, profitability, and sustainability. We remain committed to partnering with the Indian poultry sector through continuous innovation and technical excellence."

Dr. Stephanie Ladirat, Global R&D & Technical Director, NUQO, added:

"India continues to be one of the most dynamic poultry markets in the world. It is encouraging to see producers embracing science-driven nutritional solutions to improve bird health and performance. Through NUQO Connect, we are pleased to share our latest global research and technical expertise, helping customers translate innovation into practical on-farm results."

Dr. Maria Luiza, Global Technical Support Manager, NUQO, said:

"Connecting directly with customers allows us to better understand local production challenges while sharing global experiences and best practices. NUQO Connect provides an excellent platform to exchange knowledge and demonstrate how innovative nutritional technologies can contribute to healthier birds, improved efficiency, and more sustainable poultry production."



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Dr. Krishnamurthy, Commercial Director - South Asia, commented:

“NUQO Connect is more than a technical seminar—it is a platform for building stronger partnerships with our customers. By bringing global expertise closer to

the Indian poultry sector, we enable meaningful discussions that help customers address field challenges with practical, science-based solutions. This exchange of knowledge strengthens our commitment to delivering value beyond products and helps us to become the preferred partner of choice.”



Ms. Reena Rani, Head of Marketing - South Asia, added:

“NUQO Connect reflects our vision of creating meaningful engagement between NUQO and our customers. Beyond sharing scientific advancements, our objective is to foster

lasting relationships, encourage knowledge exchange, and reinforce NUQO's commitment to supporting customers with innovation, technical expertise, and collaborative growth.”

The event concluded with a vote of thanks by **Dr. Krishnamurthy, Commercial Director - South Asia**, who expressed his gratitude to the customers, guest speakers, and the entire NUQO team for their enthusiastic participation and contribution to the success of the event.

As NUQO continues to expand its presence in South Asia, **NUQO Connect** remains a key platform for bringing together global expertise and local industry stakeholders. By fostering technical dialogue and sharing practical, science-based solutions, the initiative reinforces NUQO's commitment to supporting a more productive, sustainable, and resilient poultry sector.

About NUQO

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4. As compared to other big players in the industry, how you feel Your presence is different?
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5. Please tell us about your family.
My Wife Is A Home Maker & My Son Is An Engineer
6. What you have dream to the next generation entered in this business?
Agriculture Is Not Glamorous For The Youngsters. We Must Bring Awareness On Its Importance Both To The Farmer & To Make India - A Food Basket Of The World
7. What is your favourite eatery food?
My Favorite Food Is Andhra Dishes In India & Chinese Culinary During Overseas Visits
8. What are your hobbies?
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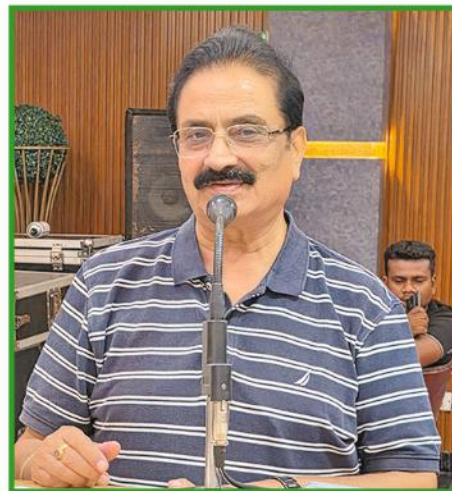
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Natural Herbs Conducted Technical Seminar For Layer Farmers In Haryana



Natural Herbs & Formulation Pvt. Ltd. (NHF) successfully organized a Technical Seminar at Hotel Yellow Sapphire, Karnal, Haryana. More than 70-layer farmers from across the region participated in the program. As viral diseases continue to pose a major challenge to the poultry industry, the seminar focused on the importance of strengthening birds' natural immunity through preventive health management rather than relying solely on treatment after disease outbreaks. The event commenced with a warm Welcome Address by NHF's Vice President **Mr. Karan Singh Rathore**, who welcomed the Chief Guests, attendees, poultry professionals, and farmers. In his address, he briefed about **NHF Group** and emphasized NHF's commitment to working closely with poultry farmers and providing comprehensive solution for effective farm management. The program was graced by Chief Guests **Mr. Balbir Marwa**, **Mr. Vishal Kalyan**, **Mr. Joginder Lather** & **Mr. Ravi Sabarwal**, whose presence added a great value to the occasion.

The technical session was delivered by NHF's President **Dr. Shashi Ranjan**, who shared practical insights on three of the most significant health concerns affecting commercial poultry farms—viral infections, mycotoxin contamination, and bacterial diseases. **Dr. Shashi** highlighted the role of **VIRONIL** in supporting natural immunity and helping birds withstand viral challenges,

BIOTOX ADVANCE in protecting birds from the harmful effects of mycotoxins while supporting liver health and productivity, and **GUT+ ADVANCE** in maintaining a healthy intestinal environment to reduce the impact of bacterial infections and improve nutrient utilization. The session was highly interactive, with farmers actively participating in discussions, sharing field experiences, and seeking practical solutions to everyday farm challenges.

The seminar concluded with a Vote of Thanks delivered by **Mr. Karan Singh Rathore**, who expressed his sincere gratitude to the Chief Guests, **Dr. Shashi Ranjan**, and all the participating farmers for their enthusiastic presence and valuable contributions. **Mr. Karan Singh Rathore** and **Dr. Mohit Budhalakoti** also presented a special vote of thanks to **Mr. Surender Bhutani**, **Mr. Chirag Bajaj** & **Mr. Naveen Sehgal**. He also thanked the organizing team for their dedicated efforts in making the program a great success and reaffirmed NHF's commitment to supporting the poultry industry through continuous technical education, innovative natural healthcare solutions, and strong field-level support. The overwhelming response from the participants reflected the importance of such knowledge-sharing initiatives in promoting healthier flocks, sustainable poultry farming, and improved productivity.

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PVS Group India and ADINATURE S.L., Spain, have jointly formed PVS-Europe S.L., marking a significant step in their long-term commitment to the European animal health and nutrition market.

The new company will focus on the **development, manufacturing, marketing, and distribution of value-added animal health care products, organic feed supplements, herbal formulations, probiotics, and innovative animal nutrition solutions** for the European market.

With more than **33 years of experience** in research, formulation, manufacturing, product development, and global distribution, PVS Group brings extensive expertise in animal health and nutrition. ADINATURE S.L. contributes strong knowledge of the European market and local business opportunities.

PVS-Europe S.L. will initially focus on the **poultry, swine, aquaculture, and cattle sectors**, with a strong emphasis on organic and sustainable animal nutrition solutions designed to improve animal health, productivity, and farm performance.

Mr. Perez Sánchez Miguel Ángel, Owner of ADINATURE S.L. and Partner of PVS-Europe S.L., Spain, said:

"We believe this partnership between PVS Group India and ADINATURE S.L. will be long-lasting and will create significant value for the European animal nutrition market. Through PVS-Europe S.L., we aim to provide high-quality, value-added health care and feed supplement products across Europe and contribute to a more sustainable and organic animal food chain."

He further added:

"PVS brings more than 33 years of rich experience in manufacturing, research, product development, and animal health solutions, while ADINATURE brings strong European market knowledge. Together, we can build a powerful and long-lasting organization serving the poultry, swine, and aquaculture sectors."

Dr. Seshiah V. Pamulapati, Chairman & Managing Director, PVS Group, said:

"The formation of PVS-Europe S.L. with ADINATURE S.L., Spain, is a landmark achievement in PVS Group's international growth journey. By combining our 33 years of manufacturing and product-development experience with ADINATURE's European market knowledge, we are confident that PVS-Europe S.L. will become a trusted platform for customers across Europe."

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Mr. Arun Pamulapati, Executive Director, PVS Group, added:

“Our strategy is simple and sustainable—develop in Europe, produce in Europe, and sell in Europe. PVS-Europe S.L. provides the right platform to combine our manufacturing expertise with strong European market knowledge and deliver innovative solutions designed specifically for European customers.”

The formation of PVS-Europe S.L. represents a **long-term partnership between India and Spain**, combining manufacturing expertise, European market knowledge, innovation, and a shared commitment to sustainable animal nutrition.

The company aims to establish a strong European platform for **manufacturing, product development, marketing, distribution, and customer support**, while contributing to improved animal health, productivity, sustainable farming, and responsible animal nutrition.



About PVS Group India

PVS Group India is an internationally recognized manufacturer of **animal health care products, feed supplements, organic feed additives, herbal solutions, probiotics, and innovative animal nutrition products**, with more than **33 years of experience**. PVS serves the poultry, swine, cattle, aquaculture, and other livestock sectors and exports its products to **more than 65 countries worldwide**.

About ADINATURE S.L., Spain

ADINATURE S.L., Spain, led by Mr. Perez Sánchez Miguel Ángel, is the Spanish partner in the formation of PVS-Europe S.L. The company contributes European market knowledge, local business expertise, and commercial capabilities to the partnership.

About PVS-Europe S.L.

PVS-Europe S.L. is jointly formed by PVS Group India and ADINATURE S.L., Spain, with a shared vision to **develop in Europe, produce in Europe, and serve the European market** with high-quality, innovative, and sustainable animal health and nutrition solutions.



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VETCONVERGENCE 2026 – 2nd edition of Vice chancellors meets supported by IPEMA-Poultry India Concludes Successfully: Hon'ble Shri Bandaru Dattatreya,



Former Union Minister, Government of India and former Governor of Himachal Pradesh, graced the conclave as Chief Guest.

VETCONVERGENCE 2026 brought together more than 30 Vice-Chancellors to impact actionable roadmap for the sustainable growth of the livestock and poultry sectors.

The 2nd Edition of the Vice-Chancellors' Conclave - VETCONVERGENCE 2026, organized by Maharashtra Animal and Fishery Sciences University (MAFSU), Nagpur and supported by Indian Poultry Equipment Manufacturers Association (IPEMA)-Poultry India, was successfully held on 10th and 11th July 2026 at Hotel AVASA, Hyderabad.

The two-day event brought together more than 30 Vice-Chancellors from veterinary universities across India, policymakers, scientists, academicians, and industry leaders under the theme “Aligning Livestock Research with Industry Demand and Entrepreneurship Development.” The conclave focused on strengthening academia-industry collaboration to drive innovation, entrepreneurship, and sustainable growth in the livestock and poultry sectors.



Hon'ble Shri Bandaru Dattatreya, Former Union Minister, Government of India and former Governor of Himachal Pradesh, graced the conclave as Chief Guest. In his inspiring address, he emphasized making veterinary education and research more practical, industry-focused, and impact-oriented. He highlighted the need for universities to produce employable graduates equipped with hands-on skills and an entrepreneurial mindset, while stressing demand-driven research, technology transfer, and university-industry partnerships. Shri Dattatreya also specifically highlighted the involvement of the female workforce in the poultry sector promoting inclusive growth.



The conclave featured impactful panel discussions covering critical topics including reorienting veterinary research to demand-driven frameworks, entrepreneurship development and agri-business incubation, technology commercialization and start-up promotion, priority research areas for the poultry sector in the next decade, developing a collective roadmap with institutional commitments, and applications of Artificial Intelligence in the livestock sector.

The following six impactful panel discussions were conducted addressing critical priorities in veterinary research, entrepreneurship, technology commercialisation, poultry sector needs, institutional collaboration, and AI applications in the livestock sector.

Session I: Reorienting Veterinary Research from Publication-Driven to Demand-Driven Frameworks

Moderated by Shri Tarun Shridhar, IAS (Retd.), DG, ICFA, with Dr. Atul Dhok as Rapporteur.





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Distinguished panellists shared insights on making veterinary research more industry-focused, impactful, and innovation-driven.

Session II: Entrepreneurship Development and Agri-Business Incubation in Veterinary Universities

Moderated by Dr. Niteen V. Patil, Vice-Chancellor, MAFSU, Nagpur.

Experts discussed strengthening entrepreneurship, innovation, and incubation ecosystems within veterinary education and the livestock sector.

Session III: Technology Commercialisation, Start-up Promotion, and Stakeholders Empowerment

Moderated by Dr. Nazeer Ahmad Ganai, Vice-Chancellor, SKUAST, Kashmir.

The session explored pathways to bridge research and enterprise, promoting startups and translating innovations into impactful ventures for the livestock sector and rural economy.

Session IV: Poultry Sector - Priority Research Areas for the Next Decade

Moderated by Mr. O. P. Singh, Managing Director, ABTL & Huvepharma India.

Industry leaders and experts identified key research priorities, technology adoption needs, and collaborative strategies to enhance the sector's competitiveness and resilience.

Session V: Developing a Collective Road Map - Institutional Commitments and Actionable Outcomes

Moderated by Dr. Yashpal Singh Malik, Dy. Director General (Edn.), ICAR, New Delhi.

Leaders from academia, research, and regulatory bodies emphasised stronger collaboration, institutional commitments, and measurable strategies to drive innovation and growth in the livestock sector.

Session VI: Artificial Intelligence Applications in Livestock Sector

Moderated by Mr. O. P. Singh, Managing Director, ABTL & Huvepharma India.

The panel highlighted AI's transformative potential in productivity, disease surveillance, precision farming, and building a more efficient, sustainable livestock ecosystem.

The Commemorative Souvenir of the 2nd Edition of the Vice-Chancellors' Conclave, VETCONVERGENCE 2026, was unveiled during the inaugural session, symbolizing the shared commitment to collaborative progress.

Shri Uday Singh Bayas, President, IPEMA-Poultry India, led the IPEMA delegation along with Treasurer **Shri M. Srikanth** and other senior members, actively contributing to the deliberations. The event witnessed enthusiastic participation from key industry representatives including **Prof. M. Gnana Prakash (VC, PVNRTVU), Suresh Chitturi (MD, Srinivasa Farms), O.P. Singh (MD, ABTL & Huvepharma India.),** and several others.



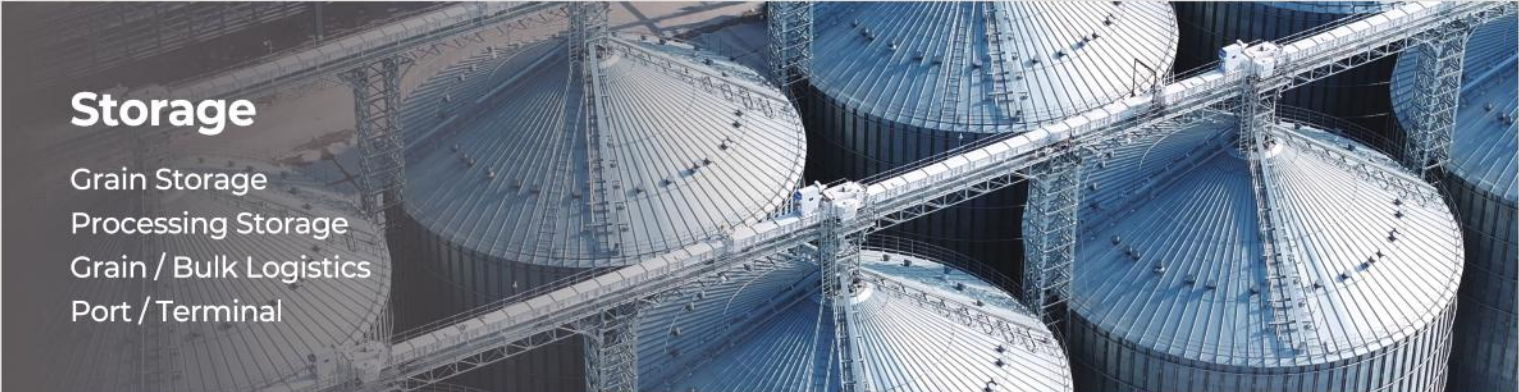
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Dr. Niteen Vasantrao Patil, Vice-Chancellor of MAFSU, led the knowledge-sharing efforts on behalf of the organizers. Maharashtra Animal and Fishery Sciences University (MAFSU) excelled in fostering insightful discussions and enriching the overall quality of the conclave.

Shri Uday Singh Bayas, President, IPEMA-Poultry India remarked, “VETCONVERGENCE 2026 has successfully created a powerful platform for dialogue between academia and industry. The rich insights and commitments made here will translate into tangible outcomes that benefit farmers, entrepreneurs, and the entire livestock ecosystem, and most importantly Poultry sector.”

During the conclave, IPEMA-Poultry India unveiled the official poster for the 18th Poultry India Expo 2026. The World’s Largest Poultry Expo to be held at HITEX, Hyderabad, from 25-27 November 2026, preceded by the Poultry Knowledge Day on 24 November 2026, bringing together innovation, knowledge, and collaboration for the global poultry industry.





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Beyond Survival: Scaling Indian Poultry in an Era of Rising Input Costs

Prof. (Dr.) P.K. Shukla and Dr. Amitav Bhattacharyya

Introduction

The poultry industry has evolved from a small backyard enterprise into one of India's most organized and technologically advanced livestock sectors. During the past five decades, the industry has consistently demonstrated resilience by achieving annual growth rates that surpass many other agricultural enterprises. Today, poultry contributes substantially to national food security by supplying affordable, high-quality animal protein through eggs and chicken meat while simultaneously generating employment opportunities across production, feed manufacturing, hatcheries, processing, logistics, retailing, and allied industries.

India ranks among the world's largest producers of eggs and broiler meat, with an estimated poultry population exceeding one billion birds and an annual egg production exceeding 149 billion eggs. The sector contributes significantly to the agricultural Gross Value Added (GVA), supports millions of direct and indirect livelihoods, and plays an increasingly important role in improving nutritional outcomes, particularly among children, women, and economically weaker sections of society. Rapid urbanization, rising disposable incomes, changing dietary preferences, increased awareness of protein nutrition, expansion of organized retail, and growth of quick-service restaurants have collectively accelerated domestic demand for poultry products.

However, the remarkable progress achieved over the past decades is now being challenged by an unprecedented escalation in production costs. Rising prices of maize, soybean meal, edible oils, vitamins, minerals, vaccines, pharmaceuticals, fuel, electricity, transportation, labour, and packaging materials have significantly reduced profit margins across the poultry value chain. Feed prices, which constitute nearly two-thirds of total production costs, have experienced considerable volatility due to climatic disturbances, competition from ethanol production, fluctuations in international commodity markets, supply chain disruptions, and changing trade policies.

In addition to economic pressures, poultry producers are confronted with emerging challenges including climate change, recurrent outbreaks of avian influenza, antimicrobial resistance, increasing consumer expectations regarding food safety and animal welfare, environmental regulations, and the need for traceability across supply chains. Small and medium-scale poultry farmers are particularly vulnerable because of limited bargaining power, restricted access to technology, inadequate financial resilience, and fluctuating market prices.

The COVID-19 pandemic further exposed structural vulnerabilities within poultry supply chains, highlighting the importance of resilience, diversification, digital marketing, and integrated production systems. More recently, geopolitical conflicts, inflationary pressures, global freight disruptions, and unpredictable weather patterns have intensified cost uncertainties across agricultural commodities.

Against this backdrop, merely maintaining existing production systems is unlikely to ensure long-term sustainability. The industry must shift its strategic focus

from cost containment alone to productivity enhancement, technological innovation, resource-use efficiency, and value creation. Future competitiveness will depend upon the adoption of precision poultry farming, artificial intelligence, Internet of Things (IoT)-based monitoring, automation, renewable energy integration, precision nutrition, improved genetics, climate-resilient infrastructure, and data-driven decision-making.

Scaling the Indian poultry sector requires a comprehensive transformation involving producers, researchers, policymakers, financial institutions, feed manufacturers, veterinary professionals, and technology providers. Such collaborative efforts will help improve efficiency while simultaneously enhancing animal welfare, environmental sustainability, food safety, and profitability.

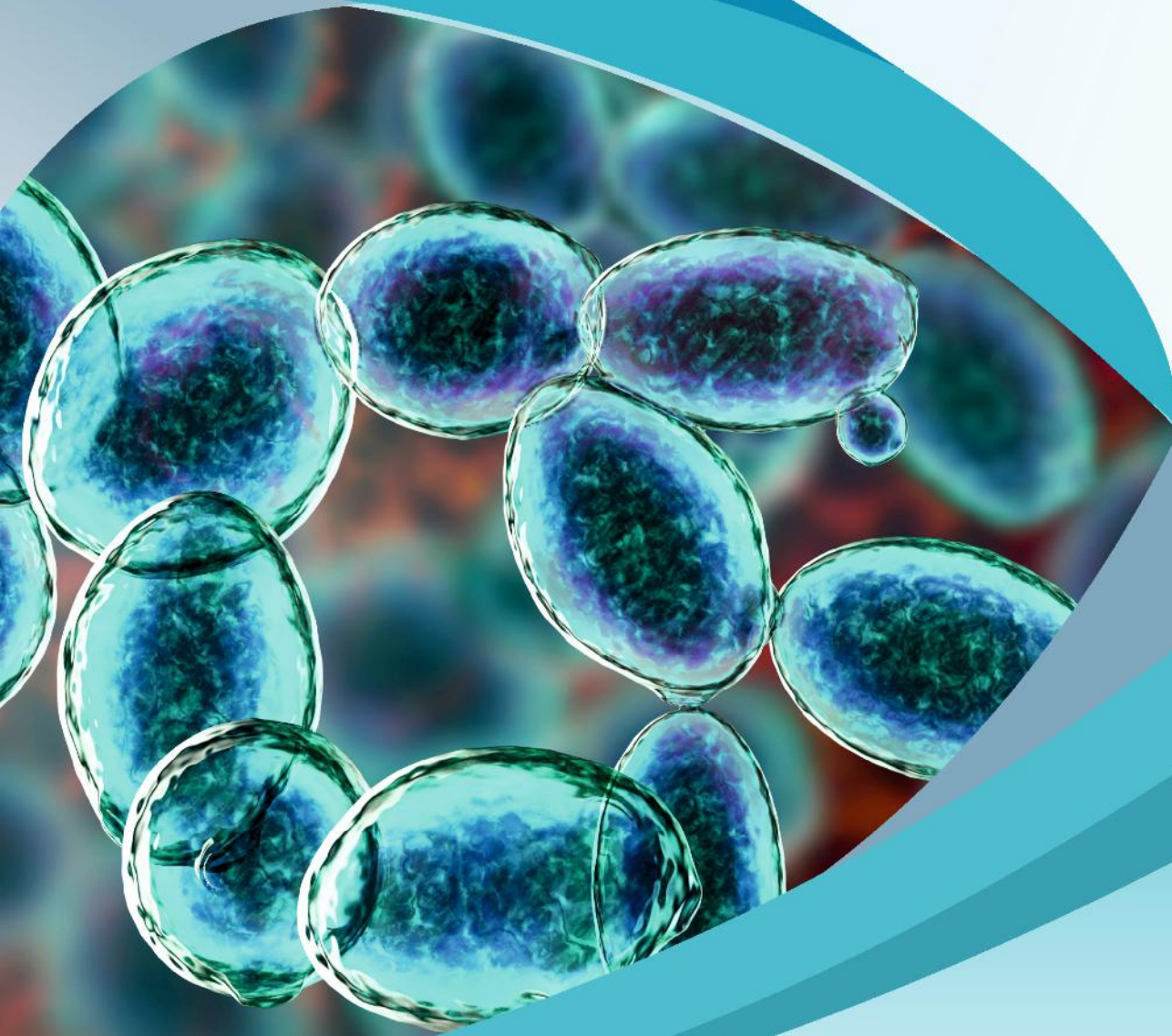
The transition from survival to sustainable growth represents not merely an economic necessity but also a strategic national priority. As India progresses toward becoming a developed nation under the vision of **Viksit Bharat 2047**, poultry production will play a central role in ensuring protein security, rural prosperity, export competitiveness, and inclusive agricultural development.

Current Status of the Indian Poultry Industry

The Indian poultry industry has undergone remarkable structural transformation since the 1970s, evolving from a largely unorganized backyard activity into a highly specialized and commercially integrated enterprise. Significant investments in genetics, hatchery management, feed manufacturing, disease control, housing systems, processing infrastructure, and supply chain management have enabled India to become one of the world's leading poultry-producing nations.

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Commercial poultry production today encompasses broiler farming, layer farming, breeder operations, hatcheries, feed manufacturing, vaccine production, poultry equipment manufacturing, meat processing, cold chain logistics, and organized retailing. Large-scale integrators coexist with thousands of contract farmers and independent producers, creating an extensive value chain that contributes substantially to the national economy.

Feed manufacturing remains one of the strongest pillars of the poultry sector. Modern feed mills utilize advanced formulation software, quality assurance systems, and nutritional technologies to optimize bird performance while minimizing feed costs. Nevertheless, the industry's heavy dependence on maize and soybean meal continues to expose producers to commodity price volatility.

The organized poultry sector has increasingly adopted scientific management practices, including controlled-environment housing, precision ventilation, automated feeding systems, computerized environmental monitoring, vaccination programmes, and improved biosecurity protocols. These advancements have significantly enhanced feed conversion efficiency, growth performance, egg production, and flock health.

Another notable feature of the Indian poultry industry is the rapid expansion of value-added poultry products. Consumer demand is gradually shifting from live bird markets toward hygienically processed chicken, ready-to-cook products, marinated meat, further-processed foods, functional eggs, omega-3 enriched eggs, antibiotic-residue-free poultry products, and convenience foods. This transition presents significant opportunities for enhancing profitability through branding, processing, and product diversification.

The sector also contributes substantially to women's empowerment, rural entrepreneurship, and livelihood generation. Poultry farming requires comparatively lower initial investment than many other livestock enterprises and offers quick returns, making it an attractive option for smallholders, self-help groups, and rural youth.

Technological innovation is rapidly reshaping poultry production systems. Artificial intelligence, sensor technologies, Internet of Things (IoT), machine vision, robotics, blockchain-based traceability, cloud computing, and predictive analytics are beginning to improve farm management by enabling real-time monitoring of bird behaviour, feed intake, environmental conditions, disease outbreaks, and production performance. These technologies have the potential to significantly improve efficiency while reducing labour dependence and operational costs.

Despite these strengths, several structural constraints continue to limit the industry's full growth potential. High dependence on imported feed additives and specialized

breeding stock, fragmented marketing systems, inadequate cold-chain infrastructure, limited export competitiveness, fluctuating commodity prices, and regional disparities in production continue to affect long-term sustainability. Furthermore, increasing environmental concerns related to waste management, greenhouse gas emissions, water use, and energy consumption necessitate the adoption of more resource-efficient production systems.

The future trajectory of the Indian poultry industry will therefore depend on its ability to balance productivity with sustainability, profitability with affordability, and technological advancement with inclusive growth. Building resilience against rising input costs while maintaining global competitiveness has become one of the defining challenges for the sector. Successfully addressing this challenge will determine whether the industry merely survives economic uncertainty or emerges stronger as a globally competitive contributor to India's agricultural transformation.

Drivers of Rising Input Costs and Their Economic Impact on the Indian Poultry

Industry

Drivers of Rising Input Costs

The profitability of the poultry industry is fundamentally determined by the relationship between production costs and market realization. Over the past few years, poultry farmers in India have experienced a sustained increase in production expenses due to multiple domestic and global factors. Unlike temporary price fluctuations, these cost escalations are becoming structural in nature, necessitating strategic interventions rather than short-term responses.

1. Escalating Feed Costs: The Largest Economic Burden

Feed constitutes approximately **65-70% of the total cost of poultry production**, making it the single most important determinant of profitability in both broiler and layer enterprises. Even marginal increases in feed prices substantially influence production economics.

The two principal feed ingredients—**maize** and **soybean meal**—have witnessed significant price volatility due to several interrelated factors like Competition for maize from the ethanol and starch industries, Climate-induced production losses resulting from erratic monsoons, droughts, and heat waves, Increased transportation and storage costs, Global commodity market fluctuations, Export-import policy uncertainties, Rising international demand for feed grains etc.

Similarly, soybean meal prices have remained volatile because of changing acreage, weather uncertainties, global oilseed markets, and competing industrial uses. Since protein sources are indispensable for poultry nutrition, sustained increases in soybean meal prices directly affect feed formulation costs.

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Besides cereals and protein meals, the prices of feed additives—including amino acids, enzymes, vitamins, organic acids, probiotics, trace minerals, pigments, and specialty nutritional supplements—have also increased. Many of these products depend on imported raw materials, exposing Indian feed manufacturers to exchange rate fluctuations and international supply chain disruptions.

Consequently, feed manufacturers are compelled to reformulate diets more frequently, balancing bird performance with economic viability. Precision nutrition and least-cost feed formulation have therefore become indispensable tools for maintaining competitiveness.

2. Energy and Fuel Costs

Modern commercial poultry farming is highly dependent on energy. Electricity and fuel are required for: Environmental control systems, Ventilation and cooling, Brooding operations, Automated feeding equipment, Water pumping, Hatchery operations, Feed milling, Processing plants and Cold-chain logistics.

The steady increase in electricity tariffs and diesel prices has significantly raised production costs. Environment-controlled poultry houses, although highly productive, consume substantial amounts of electricity, particularly during India's prolonged summer months.

Transportation expenses have also increased considerably because of higher fuel prices. Poultry products require rapid movement from farms to processing units and retail markets while maintaining product quality. Higher logistics costs ultimately reduce producer margins and increase consumer prices.

3. Labour Shortages and Rising Wages

Commercial poultry farms increasingly depend on skilled manpower capable of managing automated equipment, vaccination programmes, environmental control systems, and flock health monitoring.

However, several factors have contributed to rising labour costs like Rural-to-urban migration, Shortage of trained poultry workers, increased minimum wages, Greater demand for technically skilled personnel, Improved occupational safety requirements etc.

Automation has partially compensated for labour shortages, but the initial investment required for mechanization remains beyond the reach of many small and medium poultry farms.

4. Veterinary Health Management Costs

Maintaining flock health has become progressively more expensive due to increasing prices of: Vaccines, Veterinary medicines, Disinfectants, Diagnostic services, Biosecurity materials, Laboratory testing, Disease surveillance programmes etc.

Emerging infectious diseases, particularly highly pathogenic avian influenza, continue to pose serious risks to the poultry industry. Although outbreaks may occur

only sporadically, investments in preventive biosecurity have become essential.

Furthermore, growing global emphasis on antimicrobial stewardship has encouraged producers to adopt alternative health management strategies involving probiotics, phytogenic additives, organic acids, immunomodulators, and precision vaccination programmes. While these approaches enhance long-term sustainability, they often increase short-term production costs.

5. Climate Change and Environmental Stress

Climate variability has become an increasingly important driver of poultry production costs.

Extreme weather events—including prolonged heat waves, irregular rainfall, floods, and cold stress—negatively affect bird performance by reducing feed intake, impairing immunity, lowering egg production, decreasing growth rates, and increasing mortality.

To mitigate thermal stress, producers are investing in: Tunnel ventilation, Cooling pads, Fogging systems, Insulated poultry houses, Automated environmental monitoring, Water management systems etc. These technologies improve productivity but require considerable capital investment and recurring operational expenditure. Climate change also indirectly affects poultry production by reducing agricultural productivity, thereby influencing the availability and cost of feed ingredients.

6. Supply Chain Disruptions

Global events over the past several years have highlighted the vulnerability of agricultural supply chains. Disruptions caused by pandemics, geopolitical conflicts, container shortages, fluctuating freight charges, and international trade restrictions have increased the prices of imported poultry equipment, nutritional supplements, vaccines, and breeding stock.

Indian poultry enterprises are therefore increasingly recognizing the importance of supply chain diversification, domestic manufacturing, and strategic inventory management.

7. Financial Costs

Another emerging challenge is the rising cost of capital.

Commercial poultry farming requires substantial investments in: Poultry housing, Hatcheries, Feed mills, Environmental control equipment, Processing infrastructure, Renewable energy systems and Waste management facilities. Higher interest rates, inflation, and increased borrowing costs reduce the financial flexibility of poultry entrepreneurs, particularly first-generation farmers and small enterprises. Limited access to affordable institutional credit often delays technological modernization and expansion plans.



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Economic Impact on Broiler and Layer Enterprises

The cumulative impact of rising input costs extends across every segment of the poultry value chain.

Broiler Industry

Broiler production operates on narrow profit margins and short production cycles. Consequently, fluctuations in feed prices immediately influence production economics. Higher feed costs result in: Increased cost of live bird production, Reduced profitability, Greater market price volatility, Lower investment confidence and increased financial risk for contract growers.

When consumer purchasing power remains stagnant, producers often cannot fully transfer higher production costs to the market, resulting in compressed margins. Small independent farmers are particularly vulnerable because they generally lack economies of scale, integrated marketing networks, and strong bargaining power.

Layer Industry

The layer sector faces similar challenges. Escalating feed costs increase the cost of egg production while market prices often remain unstable because of seasonal demand fluctuations.

Layer farmers therefore experience: Lower net returns per egg, Delayed replacement of flocks, Reduced investment in infrastructure, financial stress during prolonged low-price cycles. Despite eggs remaining one of the most affordable sources of animal protein, maintaining profitability has become increasingly challenging under rising input costs.

Impact on Small and Medium Poultry Farmers

Smallholders constitute an important component of India's poultry ecosystem. Unlike large integrated companies, independent producers often face multiple disadvantages: Limited purchasing power, Higher feed procurement costs, Restricted access to credit, Limited technical advisory services, Lower adoption of precision technologies and Weak market linkages. Consequently, rising input costs disproportionately affect small and medium enterprises, leading to business closures or integration into larger contract farming systems.

Supporting these producers through technology dissemination, farmer producer organizations (FPOs), cooperative procurement models, affordable credit, and digital extension services will be essential for ensuring inclusive sectoral growth.

The Need for a Paradigm Shift

The current economic environment clearly demonstrates that traditional cost-cutting measures alone are insufficient.

Future competitiveness will depend upon improving **resource-use efficiency rather than merely reducing expenditure**. Increasing productivity per bird, optimizing feed conversion ratio, minimizing mortality, reducing wastage, improving environmental control, and

leveraging digital technologies offer significantly greater opportunities for sustainable profitability than indiscriminate cost reductions.

The poultry enterprises that successfully embrace innovation, precision management, data-driven decision-making, and integrated value chains will be better positioned to withstand future market volatility.

Therefore, the challenge before the Indian poultry industry is not simply to survive rising input costs but to transform these pressures into catalysts for modernization, resilience, and long-term growth. The next phase of development requires a strategic transition from conventional production systems to intelligent, efficient, and sustainable poultry enterprises capable of competing in both domestic and international markets.

Beyond Survival—Strategies for Scaling the Indian Poultry Industry

The increasing cost of feed ingredients, energy, labour, veterinary inputs, and logistics has fundamentally altered the economics of poultry production in India. Nevertheless, history demonstrates that periods of adversity often stimulate innovation. The industry's future competitiveness will depend not on reducing production but on producing more efficiently, more sustainably, and with greater value addition. Scaling the poultry sector requires a combination of technological innovation, scientific management, institutional support, and market-oriented strategies.

1. Precision Nutrition: Producing More with Less

Precision nutrition has emerged as one of the most effective strategies for reducing feed costs while maintaining bird performance. Rather than relying on fixed feeding schedules, precision nutrition tailors nutrient supply according to the bird's genetic potential, age, physiological status, and environmental conditions.

Modern feed formulation software enables nutritionists to optimize diets using least-cost algorithms while maintaining balanced amino acid profiles, digestible phosphorus, metabolizable energy, and micronutrient requirements. The adoption of concepts such as ideal protein, digestible amino acids, and phase feeding minimizes nutrient wastage and improves feed conversion efficiency.

Innovative feed additives—including enzymes (phytase, xylanase, protease), probiotics, prebiotics, synbiotics, organic acids, phytogenic feed additives, emulsifiers, and toxin binders—enhance nutrient digestibility, improve gut health, and reduce dependence on costly conventional ingredients. Precision nutrition not only lowers feed costs but also decreases nitrogen and phosphorus excretion, contributing to environmental sustainability.

2. Diversification of Feed Resources

India's heavy dependence on maize and soybean meal exposes the poultry industry to recurring price volatility. Diversifying feed resources is therefore essential for long-term feed security.

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Alternative energy sources such as sorghum, pearl millet, broken rice, cassava products, and processed agro-industrial by-products can partially replace maize when supported by appropriate nutritional balancing. Similarly, alternative protein sources—including sunflower meal, canola meal, cottonseed meal (after detoxification), distillers dried grains with solubles (DDGS), insect meal, single-cell proteins, algal biomass, and fermented plant proteins—offer opportunities to reduce dependence on soybean meal.

Emerging technologies such as solid-state fermentation and enzyme supplementation improve the nutritional value of unconventional feed ingredients, allowing greater flexibility in feed formulation. Continued research into locally available feed resources and region-specific feeding strategies will strengthen the resilience of Indian poultry production systems.

3. Genetic Improvement and Precision Breeding

Genetic progress remains one of the most powerful drivers of productivity. Modern poultry breeds exhibit superior growth rates, feed conversion efficiency, egg production, livability, and disease resistance compared with previous generations.

Future breeding programmes should increasingly focus on resilience traits, including heat tolerance, disease resistance, skeletal strength, reproductive efficiency, and adaptability to varying production environments. Genomic selection, molecular breeding, and advanced reproductive technologies are expected to accelerate genetic gains.

Indigenous poultry genetic resources should also receive greater attention, particularly for backyard and low-input production systems where adaptability and disease tolerance are critical.

4. Precision Poultry Farming: The Digital Revolution

The integration of Artificial Intelligence (AI), the Internet of Things (IoT), machine vision, cloud computing, robotics, and predictive analytics is ushering in a new era of Precision Poultry Farming (PPF).

Smart sensors continuously monitor environmental parameters such as temperature, humidity, ammonia concentration, carbon dioxide, light intensity, and air velocity. Computer vision systems assess bird behaviour, movement, feeding patterns, and welfare indicators. AI algorithms analyze these data streams to predict disease outbreaks, optimize feeding schedules, detect equipment failures, and support real-time management decisions.

Digital dashboards accessible through smartphones and cloud-based platforms enable farmers to monitor flock performance remotely, reducing labour requirements and enhancing management precision. Such technologies improve feed efficiency, reduce mortality, optimize environmental conditions, and increase overall productivity.

Although adoption remains limited among smallholders due to initial investment costs, declining sensor prices and the emergence of affordable digital platforms are expected to accelerate the diffusion of smart farming technologies across the Indian poultry sector.

5. Strengthening Biosecurity and Preventive Health Management

Disease prevention remains more economical than disease treatment. Investments in robust biosecurity systems significantly reduce production losses and enhance profitability.

Essential biosecurity measures include controlled farm access, sanitation protocols, all-in/all-out management, effective litter management, pest control, vaccination programmes, water sanitation, and routine disease surveillance. Digital disease reporting systems and artificial intelligence-assisted epidemiological monitoring can facilitate early detection and rapid response to disease outbreaks.

The adoption of antimicrobial stewardship programmes, combined with alternatives such as probiotics, phytobiotics, organic acids, and immunomodulators, supports sustainable poultry production while addressing concerns regarding antimicrobial resistance.

6. Climate-Smart Poultry Production

Climate change necessitates the redesign of poultry production systems to improve resilience against heat stress, water scarcity, and extreme weather events. Environment-controlled housing, tunnel ventilation, evaporative cooling systems, insulated roofing, reflective building materials, and precision climate control technologies enhance bird comfort and maintain productivity during adverse climatic conditions.

Climate-smart management also includes optimizing stocking density, adjusting feeding schedules during periods of heat stress, improving water availability, and selecting heat-tolerant genetic lines. Integrating renewable energy sources such as rooftop solar photovoltaic systems can reduce electricity costs while lowering the carbon footprint of poultry farms.

7. Renewable Energy and Resource Efficiency

Energy efficiency is becoming an increasingly important determinant of production economics. Solar energy systems can power lighting, ventilation, water pumping, and automation equipment, reducing dependence on grid electricity and diesel generators. Biogas plants utilizing poultry litter provide renewable energy while generating nutrient-rich organic fertilizers.

Water conservation through rainwater harvesting, automated drinkers, leak detection systems, and water recycling technologies further enhances resource efficiency. Collectively, these measures reduce operating costs and improve environmental sustainability.

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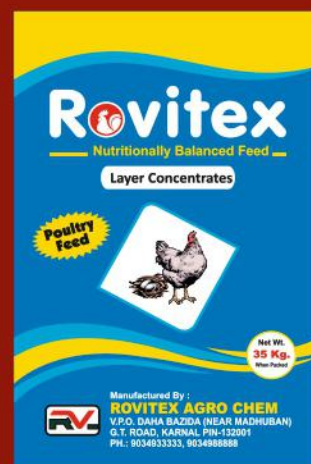
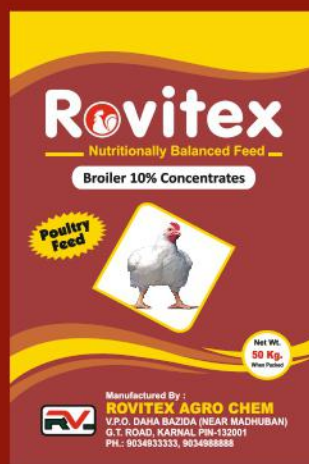
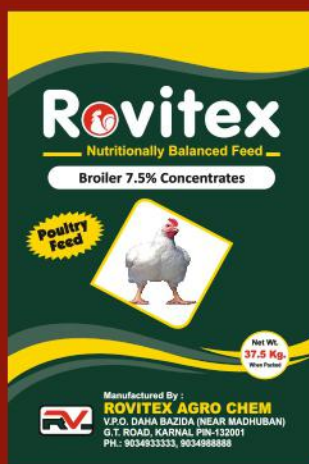
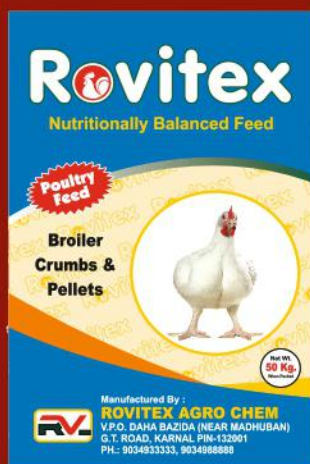
- ❖ Broiler 10% Concentrates
- ❖ Broiler 7.5% Concentrates
- ❖ Broiler 5.5% Concentrates
- ❖ Broiler 3.5% Concentrates
- ❖ Broiler 2.5% Concentrates
- ❖ Broiler 1.5% Concentrates

Layer Concentrates:

- ❖ Layer 5% Concentrates
- ❖ Layer 10% Concentrates
- ❖ Layer 25% Concentrates
- ❖ Layer 35% Concentrates

Broiler Crumbs/Pellets:

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8. Waste-to-Wealth and Circular Economy Approaches

Poultry litter, feathers, hatchery waste, and processing by-products should increasingly be viewed as valuable resources rather than waste materials. Poultry litter can be converted into organic fertilizers, compost, biogas, biochar, and energy pellets. Feathers may be processed into feather meal, amino acid concentrates, biodegradable materials, and industrial products. Rendering technologies enable the recovery of valuable proteins and fats from poultry processing waste.

Circular economy principles reduce environmental pollution while generating additional revenue streams, thereby improving farm profitability and sustainability.

9. Vertical Integration and Supply Chain Optimization

Vertical integration has played a significant role in the growth of India's commercial poultry sector. Integrating breeding, hatcheries, feed production, farming, processing, transportation, and marketing improves coordination, reduces transaction costs, and enhances quality control.

Digital supply chain management systems utilizing blockchain technology and traceability platforms improve transparency, food safety, and consumer confidence. Efficient cold-chain infrastructure and logistics management minimize post-harvest losses and expand access to distant markets.

Farmer Producer Organizations (FPOs), cooperatives, and contract farming arrangements can provide smaller producers with economies of scale, technical support, input procurement advantages, and assured market access.

10. Value Addition and Product Diversification

Future growth will increasingly depend on moving beyond the sale of raw poultry products.

Value-added products—including ready-to-cook, ready-to-eat, marinated, smoked, functional, fortified, and convenience poultry products—offer significantly higher profit margins than conventional fresh meat. Functional eggs enriched with omega-3 fatty acids, selenium, vitamin D, lutein, and other nutraceutical components cater to health-conscious consumers and create premium market opportunities.

Branding, attractive packaging, quality certification, traceability, and adherence to food safety standards further enhance consumer confidence and market competitiveness.

11. Capacity Building and Human Resource Development

Technological advancement must be accompanied by investments in human capital. Farmers, veterinarians, extension personnel, nutritionists, and farm managers require continuous training in precision farming, biosecurity, digital technologies, welfare standards, and environmental management.

Universities, research institutions, industry associations, and private companies should collaborate to strengthen skill development programmes, promote technology transfer, and establish demonstration farms showcasing innovative production systems.

12. Policy Support and Investment Ecosystem

Government policies play a crucial role in facilitating sectoral transformation. Priority areas include:

- Strengthening domestic production of feed ingredients and feed additives.
- Encouraging investment in poultry infrastructure.
- Expanding institutional credit and insurance coverage.
- Supporting renewable energy adoption.
- Enhancing research and development.
- Improving disease surveillance systems.
- Promoting exports through internationally compliant processing facilities.
- Encouraging digital agriculture initiatives and smart farming technologies.

Public-private partnerships can accelerate technology dissemination, infrastructure development, and innovation while creating an enabling environment for sustainable growth.

13. Building Export Competitiveness

India possesses considerable potential to expand exports of poultry meat, eggs, egg powder, and value-added poultry products. Achieving this objective requires strict adherence to international standards relating to food safety, traceability, biosecurity, animal welfare, and environmental sustainability.

Investments in modern processing facilities, residue monitoring programmes, certification systems, and market intelligence will strengthen India's position in global poultry markets. Export diversification will also reduce dependence on domestic market fluctuations and provide new growth opportunities for the industry.

Towards a Resilient and Competitive Poultry Sector

Scaling the Indian poultry industry in an era of rising input costs demands a paradigm shift from reactive cost management to proactive value creation. Productivity enhancement, digital transformation, resource-use efficiency, innovation, and sustainability must become the cornerstones of future development.

The poultry enterprises that successfully integrate scientific nutrition, precision farming, renewable energy, robust biosecurity, circular economy principles, and value-added marketing will not only withstand economic pressures but also emerge as globally competitive enterprises. Such a transformation will contribute significantly to food and nutritional security, employment generation, rural prosperity, and the realization of *Viksit Bharat 2047*, positioning India as a leading force in the global poultry economy.

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Future Outlook: Towards a Resilient and Globally Competitive Poultry Sector

The Indian poultry industry stands at a defining moment in its development. Over the last five decades, the sector has evolved from a subsistence-oriented activity into one of the most dynamic components of Indian agriculture. However, the future trajectory of the industry will be determined not only by its ability to increase production but also by its capacity to enhance efficiency, resilience, sustainability, and global competitiveness.

Several macroeconomic and technological trends are likely to shape the next decade of poultry production in India.

First, **the demand for animal protein is expected to grow steadily** due to population growth, urbanization, rising incomes, expanding middle-class households, and increasing awareness of the nutritional benefits of eggs and poultry meat. Eggs and chicken remain among the most affordable and efficient sources of high-quality animal protein, making poultry indispensable for achieving India's nutritional security goals.

Second, **digital transformation will redefine poultry farm management**. Artificial Intelligence (AI), Machine Learning (ML), Internet of Things (IoT), robotics, computer vision, blockchain, cloud computing, and predictive analytics will increasingly support precision decision-making across the poultry value chain. Smart poultry farms capable of continuously monitoring bird health, environmental conditions, feed consumption, water intake, behaviour, and production performance will improve productivity while reducing resource wastage.

Third, **climate resilience will become an essential component of poultry production systems**. Heat stress, water scarcity, emerging diseases, and unpredictable weather patterns will require investments in climate-smart housing, renewable energy, precision ventilation, water conservation technologies, and genetically resilient poultry strains.

Fourth, **consumer expectations will continue to evolve**. Modern consumers increasingly demand safe, traceable, antibiotic-responsible, sustainably produced, and value-added poultry products. The expansion of organized retail, e-commerce, and food service industries will create new opportunities for premium poultry products, functional eggs, processed meat, and branded offerings.

Fifth, **export opportunities are expected to expand** as India strengthens disease surveillance, food safety systems, processing infrastructure, and international certification mechanisms. Compliance with global sanitary and phytosanitary standards will be essential for increasing India's share in international poultry markets.

The convergence of these trends presents an opportunity to transform the Indian poultry industry into a globally competitive, technology-driven, environmentally sustainable, and economically resilient enterprise.

Way Forward

The Indian poultry industry has consistently demonstrated remarkable resilience and adaptability despite facing recurrent disease outbreaks, market fluctuations, feed shortages, and economic uncertainties. Nevertheless, the current era of rising input costs presents challenges of unprecedented magnitude. Escalating prices of feed ingredients, energy, labour, veterinary inputs, and logistics have fundamentally altered the economics of poultry production, placing increasing pressure on producers across the value chain.

These challenges should not be viewed solely as threats. Rather, they present an opportunity to accelerate the modernization of the poultry sector through scientific innovation, digital transformation, precision management, and sustainable resource utilization.

The future belongs to poultry enterprises that prioritize efficiency over expansion alone, intelligence over intuition, prevention over treatment, and value creation over cost reduction. Investments in precision nutrition, smart farming technologies, climate-resilient infrastructure, renewable energy, circular economy approaches, robust biosecurity, and value-added marketing will enable the industry to maintain profitability despite economic volatility.

Equally important is the need for supportive public policies that strengthen feed security, facilitate access to affordable finance, promote research and innovation, improve disease surveillance, and encourage technology adoption among farmers of all scales. Collaboration among policymakers, scientists, veterinarians, industry leaders, entrepreneurs, and producers will be essential to build a resilient and globally competitive poultry ecosystem.

As India progresses towards the vision of **Viksit Bharat 2047**, the poultry sector will play an increasingly strategic role in ensuring food and nutritional security, generating rural employment, empowering women and youth, supporting agricultural diversification, and enhancing export earnings. By embracing innovation, sustainability, and resilience, the Indian poultry industry can move confidently **beyond survival** toward sustained growth and global leadership.

Prof. (Dr.) P.K. Shukla and Dr. Amitav Bhattacharyya
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From SEC Learner to Global STAR:

Pragathi Salutgi's Journey of Excellence

From learning and community engagement to recognition on the global stage



The journey to becoming an SEC Global STAR begins with something simple: a willingness to learn.

The Soy Excellence Center (SEC) brings together professionals and learners across six global regions, creating opportunities to build knowledge, strengthen professional skills, connect with peers and contribute to the wider protein value chain. But SEC is more than a collection of courses. It is a community and for those who remain engaged, the learning journey can lead much further.

From Learning to Leadership

A participant may begin with a basic course certification (stage 1 in the SEC Philosophy graphic), but the journey does not stop there. Members continue to learn, participate in advanced programs and special events, share knowledge and engage with the SEC community (stage 2&3 in the SEC Philosophy graphic). Through this continued involvement, participants have opportunities to demonstrate their growth, contribution and leadership; badges of recognition are won (Stage 4 in the SEC Philosophy graphic).

The journey can be summed up simply:

Learn. Apply. Belong. Lead. Inspire.

At the pinnacle of this journey is the **SEC Global STAR Award**, which recognizes exceptional professionals for their contribution, growth through SEC, active community engagement and leadership potential (Stage 5 in the SEC Philosophy graphic).

The scale of the recognition makes it particularly special. In 2026, 34 professionals applied, nine finalists were selected, and only three honorees one from each global region were chosen. With only one member from a region receiving the distinction in a two-year cycle, becoming a STAR is a truly exceptional achievement.



2026

SEC Top Achiever Recognition Awards Ceremony at SOY CONNEXT

5 August 2026, Chicago



Why the STAR Awards Matter?

SEC GOAL: Develop tomorrow's leaders while fostering long-term engagement with U.S. Soy

Basic Learning

Community Involvement and Intermediate Learning

Long-term engagement with U.S. Soy Family

STAR Honorees are recognized as individuals with broader leadership potential for the protein value chain



STAR AWARDS





(Left to Right - Brent Babb, Iqbal Putra, Pragati Salutgi, Harry Chunga)



(Brent Babb, Sherry Chen, Iqbal Putra, P.E. Vijay Anand, Pragati Salutgi, Luis Bastamante, Harry Chunga)

From India to Chicago

Among the three 2026 Global SEC STAR Award honorees was **Dr. Pragati Salutgi** from India.



"The recognition inspires me to keep learning, pushing boundaries and creating meaningful impact in the animal nutrition industry."

— **Dr. Pragati Salutgi**

Her journey represents much more than the completion of SEC courses. It reflects what can happen when a participant embraces the learning community, continues to grow, stays connected with fellow professionals and turns learning into meaningful contribution.

From beginning her journey as an SEC learner in India to being recognized on the global stage in Chicago, Pragati's achievement is a powerful example of the possibilities within the SEC community.

The award may have been presented in Chicago, but the journey to that moment began much earlier.



(left SEC India Center Lead Dr P.E Vijay Anand, Center Dr Pragati Salutgi, Right-SEC Global advisory Panel Chair-Anne Meis)

A Global Community Behind Every Journey

While the participant is at the heart of the journey, the SEC community across six regions provides the support and opportunities that help learners remain connected and continue to grow. The work of SEC teams, community managers and central leads helps sustain that engagement and create pathways for participants to take their learning further.

For Pragati, that journey ultimately led from India to Chicago. Her achievement reflects not only her own commitment, but also the strength of a global learning community that encourages its members to keep learning, contributing and growing.

A Journey Worth Beginning

Pragati's story demonstrates that the SEC journey is not simply about completing a course. It is about what comes next, applying knowledge, becoming part of a community, continuing to learn, contributing to others and developing the confidence to lead.

For professionals and learners in veterinary science, animal science, life sciences and related fields, her achievement offers an inspiring message:

Every STAR journey begins with a learner who takes the first step.

Today, that journey can begin with SEC.

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Legend SERIES 34 (Posthumous)

In our journey we visited many faces with our poultry Sector legends, and one among them is **Dr A.T. VENUGOPALAN**

1. Where was he originally from ?

He was originally from a remote village near Chidambaram from Tamil Nadu.

2. What was the best thing about his Journey ?

He liked helping people and also had tremendous energy to work in multiple disciplines and was considered a trustworthy person by his managers, friends and family members

Satisfied by the well being of people in contact with him i. e. Students, farmers, teachers and poultry firm personnel

3. Why did he choose the Poultry profession ?

Being a Microbiologist, and with experience in disease investigations, he got naturally attracted to poultry.

Humble and little did he speak with pride about his contributions. We came to know a lot through farmers from poultry areas who called on us after his demise. (Farmers from Namakkal, Palladam, Erode, Salem). They had great trust and faith in his recommendations.

4. How was his presence felt in the Industry?

Integrity, Hardworking and the passion for people well-being was his strength. Providing effective solutions at reasonable prices

5. Tell us about his family.

He had 2 son and 1 daughter. Lost a son in accident, but other son and daughter are doing well., living in Chennai He also has 2 grandson and 1 granddaughter.

6. What was his dream for the next generation entering the business ?

I have seen him vibing well with younger generations from the industry and they had great respect for him. He considered them as good Vets and will serve the industry better than him.

7. What was his favorite food ?

He liked sweets a lot and some of the favorite shops are around the Madras Veterinary college He takes his guest, relatives and friends to these places with pride and happiness.

8. What was his hobby ?

Reading, writing and watching movies.

9. Anything you would like to add?

A Humble, Multitalented, and was passionate about the work and his responsibilities. A loving father and helped so many people to live a better life. Thanks



Host by:
Dr. Ramesh Sikka
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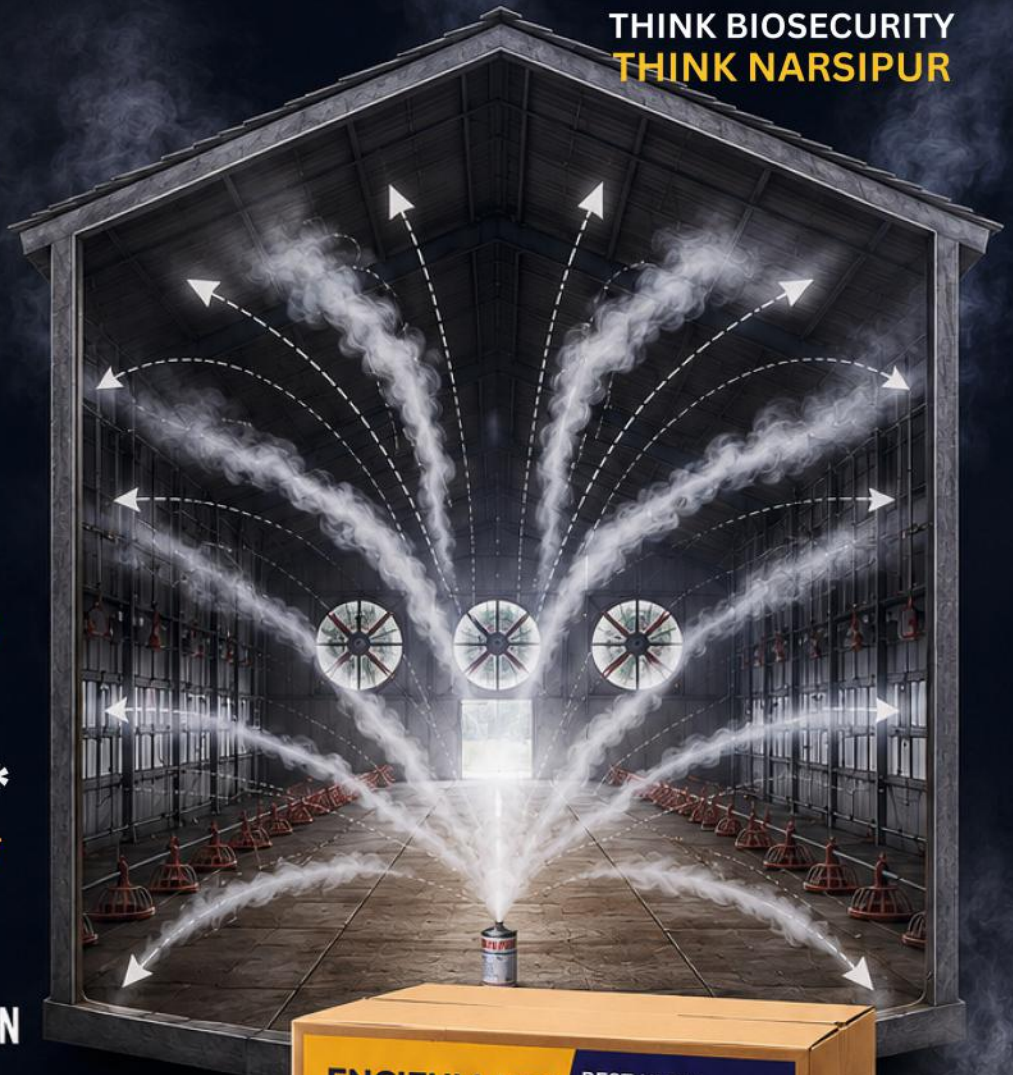
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What Lies Behind Wet Litter?

Kemin Research Points to an Emerging Intestinal Disease in Layers

Kemin Research Published in *Poultry Science* Identifies Key *Brachyspira* Species Associated with Avian Intestinal Spirochaetosis (AIS) in India

Wet litter, loose droppings, dirty eggs, and unexplained declines in egg production are challenges frequently encountered in layer farms and are often linked to management, nutrition, or environmental factors. However, emerging intestinal diseases may sometimes be an overlooked part of the picture.

A recent peer-reviewed study led by **Dr. R. Chanthirasekaran (RC)** of Kemin and published in the internationally renowned journal *Poultry Science* provides important new insights into **Avian Intestinal Spirochaetosis (AIS)**, an intestinal disease of laying hens caused by *Brachyspira* species.

Contributing New Knowledge to the Industry

Using advanced molecular diagnostics, PCR testing, and genetic characterization, the study investigated clinically suspected commercial layer flocks from key poultry-producing regions of India. The findings revealed a high frequency of *Brachyspira* detection in flocks exhibiting intestinal health concerns, reinforcing the need to consider AIS as part of the differential diagnosis when persistent gut health challenges are observed.

From Field Observations to Scientific Evidence

The study found that affected flocks commonly presented with **wet litter, loose droppings, vent pasting, dirty eggs, and modest reductions in production performance**. The findings highlight that symptoms often regarded as routine management challenges may, in some cases, have an infectious component that warrants further investigation.

The research also observed that detection tended to be higher in older flocks, suggesting that long-cycle layer operations may benefit from increased attention to intestinal health monitoring and diagnostics.

A Commitment to Science and Industry Advancement

This publication reflects Kemin's commitment to advancing poultry health through scientific research, technical expertise, and practical field investigations. By transforming field observations into peer-reviewed scientific evidence, Kemin continues to contribute meaningful knowledge that supports veterinarians, nutritionists, and producers in making informed, evidence-based decisions.

As the poultry industry evolves, understanding emerging health challenges becomes increasingly important. Through science, diagnostics, and innovation, Kemin remains committed to helping the industry better understand, identify, and manage conditions that impact flock health, productivity, and profitability.



Dr. R. Chanthirasekaran



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Mycotoxin-Detoxifying Agents

from Adsorption to Biotransformation: Why Mycotoxin Control Cannot Rely on a Single Tool

Dr. Sridhar Selvapandian, Dr. Sushant Mhatre, Dr. Jayanta Bhattacharyya

Introduction:

Mycotoxins are fungal secondary metabolites primarily from the genera *Aspergillus*, *Fusarium*, *Penicillium*, *Alternaria*, and *Claviceps*. Of over 400 mycotoxins, aflatoxins (AF), fumonisins (FUM), deoxynivalenol (DON), zearalenone (ZEA), ochratoxin A (OTA), and T-2 toxin are the main threats to feed due to toxicity and prevalence. **Co-contamination is widespread**, with over 88% of global feed samples in 2019 containing multiple toxins. Control methods are categorized by mechanism:

- **Adsorbing Agents (Mycotoxin Binders)**
- **Biotransforming Agents (Mycotoxin Modifiers)**

Adsorbing Agents (Binders):

These agents limit mycotoxin bioavailability, reducing uptake and systemic distribution.

A. Inorganic Adsorbents - Stable and highly adsorptive, they include **phyllosilicates** (bentonite, montmorillonite, smectite, HSCAS, kaolinite, hectorite, sepiolite, palygorskite) and **tectosilicates** (zeolites like clinoptilolite, mordenite, heulandite), as well as high-surface-area **activated carbon**.

B. Organic Adsorbents - Of biological origin, these include **yeast cell wall (YWCCW)** components (β -glucans, mannan oligosaccharides, glucomannans), **plant-derived** and **agricultural fibre-based adsorbents**, and **humic substances**.

Why a Single Binder Cannot Solve Every Mycotoxin Challenge?

The universal mycotoxin binder concept was abandoned because adsorption requires specific interactions between the **physicochemical properties of both the adsorbent and the mycotoxin**. Each toxin acts differently in the gastrointestinal tract, and adsorbents have unique structural and chemical traits.

Multiple factors prevent a single product from being universally effective.

a. Diversity of Mycotoxin Chemistry

Adsorption efficacy depends on mycotoxin physicochemical properties (Galvano *et al.*, 1997). Highly polar, small molecules like aflatoxins bind easily. Fumonisins and OTA/T-2 (intermediate to high polarity) exhibit moderate binding, while DON and ZEA (low polarity, steroid-like) are difficult to bind. This variability explains why binders effective against aflatoxins often fail against *Fusarium* toxins.

b. Adsorbent Characteristics Determine Performance

Mineral binder efficacy depends on four core properties: **Cation Exchange Capacity (CEC)** defines site availability; Na-montmorillonite (80-130 meq/100g) outperforms Ca-montmorillonite (40-70 meq/100g). **Surface Area** determines binding potential, ranging from bentonite (150-200 m²/g) to activated carbon (500-3000 m²/g).

Interlayer Spacing regulates penetration; bentonite's 15-20 Å layers fit AF B₁ (10-12 Å) better than zeolite's narrow pores (3-8 Å). Finally, **Surface Charge** varies with GI pH; binders must remain stable despite gastric protonation to maintain effective cation exchange.

Comparison of Adsorbents and Mycotoxin Preferences:

Adsorbent	Mechanisms / Components	Advantages & Targets	Limitations
Bentonite & Montmorillonite	Cation exchange, H-bonding, Van der Waals forces	High adsorption/CEC, expandable layers. Best for aflatoxins, some fumonisins	Limited efficacy against DON, ZEA
HSCAS	Electron donor-acceptor interactions (aflatoxin carbonyls-clay cations)	Gold standard for aflatoxins; stable during digestion	Less effective against <i>Fusarium</i> toxins
Zeolites	Molecular sieving, ion exchange	High thermal stability; adsorbs aflatoxins, some fumonisins	Lower affinity for non-polar toxins (hydrophilic)
Activated Carbon	Hydrophobic interactions, π - π bonding, pore-filling	Broad spectrum, very high surface area	Low specificity; non-selectively adsorbs nutrients, medications
Yeast Cell Wall	β -glucans, mannans, glucomannans; H-bonding, Van der Waals, 3D recognition	Biological origin; better activity against certain <i>Fusarium</i> toxins	Lower aflatoxin adsorption than clay minerals

C. Modified Adsorbents

Natural hydrophilic clays show limited efficacy against lipophilic mycotoxins, including zearalenone, ochratoxin A, and T-2 toxin. Surface modification using organic cations like choline, carnitine, or quaternary ammonium compounds increases hydrophobicity and broadens their adsorption spectrum. For example, organically modified zeolites can increase ZEA adsorption from ~5% to >90%, though high inclusion rates may reduce aflatoxin-binding efficiency or interfere with fat digestion. Additional polymer applications include **Cholestyramine**, an insoluble quaternary ammonium anion exchange resin with a robust binding capacity for anionic compounds, and **Polyvinylpyrrolidone**, a highly polar amphoteric polymer.

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Evaluation of Mycotoxin Binder Efficacy:

a. Techniques for Quantifying Mycotoxin Binder Adsorption Capacity:

To evaluate the sequestration performance of mycotoxin binders (MTB), in vitro testing is routinely implemented as an initial screening protocol (Gallo *et al.*, 2010). These methodologies comprise: Individual in vitro assays, Adsorption isotherm profiling and Dynamic gastrointestinal simulation models

b. Characteristics of an Effective Mycotoxin Adsorbent:

The efficacy of a mycotoxin adsorbent cannot be evaluated solely by its adsorption capacity under laboratory conditions. An effective product must maintain stable toxin binding throughout the dynamic environment of the gastrointestinal tract while minimising interactions with essential nutrients.

According to guidelines established by the EFSA (European Food Safety Authority), a top-performing adsorbent should demonstrate the following criteria:

- Documented effectiveness within a standardised in vitro trial.
- Validation through a minimum of two separate in vivo studies.
- Consistent adsorption stability across the entire gastrointestinal pH range.
- Strong adsorption affinity at an inclusion level of 1-2 kg/tonne.
- Swift binding action before intestinal absorption can occur.
- Negligible interaction with nutrients (amino acids, vitamins, minerals) and veterinary drugs.
- Guaranteed safety for both the animals and final consumers.

The adsorption efficiency of an adsorbent is influenced by both the physicochemical characteristics of the adsorbent and the molecular properties of the mycotoxin, including polarity, molecular size, charge distribution, pore dimensions, and environmental pH.

Key attributes of an ideal adsorbent:

- High affinity and selectivity for target mycotoxins
- Broad adsorption spectrum where appropriate
- Stability over the physiological gastrointestinal pH range
- Strong retention of the toxin-adsorbent complex during digestion
- High cation exchange capacity and suitable surface chemistry
- Compatibility with different feed matrices
- Minimal adsorption of vitamins, minerals, amino acids, and veterinary drugs
- Proven efficacy through standardised in vitro and in vivo evaluations

For these reasons, modern commercial mycotoxin-detoxification products increasingly combine multiple mineral adsorbents with organic adsorbents, biotransformation technologies, and supportive

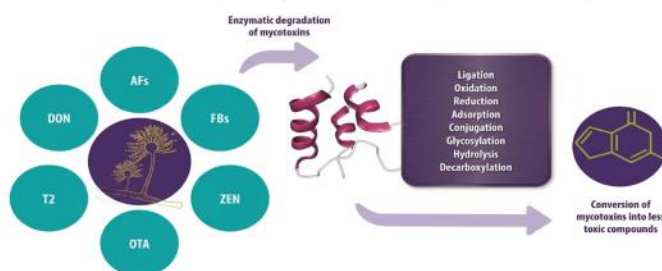
functional additives to achieve broader-spectrum efficacy and improved performance under commercial production conditions.

C. Interaction of Mycotoxin Binders with Nutrients

Evaluating nutrient adsorption by mycotoxin binders is critical. Although most in vivo studies show negligible nutrient reductions at recommended inclusion levels, selecting highly selective binders with minimal nutrient adsorption remains crucial (Kihal *et al.*, 2022).

Biotransforming Agents:

Biotransformation uses biological entities like bacteria, fungi, or enzymes to neutralise mycotoxins by breaking them down into non-toxic metabolites through irreversible chemical reactions, without altering feed nutritional value. Differentiated by their high specificity and efficiency, **enzymes are the most promising detoxification technology**. Key options include epoxidases for trichothecenes (DON), lactonohydrolases for zearalenone (ZEA), and fumonisin esterases for fumonisins, alongside **protease A**, **pancreatin**, and **carboxypeptidase A** (Boudergue *et al.*, 2009). Because this enzymatic process is **highly specific and irreversible**, it critically complements binders within modern, multi-target mycotoxin mitigation strategies.



Conclusion:

Due to the complex co-occurrence of structurally diverse mycotoxins that prevents a single tool from providing complete protection, management has shifted from a solitary binder to a multifaceted strategy combining **adsorbing agents**, **biotransforming enzymes**, and **supportive feed additives**. Consequently, selecting a detoxifying agent must rely on empirical data, specific in vitro profiles, and field validation rather than the assumption of universal efficacy.

Reference will be available on request.



Dr. Sridhar Selvapandian
Livestock Nutritionist



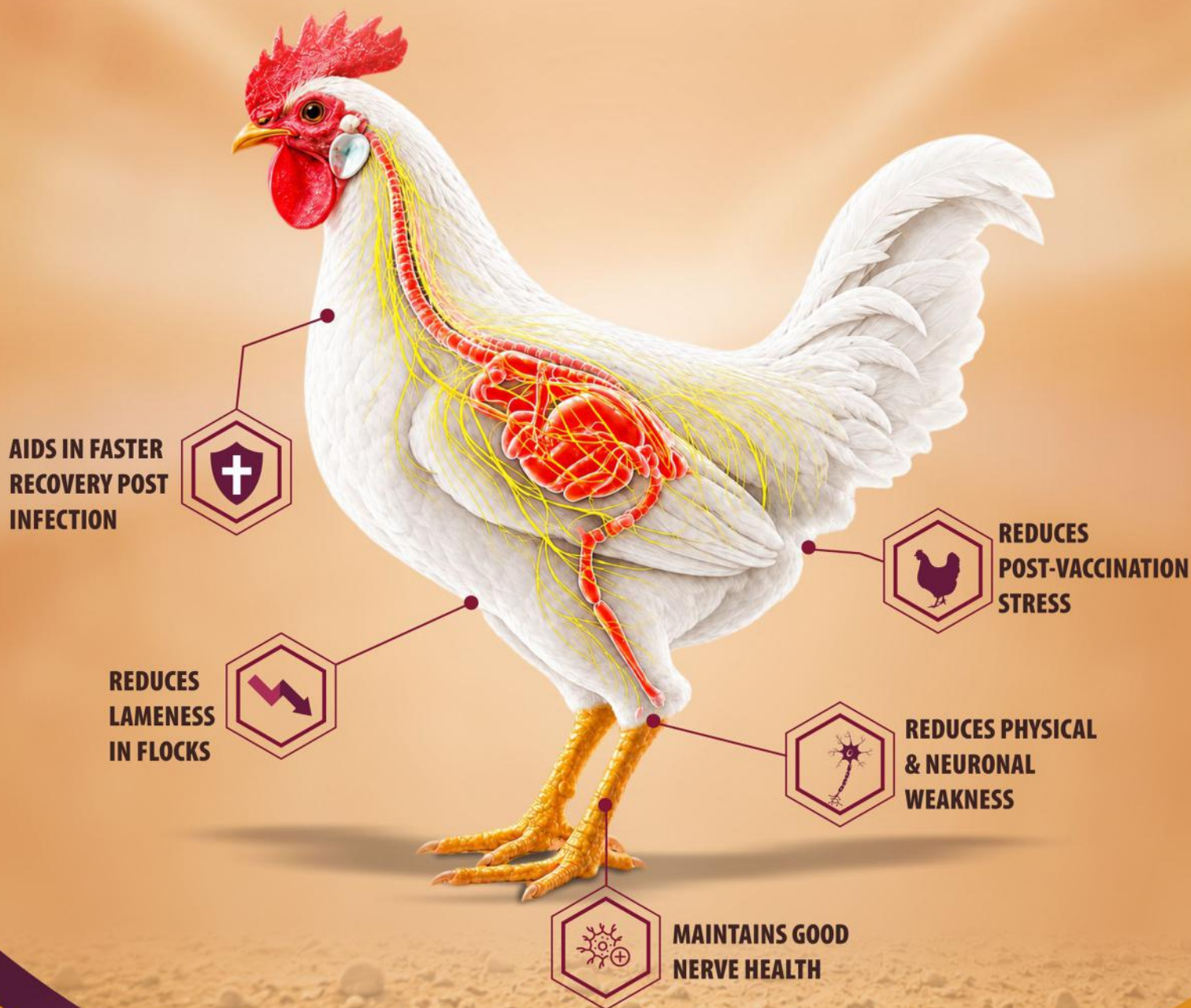
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Poultry Federation of India

Delegation Holds High-Level Policy Talks with Haryana Government to Accelerate Poultry Sector Reforms



Poultry Federation of India delegation met Shri Mahipal Dhanda Ji, Hon'ble Education Minister, Government of Haryana, to discuss key policy issues aimed at strengthening the growth, competitiveness and long-term sustainability of Haryana's poultry sector. The PFI delegation led by Mr. Ranpal Dhanda, President, comprised Mr. Sanjeev Gupta, Vice President - HQ, Mr. Ravinder Sandhu, Secretary, Mr. Ricky Thaper, Joint Secretary, Mr. Rahul Khatri, Treasurer, Mr. Saurabh Gupta, EC Member, Mr. Dilbagh Singh, EC Member, Mr. Baljinder Aghi, Member, Mr. Satish Kalyan, Member, along with Mr. Jagdish and Mr. Rithik, PFI Office Managers.



The Association expresses sincere gratitude to Hon'ble Minister Shri Mahipal Dhanda Ji for his proactive leadership and for facilitating a series of high-level meetings with senior officials of the Government of Haryana in Chandigarh. These interactions reflect the



Government's commitment to promoting a progressive and industry-friendly policy environment for one of the state's most important agri-based sectors.

The meeting with Mr. Vinay Pratap Singh, IAS, Commissioner, regarding certain Pollution Control Board guidelines that are not aligned with the operational realities of poultry farming was very encouraging and discussions were highly positive. Later the delegation met Shri Vedpal, Chairman, Market Committee, Haryana. The discussions were highly positive and we were assured that the concerns of poultry sector will be addressed through a practical and regulatory approach. Mr. Ranpal Dhanda suggest Chairman Market Committee that the 1% market committee fee levied on maize and bajra arriving from other states should be abolished. Also The 2% market committee fee levied on eggs and cull layer birds should be abolished. This decision will play a significant role in reducing production costs for poultry farmers in Haryana, enhancing their competitiveness, and promoting the sustainable development of the state's poultry sector as well as employment generation. PFI is fully confident that Chairman, Market Committee will give sympathetic consideration to this farmer-friendly matter. The discussions centred on improving the Ease of Doing Business for poultry farmers, promoting regulatory reforms, reducing procedural bottlenecks and creating an enabling ecosystem that encourages investment, employment generation and sustainable growth across the poultry value chain.

The Poultry Federation of India sincerely appreciates the constructive approach and positive response extended by the Hon'ble Minister and senior Government officials to the recommendations submitted by the Federation. Such collaborative engagement between the Government and industry is essential for unlocking the full potential of the poultry sector, enhancing farmer prosperity, strengthening rural livelihoods and ensuring affordable, high-quality protein for millions of Indian consumers.



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Trouw Nutrition Previews FeedTechnoVision 2026, India: Shaping Asia's Future of Feed



Trouw Nutrition, Nutreco's livestock feed business line, hosts its premiere feed event, **FeedTechnoVision**, on 29-30 September 2026 in Jaipur, India. Held at the Hyatt Regency, Jaipur, FeedTechnoVision 2026 convenes feed mill managers, quality leaders, nutritionists, and feed safety specialists to help shape the future of Asia's feed industry and inspire progress across the global feed sector. The fourth instalment of FeedTechnoVision explores how science, technology, operational expertise, and collaboration can improve efficiency and strengthen resiliency throughout a rapidly expanding feed production region.

Asia's feed industry is facing mounting pressures. Across the value chain, stakeholders are dealing with raw material volatility and quality constraints whilst striving to improve production consistencies, manage feed safety, and navigate changing sustainability and regulatory requirements. Markets such as India, Thailand, Indonesia, and Vietnam are shifting from a complex and rapidly evolving feed production landscape towards a clearer and more consistent process that is increasingly impacting the global feed industry. With these shifts in mind, FeedTechnoVision 2026 examines complexities in the Asian feed-to-food chain and explores practical approaches for solving key concerns. Eleven sessions and three panel discussions led by feed industry experts representing South America, Europe, and Asia address ongoing and emerging challenges impacting Asia's feed sector.

A journey built around four main objectives

FeedTechnoVision 2026 is built around four guiding objectives: cross-functional knowledge sharing, accelerating technology adoption, networking and

collaboration, and a continuous feedback loop transforming insights into practical actions. The programme is designed as a progressive customer journey and is organized into three sessions:

29 September - Resilient ingredients and integrated quality systems to optimise feed Osler Desouzart, CEO of OD Consulting, Market Planning & Strategy, Brazil, opens FeedTechnoVision 2026 with a strategic view of the forces shaping Asia's feed industry. His remarks address global macroeconomic trends, trade dynamics, and lessons from Brazil's transformation into one of the world's leading animal production regions. Next on the morning's agenda, leaders from Nutreco Asia and Trouw Nutrition consider raw material availability, resilience, and sourcing and demonstrate the influence that raw material quality and formulation accuracy have on animal performance.

The afternoon programme moves towards integrated solutions. Speakers show why sustainable improvements cannot be achieved through isolated technologies but require connected systems combining data, risk-based decision making, sourcing, process control, and quality management. Dr. Jean Michel Nebout of Laboratoire d'Analyses Microbiologiques, France, presents a holistic approach to feed production that evolves from quality control to integrated feed safety. Head of the Center for Feed Technology at the Norwegian University of Life Sciences, Dr. Dejan Miladinovic, shares how operational excellence can reduce risk and improve performance in feed production. Dr. Swamy Haladi presents proactive mycotoxin risk management and Dr. Eugenio Alcalde explains how microbial ecology supports more effective prevention strategies.



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30 September - From operational excellence to the Feed Mill of the Future

Day two spotlights practical implementation. Sessions focus on process control, steam quality, moisture optimisation, particle size, thermal processing, and pellet quality to demonstrate how process control and optimisation simultaneously improve feed safety, feed mill efficiency, and animal performance. The event concludes with a panel discussion on the Feed Mill of the Future, examining how digitalisation, automation, and smart data will transform feed manufacturing.

"Asia's feed industry is evolving at an unprecedented pace," says Noel Kim, Managing Director, Nutreco Asia. "New challenges demand new thinking. FeedTechnoVision brings together customers, industry leaders, and technical experts to explore the innovations and capabilities that will define the next generation of feed and animal production. Together, we can build a more productive, resilient, and sustainable future for our industry."

Pedro Caramona, Global Strategic Marketing Director-X Species, Trouw Nutrition notes the programme focuses on actionable takeaways. "FeedTechnoVision 2026 is designed as a collective learning journey. By bringing together nutritionists, quality leaders, and operations managers, we aim to create a cross-functional common

language around the industry's biggest challenges," Caramona says. "Every participant should leave Jaipur with practical ideas they can implement immediately to build safer, more resilient, and higher-performing feed production systems."

About Trouw Nutrition

Trouw Nutrition is Nutreco's livestock feed business line and a global leader in the feed, farm, and health aspects of producing quality meat, eggs, and milk. We've spent nearly a century developing innovative feed products and more sustainable ways of raising healthy farm animals and companion animals. We believe that animal nutrition and good farm management have the power to transform our industry and even our planet. Through our dedicated team of 5,871 experts and our global network, we work together with our customers to solve the challenges facing our feed-to-food chain and achieve our purpose of Feeding the Future.

With 65 manufacturing plants and a presence in 100+ countries, Trouw Nutrition is everywhere our customers need us to be. We provide a one-stop-shop for feed specialities, feed additives, premixes, nutritional models, and customised, integrated services. Our global brands include NutriOpt™, Milkiwean™, Erliva™, Maxcare™, Sprayfo™, and Selko™. For more information, please go to trouwnutrition.com or follow us on LinkedIn.

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67th National Symposium 2026

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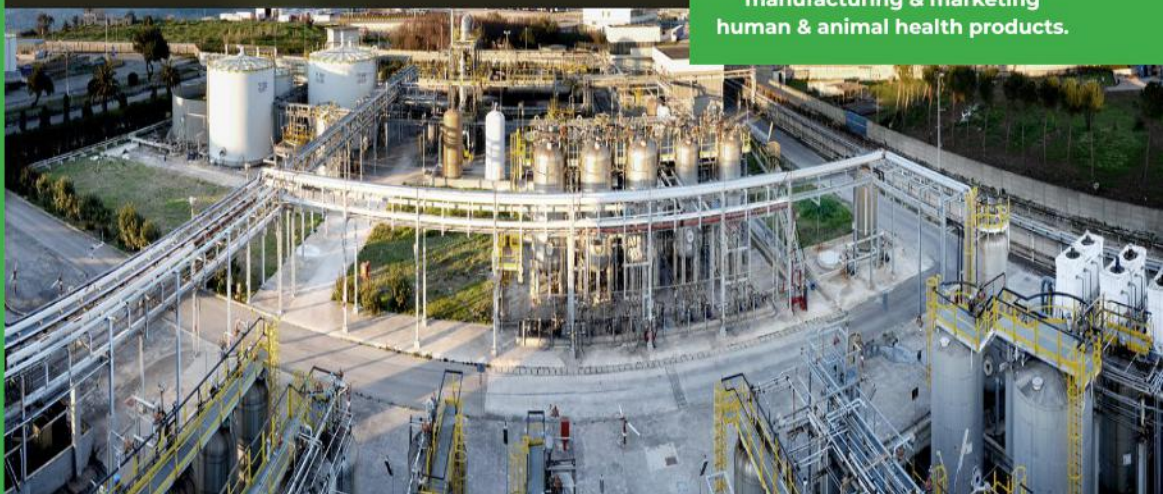
Kiril Domuschiev



President of Huvepharma drive is an example of a modern business determined to leave a positive legacy. He is interested not only in operating a profitable business but also in reinvesting earnings into better, more modern technologies to improve production methods. These investments will also promote a healthier and more sustainable environment, benefiting employees and local residents alike.



Solidifying the Vanguard: Huvepharma Group Secures Landmark Acquisition of Euroapi Italy to Propel Global Biotech Leadership



O. P. Singh



Managing Director, Huvepharma SEA (Pune) Pvt. Ltd., which is a fast-growing global pharmaceutical company with a focus on developing, manufacturing & marketing human & animal health products.

On the 29th of July, 2026, Huvepharma EOOD consummated a definitive Share Purchase Agreement with Euroapi S.A. to acquire a 100% equity stake in Euroapi Italy S.r.l. This transaction remains subject to customary closing conditions, including the requisite Golden Power regulatory clearance. The perimeter of this strategic acquisition encompasses the premier manufacturing facility in Brindisi, Italy, an asset boasting a venerable industrial heritage in microbiological fermentation dating back to 1966.

"A profound synergy exists between the cutting-edge biotechnological profile of Huvepharma and the deep institutional knowledge and expertise of the Brindisi workforce," remarked Kiril Domuschiev, President and CEO of Huvepharma. He further articulated, "Huvepharma intends to fully leverage these symbiotic capabilities to introduce novel products and advanced formulations to the global marketplace. Our strategic focus remains steadfastly anchored in the development, manufacture, and commercialisation of animal health, human health, and nutraceutical solutions. This acquisition serves as a testament to that enduring commitment to our global clientele."

To ensure unparalleled quality assurance, the entirety of Huvepharma portfolio is manufactured exclusively in-house across proprietary facilities owned by the Huvepharma Group. This vertical integration grants the corporation absolute governance over its production methodologies, guaranteeing adherence to the most stringent quality standards. Furthermore, this operational autonomy fosters exceptional organizational agility, empowering the Huvepharma Group to dynamically recalibrate and optimize product formulations in alignment with evolving market demands.

This landmark acquisition expands Huvepharma aggregate fermentation capacity by 25%, elevating its total volume past the 12,000m³ threshold. Consequently, this expansion solidifies the company's position as a preeminent vanguard of the European biotechnology sector while catalysing the broader expansion of its global footprint. Ultimately, this transaction reinforces client confidence in Huvepharma sustainable, resilient, and long-term manufacturing architecture.

This landmark acquisition marks a monumental leap forward in our global manufacturing paradigm says Mr. O. P. Singh – Managing Director, Huvepharma SEA (Pune) Pvt. Ltd. He further added; by expanding our aggregate fermentation capacity to unprecedented heights, the Huvepharma Group drastically fortifies its global supply chain. For our discerning clientele here in India and the wider South Asian region, this translates to unparalleled product reliability, robust operational continuity, and enhanced access to world-class biotechnological solutions. We are exceptionally proud to synergise our regional operations with this newly augmented global infrastructure.

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A Remarkable Conclusion to the 27th World Poultry Congress 2026 – Inspiring Innovation and Collaboration of Global Poultry – Ricky Thaper

The 27th edition of World Poultry Congress (WPC) 2026 organised by the World's Poultry Science Association (WPSA) at the Metro Toronto Convention Centre, Toronto, Canada, from July 13-17, 2026 was recognised as the world's premier gathering for poultry science and technology, WPC 2026 had brought together a good delegates comprising poultry scientists, researchers, academicians, veterinarians, industry leaders, production specialists, policymakers and students from more than 55 countries. The congress served as an exceptional platform for exchanging knowledge, showcasing cutting-edge innovations and strengthening international collaborations that will shape the future of the poultry industry.

The scientific and technical program covered a wide spectrum of critical topics including genetics and breeding, poultry nutrition, health and disease prevention, animal welfare, sustainability, precision production technologies, processing innovations and global food security. At a time when the poultry sector is addressing evolving challenges related to disease management, climate resilience, sustainability and feeding a growing global population, forums like WPC continue to play a pivotal role in driving science-based solutions and technological advancement. Held once every four years under the auspices of the World's Poultry Science Association (WPSA), the World Poultry Congress remains one of the most influential international platforms dedicated to advancing poultry science and industry worldwide. The exhibitors displayed their promotional material in Exhibit Hall and the seminars /



presentations were in various session rooms. The poster and oral presentation sessions represented the cutting edge of global poultry research.

During World Poultry Congress 2026, it was my privilege to meet distinguished poultry leaders, scientists, researchers, innovators and industry colleagues from around the world and explored new opportunities for collaboration that will contribute to the sustainable growth and future of the global poultry sector. My sincere congratulations to the World's Poultry Science Association (WPSA) organising committee, sponsors, exhibitors, and everyone who worked tirelessly to make WPC 2026 an outstanding success. As one memorable chapter comes to an end, we now look forward to the 28th World Poultry Congress, which will be held in Tokyo, Japan from July 21-25, 2030.





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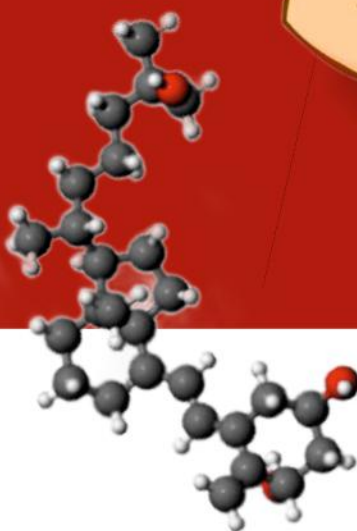


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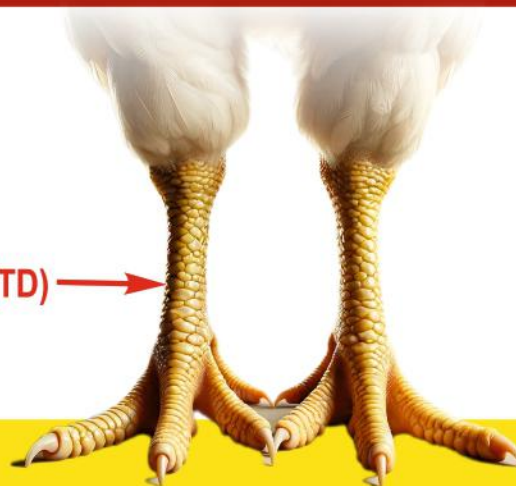


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Bacillus Subtilis PB6 – A Reliable and Optimal Solution for Dysbacteriosis in Broilers

Ajay Kumar, Venket M Shelke, Partha Das, and R Chanthirasekaran

Introduction

Modern broilers achieve high body weight and improved Feed Conversion Ratio (FCR), but this performance places significant stress on the gut, making them susceptible to bacterial enteritis, dysbacteriosis, necrotic enteritis (NE), and coccidiosis. Poor gut health elevates FCR and leads to wet litter, respiratory stress, increased litter handling needs, and higher treatment costs. In India, a considerable cost per ton of feed is incurred for the management and treatment of gut health disorders, particularly dysbacteriosis. Subclinical necrotic enteritis (NE) arises when intestinal dysbiosis facilitates the overgrowth and upward migration of *Clostridium perfringens* from the hindgut to the upper gastrointestinal tract, resulting in substantial but often undetected economic losses. Predisposing factors include coccidiosis, high protein diets, abrupt feed transitions, prolonged off feeding, poor shed management, and immunosuppression. Rising conventional feed ingredient prices and subsequent increased inclusion of non-conventional raw materials, recurrent viral outbreaks, and non-judicious antibiotic use further weaken intestinal health.

In recent years, the broiler industry has been experiencing coccidiosis and subclinical NE as two primary diseases for intestinal health upset. Next to these two diseases, nonspecific bacterial enteritis/dysbacteriosis occurs, caused by an imbalance in the nonspecific bacterial population in the poultry gut. Sometimes it is also called SIBO (Small Intestinal Bacterial Overgrowth), manifested as undigested feed particles in droppings (Fig. 3a,b), diarrhea, wet litter, watery intestinal content (Fig. 4a), thin intestinal membrane (Fig. 4b) & dilated serosal blood vessels (Fig. 5a), resulting in poor performance of broiler birds. So, to analyze the severity of dysbacteriosis and coccidiosis in the Indian context, macroscopic observation of the intestinal tract of broiler chicken across the country was performed in the year 2024 as a regular annual program by the Kemin Technical Services team. Macroscopic dysbacteriosis and coccidiosis scores were assigned to commercial broilers by experienced veterinarians during necropsy across Indian states. *Bacillus subtilis* PB6, a patented organism, has an active microbial property that can specifically show inhibitory action on the *Clostridium perfringens* population and promote the growth of other beneficial bacteria. The present study evaluated the efficacy of *Bacillus subtilis* PB6 in 2024 in Indian states. The study was conducted among Indian broiler producers, both PB6 users and non-users. Assessment of the prevalence of dysbacteriosis and coccidiosis in Indian broiler farms was done and analyzed to see the effect of PB6 in controlling dysbacteriosis.

Trial Design/ Method

Johnson & Reid's lesion-scoring procedure for coccidiosis was carried out during the study. A dysbacteriosis scoring system, developed by the Kemin technical team and in line with the method described by Teirlynck et al., 2011, was used in this study. During the year 2024, 499 Indian broiler farms were analyzed from 71 broiler integrators across different regions. From each broiler farm, 3-5 healthy live birds were sacrificed by cervical dislocation by an expert veterinarian and immediately necropsied.

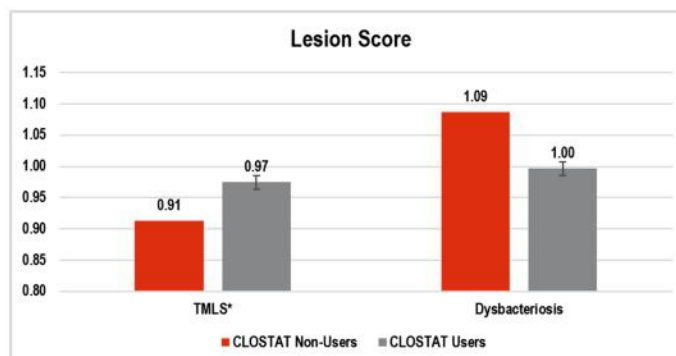
Intestinal lesion scoring was conducted and recorded immediately at farms. A total of 1513 broiler birds with a mean age of 26 days and an age range between 15 and 45 days were selected based on dysbacteriosis and coccidiosis prevalence during the year 2024.

Results & Discussion

The intestinal health monitoring in 71 broiler integrations across different regions of India in the year 2024 resulted in an average dysbacteriosis score of 1.00 in PB6 users, which was numerically lower than that of non-PB6 users, which was 1.09. The average coccidiosis score was more than 0.9 in both PB6 users and non-users. The results showed that PB6 users had numerically lower dysbacteriosis scores than non-users, while the prevalence of coccidiosis was the same in PB6 users and non-users across the country during the year 2024. The mean lesion score of coccidiosis and TMLS in *Bacillus subtilis* PB6 users and non-users during the year 2024 is shown in the figure. 2. Regional variation was also observed across India for both total mean lesion score (TMLS) and dysbacteriosis.

- TMLS by region: West (1.77; highest), East (1.43), North (1.07), South (0.60; lowest).
- Dysbacteriosis score by region: West (1.25; highest), South (1.08), East (0.89), North (0.67; lowest).

Figure 1: Dysbacteriosis lesion score and Total mean lesion score (TMLS) of coccidiosis at *Bacillus subtilis* PB6 users and non-users during the year 2024





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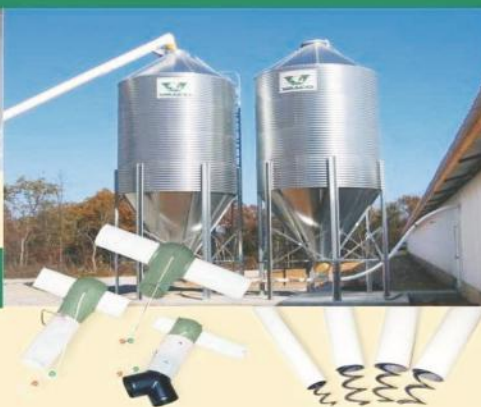
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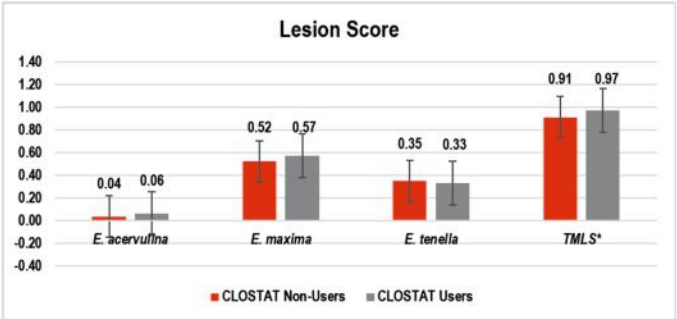
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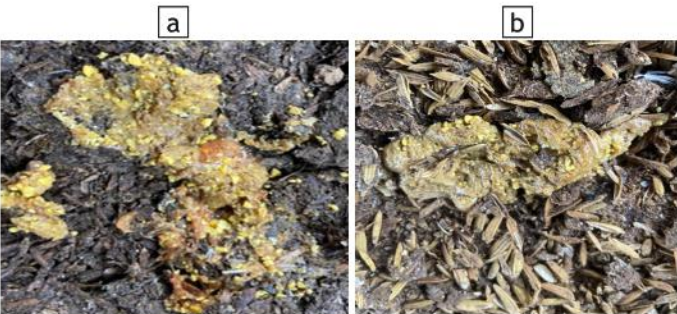
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Figure 2: Mean lesion score of coccidiosis and TMLS at *Bacillus subtilis* PB6 users and non-users during the year 2024



Figures: 3a and b: Undigested particles with orange mucus in feces.



Figures 4a and b: Watery intestinal content and thin intestinal membrane



Figures 5a and b: Dilated serosal blood vessels and orange intestinal content with undigested feed particles



Nowadays, the poultry industry faces multiple challenges, like improper raw material quality with higher fungal contamination, along with various adulterations of feed raw materials and their inferior quality, leading to immunosuppression, which results in various disease outbreaks, and environmental

challenges, which have a direct adverse impact on productivity. Over the last 2-3 years, it has been found that the incidence of subclinical coccidiosis is increasing year-round, regardless of season. The major reasons are resistance to commonly used anticoccidials due to improper anticoccidial rotation that does not follow the golden rules of rotation, immunosuppression due to inferior-quality raw materials, and emerging diseases and environmental variations, etc. As coccidiosis is a major predisposing factor for NE or dysbacteriosis, its incidence has become more prevalent, which is shown in the lesions in the figures above (Figs. 1 & 5b). Several feed additives, like organic acids, probiotics, prebiotics, essential oils, etc., were tried to control gut health issues as an alternative to AGP. Among these alternatives, probiotics have gained worldwide recognition for managing gut health effectively. In the present study, we have also observed numerically better control of dysbacteriosis in the CLOSTAT™ user group. PB6 is a natural strain isolated from the healthy chicken gut, and it is known to secrete surfactins and other secondary bacterial peptides, which have antibacterial activity against common pathogens like *Clostridium* spp. Although the TMLS of coccidiosis is numerically higher in CLOSTAT™ users than non-users, *Bacillus subtilis* PB6 is still helping to minimize dysbacteriosis more efficiently in CLOSTAT™ users than non-users, as evidenced by a numerically lower dysbacteriosis score in *Bacillus subtilis* PB6 users than non-users.

CONCLUSION

The findings of the 2024 study indicate that coccidiosis and dysbacteriosis occurred consistently across all regions of India’s broiler market, irrespective of seasonal variations. Gut health challenges are aggravated by extreme day-night temperature variations, poor/compromised ventilation, and the use of foggers or water spraying during extreme summer conditions. During this study, we found that *Bacillus subtilis* PB6 users were able to maintain better intestinal health than non-users during the year 2024. The study concluded that *Bacillus subtilis* PB6 is a reliable and sustainable solution for managing dysbacteriosis, even in challenging situations such as coccidiosis, pressure from non-conventional raw materials, indiscriminate use of AGPs, and AGP bans. So, *Bacillus subtilis* PB6 can maintain intestinal health not only by its direct killing action on *Clostridium perfringens* but also by maintaining the harmony of intestinal microbiota. *Bacillus subtilis* PB6 can be used as a unique tool to maintain gut health, as a complete replacement for AGPs, or with AGPs, at a subtherapeutic dosage by poultry producers. Hence, *Bacillus subtilis* PB6 will help to manage gut health & protect gut health from the deleterious effects of necrotic enteritis and dysbacteriosis.

Ajay Kumar, Venket M Shelke, Partha Das, and
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Northern Region

COMPANY: Sampoorna Feeds FARMER NAME: Mr. Kulwinder Singh 	JULY-2026	Top #1
	Farm Type	Open House
	State	PUNJAB
	Chicks Placed	9,951
	Mean Age	36
	Avg Body Wt	2,818
	FCR	1.37
	cFCR	1.18
	Livability%	97.1
	Daily Gain	76.3
	EPEF	541

Eastern Region

COMPANY: IB Group FARM NAME: Mr. Manjurul Sarkar 	JULY-2026	Top #1
	Farm Type	Open House
	State	BENGAL
	Chicks Placed	1289
	Mean Age	31
	Avg Body Wt	2,034
	FCR	1.24
	cFCR	1.23
	Livability%	98.1
	Daily Gain	65.6
	EPEF	518

Central Region

COMPANY: Japfa FARMER NAME: Mr. Tanaji Kisan Shelar 	JULY-2026	Top #1
	Farm Type	Closed House
	State	MAHARASHTRA
	Chicks Placed	16,990
	Mean Age	32
	Avg Body Wt	2,345
	FCR	1.34
	cFCR	1.26
	Livability%	97.1
	Daily Gain	73
	EPEF	527

South Region

COMPANY: IB Group FARMER NAME: Mr. Bolistti Sreera 	JULY-2026	Top #1
	Farm Type	Closed House
	State	ANDHRA PRADESH
	Chicks Placed	18,500
	Mean Age	37
	Avg Body Wt	2,571
	FCR	1.51
	cFCR	1.38
	Livability%	97.6
	Daily Gain	69.5
	EPEF	449

July 2026 -Top PERFORMANCE BY AREA

Area	Chicks Placed	Mean Age(Days)	BW	FCR	cFCR(2Kg)	Livability%	Daygain	EPEF
North EC House	12,030	32	2,156	1.38	1.35	95.9	67.2	467
North Open House	9,951	37	2,818	1.37	1.19	97.1	76.3	541
East EC House	7,161	35	2,555	1.47	1.35	97.3	73.0	483
East Open House	1,289	31	2,034	1.24	1.24	98.1	65.6	518
Central EC House	16,990	32	2,345	1.34	1.27	97.1	73.0	527
Central Open House	9,900	32	2,214	1.39	1.35	96.2	67.4	465
South EC House	18,500	37	2,571	1.51	1.38	97.6	69.5	449
South Open House	3,510	37	2,410	1.47	1.38	96.5	65.1	428

July 2026 -Top 10 FIELD PERFORMANCE

Flock	Farm Type	State	Chicks Placed	Mean Age	BW	FCR	cFCR	Livability%	Day Gain	EPEF
Flock 1	OPEN HOUSE	PUNJAB	9,951	37	2,818	1.37	1.19	97.1	76.3	541
Flock 2	CLOSED HOUSE	MAHARASHTRA	16,990	32	2,345	1.34	1.27	97.1	73.0	527
Flock 3	OPEN HOUSE	PUNJAB	9,996	34	2,510	1.36	1.25	96.2	73.2	518
Flock 4	OPEN HOUSE	NORTH BENGAL	1,289	31	2,034	1.24	1.24	98.1	65.6	518
Flock 5	CLOSED HOUSE	MAHARASHTRA	7,885	33	2,536	1.40	1.28	94.8	76.4	516
Flock 6	OPEN HOUSE	PUNJAB	14,360	34	2,425	1.34	1.25	97.0	70.3	509
Flock 7	OPEN HOUSE	PUNJAB	5,675	32	2,366	1.36	1.28	93.6	73.9	509
Flock 8	OPEN HOUSE	PUNJAB	8,375	33	2,367	1.35	1.27	95.8	70.9	503
Flock 9	OPEN HOUSE	PUNJAB	10,117	35	2,535	1.36	1.24	95.5	71.6	503
Flock 10	OPEN HOUSE	PUNJAB	5,085	32	2,325	1.37	1.30	95.3	72.2	502

Minimizing Pre-Slaughter Shrinkage in Broilers: Nutritional and Management Strategies

Dr. Om Prakash Reddy, Dr. Prasad Nagpure

Shrinkage loss is one of the most significant yet often overlooked sources of economic loss in broiler production. It refers to the reduction in live body weight that occurs between feed withdrawal and processing due to gut emptying, dehydration, respiration, and transportation stress. Excessive shrinkage directly reduces live weight, carcass yield, and overall producer profitability.

Since feed accounts for nearly 70% of total production costs, preserving every kilogram of live weight prior to slaughter is essential. Scientific management of feed and water withdrawal, optimization of dietary electrolyte balance (DEB), maintenance of cellular hydration, and targeted nutritional interventions can effectively minimize shrinkage losses while improving bird welfare, processing efficiency, and economic returns.

Causes of Shrinkage Loss in Poultry

Shrinkage loss is primarily caused by the following factors:

1. Dehydration & Water Loss

Dehydration causes immediate muscle shrinkage in poultry because water accounts for approximately 70% to 75% of a bird's total body weight and muscle tissue. When a bird loses water, fluid is drawn directly from the intracellular spaces of the muscle to maintain circulating blood volume. This leads to visible tissue depletion, live weight loss, and reduced meat yield.

2. Feed and Water Withdrawal (Fasting Window)

Managing the pre-harvest fasting period requires balancing food safety with carcass yield. The industry standard for total fasting (time from feed removal to slaughter) sits at a critical window of **8 to 12 hours**. Water withdrawal should occur **less than 6 hours** before slaughter.

- **Under-withdrawal (<8 hours):** The gastrointestinal tract remains full. This maximizes the risk of physical rupture and fecal contamination during automated evisceration while artificially inflating excretory shrink metrics.
- **Over-withdrawal (>12 hours):** The bird depletes its transient digestive tract contents and begins drawing moisture directly from muscle tissues. Extended fasting triggers the sloughing of the intestinal mucosa, causes gallbladder enlargement (leading to green liver staining), and causes tissue shrinkage to escalate exponentially.

3. Heat Stress & Environmental Conditions

Poultry possess a narrow thermoneutral zone. Because birds lack sweat glands, high ambient temperatures force them to rely on evaporative cooling through panting. Accelerated respiration significantly increases water vapor loss from the respiratory tract, leading to rapid dehydration and severe tissue shrink. Conversely, extreme cold temperatures compel birds to mobilize energy reserves and burn glycogen stores simply to maintain homeothermy, resulting in metabolic weight loss.

4. Catching, Loading, and Crate Stocking Density

Rough handling during catching triggers an acute fear and stress response, causing a surge of corticosterone and adrenaline. This hormonal cascade accelerates heart rate and glycogen breakdown, inducing weight loss before the transport vehicle even departs. Additionally, overstocking crates restricts internal airflow, creating localized pockets of high heat and stagnant humidity that trap metabolic heat and drive up tissue shrink.

5. Transport Duration, Distance, and Logistics

Weight loss is directly proportional to total transit time. Extended transit exposes birds to prolonged feed and water deprivation alongside continuous mechanical vibration, motion stress, and wind drafts. These factors collectively accelerate physical exhaustion and physiological dehydration.

Estimated Shrinkage Loss by Distance

Distance (km)	Estimated Shrinkage Loss (%)
0-50 km	0.3 - 0.5%
50-100 km	0.5 - 1.0%
100-200 km	1.0 - 1.5%
200-400 km	1.5 - 2.5%
400+ km	2.5 - 4.0%

Note: The above values are based on conditions within the thermoneutral zone and may vary depending on actual ambient weather conditions.

Estimated Shrinkage Loss by Transport Time

Time (Hours)	Estimated Shrinkage Loss (%)
1-2 hours	0.2 - 0.5%
2-4 hours	0.5 - 1.0%
4-6 hours	1.0 - 1.5%
6-10 hours	1.5 - 2.5%
10+ hours	2.5 - 4.0%



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6. Metabolic Rate & Glycogen Depletion

Acute pre-slaughter stress and prolonged fasting induce hyper-metabolism, forcing a metabolic shift from dietary energy utilization to glycogen depletion and structural muscle protein catabolism.

7. Relative Humidity & Weather Conditions

Humidity alters the bird's microclimate by modifying its evaporative cooling efficiency. High relative humidity impairs cooling; when the air is saturated, panting fails to dissipate body heat effectively. This creates compounding thermal stress that spikes core body temperature, accelerates stress hormone secretion, and drives up tissue shrinkage.

Weather ConditionEffect on Shrinkage

High Temperature (>30°C)	Increases shrinkage loss due to rapid dehydration and high respiration rates.
Cold Weather (<15°C)	Reduces moisture shrinkage but increases stress and metabolic heat loss (glycogen burn).
High Humidity (>80%)	It lowers evaporative moisture loss but can cause severe respiratory stress and thermal collapse.
Low Humidity (<40%)	Increases dehydration and accelerates tissue shrinkage loss.
Strong Winds	Causes rapid moisture loss from drafts, increasing physical shrinkage.

8. Sex (Gender Differences)

Females exhibit higher shrinkage losses than males. This is due to a smaller body mass, a higher surface area-to-body weight ratio, lower fat reserves, and a higher metabolic rate per unit weight compared to males.

Targeted Nutritional Interventions Prior to Slaughter

Implementing precise nutritional interventions before slaughter significantly mitigates live weight shrinkage:

1. Electrolyte Loading (Osmoregulatory Interventions)

Stress from catching, loading, and transit triggers rapid cellular dehydration, forcing the bird's body to pull water directly out of breast muscle tissue.

Dietary Electrolyte Balance (DEB): Maintaining an optimal **Dietary Electrolyte Balance (DEB)** during the finishing phase is one of the most effective nutritional strategies for minimizing pre-slaughter shrinkage losses in broilers. DEB regulates **acid-base balance, osmotic pressure, cellular hydration, and muscle water retention**, enabling birds to better withstand the physiological stress of feed withdrawal, catching, transportation, and lairage. To maximize hydration, it is recommended to maintain a **DEB of approximately 250 mEq/kg in the Finisher-I diet**, increasing it to **270 to 280 mEq/kg during the final week before bird lifting**.

Role of minerals in maintaining cellular hydration

Sodium (Na⁺), the primary extracellular cation, helps maintain blood volume and extracellular fluid balance, while potassium (K⁺), the major intracellular cation, preserves cellular hydration and muscle water content. Together, these electrolytes support water retention and reduce dehydration-related live weight losses.

Under the thermoneutral zone (18 to 24°C), a DEB of **220-250 mEq/kg** is generally adequate, while **250-280 mEq/kg** is preferred during warm weather. During periods of acute heat stress and towards the end of lifting, DEB may be increased to **270-280 mEq/kg** with careful monitoring, which helps preserve live weight, improve carcass yield, and enhance overall processing profitability.

- **Water-Soluble Electrolytes:** Add water-soluble sodium bicarbonate (NaHCO₃) 1-2 kg and potassium chloride (KCl) 0.5-1 kg in 1000 liters of drinking water 12 hours before catching. This prevents the systemic metabolic acidosis caused by transport stress and heat.
- **Betaine Supplementation:** Incorporate betaine (an organic osmolyte) into the finisher feed or drinking water at 0.1% to 0.15%. Natural anhydrous betaine helps maintain muscle hydration and minimizes shrinkage loss compared to synthetic betaine HCL.

2. Amino Acid Matrix Buffering

- Once the gastrointestinal tract empties, the bird enters "live shrink," where it begins catabolizing its own muscle tissue for energy.
- **Ideal Amino Acid Profile:** Maximize digestible lysine and methionine levels using crystalline amino acids. This builds structurally dense myofibrillar proteins that trap water tightly within the muscle matrix, reducing drip loss and tissue catabolism.
- **Crude Protein (CP) Restriction:** Drop the total CP level by **0.5% to 1.0%** while keeping synthetic amino acid levels high. Excess CP forces the bird to synthesize and excrete uric acid, a highly water-intensive process that leaves tissues depleted of water before transit.

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3. Structural Carbohydrate Control (Fiber Reduction)

- Gut fill inflates live weight on the farm but translates directly to extreme excretory shrink during the initial hours of fasting.
- **Low-Fiber Shift:** Eliminate high-fiber ingredients (e.g., wheat bran, sunflower meal, or DDGS) from the final finisher feed.
- **Highly Digestible Energy:** Rely strictly on finely ground corn, broken rice, or fat concentrates. Highly digestible starch clears the intestinal tract cleanly within **4 to 6 hours** without trapping excess water in the gut lumen, stabilizing the bird's true body weight.
- **4. Feed Additives for Stress Mitigation**
- **Vitamins C & E + Selenium:** Supplement finisher feed or drinking water with high doses of **vitamin C (200 mg/kg)**, **vitamin E (150 mg/kg)**, and **organic selenium**. These antioxidants stabilize cell membranes against lipid peroxidation triggered by catching and transporting stress.

5. Additional Key Recommendations

- **Transport Cage Ventilation & Density:** Ensure proper ventilation and optimize bird stocking density in crates to minimize localized heat buildup.
- **Pre-Transport Hydration:** Provide drinking water enriched with natural anhydrous betaine for **2 to 3**

hours prior to catching to maximize tissue hydration.

Conclusion

Shrinkage losses in broilers are not inevitable; they can be significantly minimized through a combination of scientific pre-slaughter management and precision nutrition.

Optimizing feed and water withdrawal schedules, maintaining an appropriate dietary electrolyte balance, supplementing drinking water with osmolytes and electrolytes, and reducing dietary fiber prior to transport all help preserve muscle hydration, reduce physiological stress, and improve carcass yield. Together, these interventions enhance bird welfare, processing efficiency, and overall profitability—making proactive shrinkage management an essential component of modern broiler production.



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Choosing the Right Trace Mineral Source: The SMART Delivery Concept

By Sopaphan Pruekvimolphan,
Jolien van Soest

Shifting from mineral quantity to mineral quality

Although required in small amounts, trace minerals support enzyme activity, immunity, antioxidant defense, reproduction, skeletal strength, oxygen transport, hoof integrity, meat quality, and rumen metabolism. Modern poultry and ruminant nutrition is therefore shifting from mineral quantity to source quality: selecting forms that deliver minerals efficiently, with low reactivity and at the right site of action. This matters because soluble sulphates and oxides can release reactive metal ions that bind nutrients such as phytate, vitamins, enzymes, fats, amino acids, or other minerals, causing instability, oxidation, reduced enzyme efficacy, poorer palatability, and higher excretion. Superior mineral sources should combine adequate concentration with stability, controlled solubility, bioavailability, low antagonism, predictable response, and lower environmental impact. These qualities are best evaluated through four practical areas: nutrient antagonism, premix and feed stability, site of action, and economic justification.

Trace Mineral Antagonisms

Trace mineral antagonism is often overlooked but can reduce nutrient availability. Highly soluble sulphates rapidly release free copper, zinc, or iron, which may bind with phytate, calcium, fiber, sulfur, molybdenum, or other minerals. In poultry, this can reduce nutrient stability, enzyme efficacy, lipid quality, gut health, and mineral absorption. In ruminants, early copper and zinc release may disrupt microbial fermentation. Orffa in vitro data showed that sulphate and several organic sources reduced total VFA production, while hydroxy trace minerals did not, supporting their use where rumen activity is critical.

Premix and Feed Stability

Trace mineral source affects feed stability. Reactive minerals can degrade vitamins, enzymes, fats, and amino acids, reducing nutrient value. In poultry diets, free copper and iron can accelerate lipid oxidation and lower fat quality. Hydroxy Cu, Zn, and Mn reduce reactive metal release, while Orffa data showed 10% higher vitamin A and E retention after three months when Excential Smart minerals replaced sulphates. In ruminants, minerals that dissolve too early may suppress fermentation; hydroxy trace minerals maintained total VFA production better than sulphate and several organic sources.

Site of Action

The best trace mineral source depends on where the mineral needs to act. In poultry and swine, the priority is controlled release and absorption in the small intestine. HydroxyCu, Zn, and Mn help reduce early antagonism, while ferrous glycinate supports more efficient iron utilization. In ruminants, the strategy varies by mineral: hydroxy forms help protect rumen fermentation for Cu, Zn, and Mn; L-selenomethionine builds selenium reserves; and cobalt sulphate remains practical because cobalt must be available to rumen microbes for vitamin B₁₂ synthesis.

Economic Justification

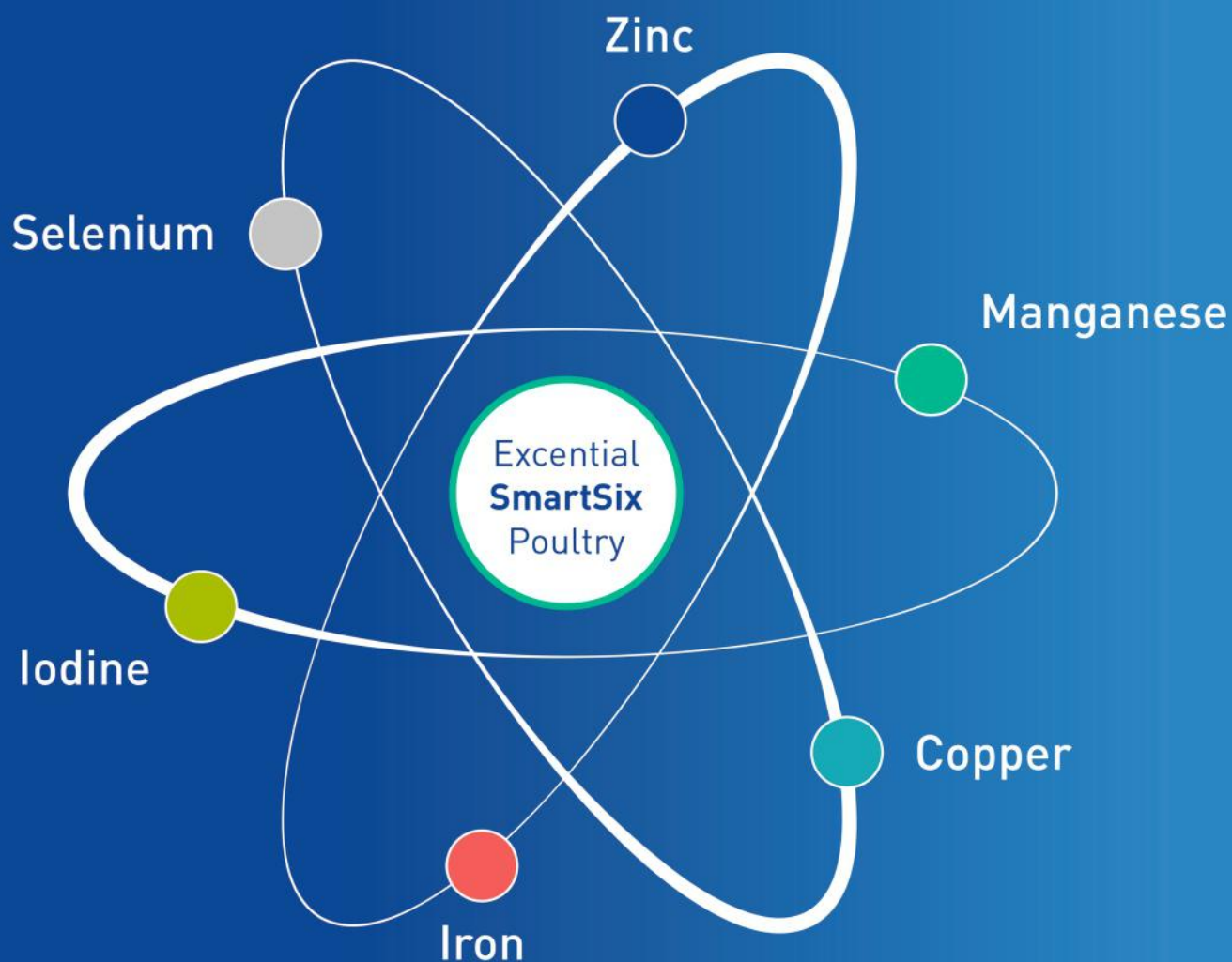
Economics should be judged by total value, not price per kilogram. More bioavailable, less reactive sources can support lower inclusion, reduced excretion, and stronger return on investment.

Why Hydroxy Cu, Zn, and Mn Are Strong Choices: Why Smart bonding matters

Hydroxy Cu, Zn, and Mn are superior sources because their crystalline structure and strong covalent bonds control solubility and reduce reactivity. This targeted release limits early interactions with phytate, vitamins, enzymes, fats, and other minerals, improving both feed stability and biological efficiency.

Orffa data show that Excential Smart C remains stable at neutral pH but progressively releases Cu at lower stomach pH, while copper sulphate stays soluble across pH conditions. By reducing Cu-phytate complex formation, it helps protect phytase activity and improve phosphorus release. Pang and Applegate (2006) also reported consistently higher phytate P hydrolysis with hydroxy copper across Cu levels, whereas hydrolysis declined significantly as Cu increased from 0 to 500 ppm in the copper chloride and copper sulphate groups.

Stability data further supports the practical value of hydroxy trace minerals. Compared with sulphate sources, Excential Smart Hydroxy Cu, Zn, and Mn improved retention of fat-soluble vitamins A by 10% after 3 months storage in premix (Figures 1). For lipid stability, reduced release of reactive metal ions helps slow oxidation. Anisidine value (AV) was measured in Orffa internal study. AV indicates secondary oxidation products such as aldehydes and ketones, which are linked to rancidity, off-flavors, reduced palatability, and lower nutrient quality. After 3-month storage, feed containing hydroxy minerals had lower AV than feed containing sulphate minerals.



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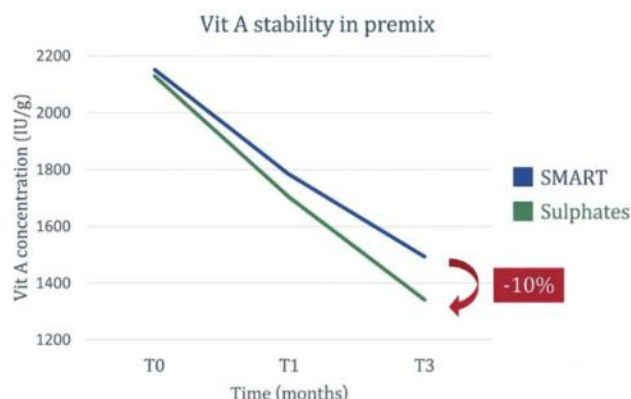


Figure 1. Vitamin A content in 2 premixes with identical composition of trace minerals from SMART hydroxy source and Inorganic source of Zn, Cu, and Mn, at 14000, 18000, and 10000 ppm, respectively, in 3 months storage duration.

For ruminants, the same low-reactivity profile supports rumen compatibility. In simulated rumen fermentation by in vitro gas production technique, hydroxy trace minerals were the only tested source that did not reduce total volatile fatty acid (VFA) production, whereas sulphate and several organic sources reduced fermentation indicators (Figure 2). This makes hydroxy trace minerals especially valuable when the goal is to meet mineral requirements while protecting microbial fermentation.

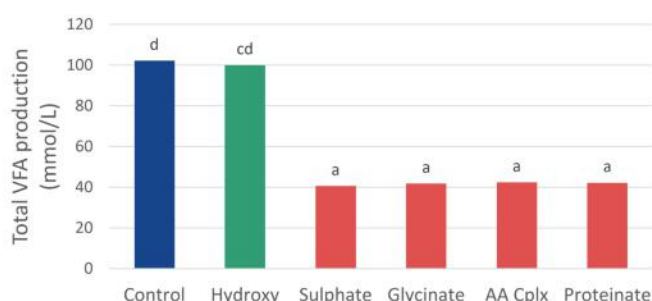


Figure 2. Total VFA production in the rumen with different trace mineral sources (Orffa internal study). Means with different superscripts differ significantly ($P < 0.05$). Source: The XIIIth International Symposium on Ruminant Physiology (ISRP 2019).

Overall, hydroxy Cu, Zn, and Mn are precision mineral sources that combine stable bonding, low neutral-pH reactivity, and controlled digestive release to protect sensitive nutrients, reduce antagonism, preserve feed and premix quality, and improve targeted mineral delivery.

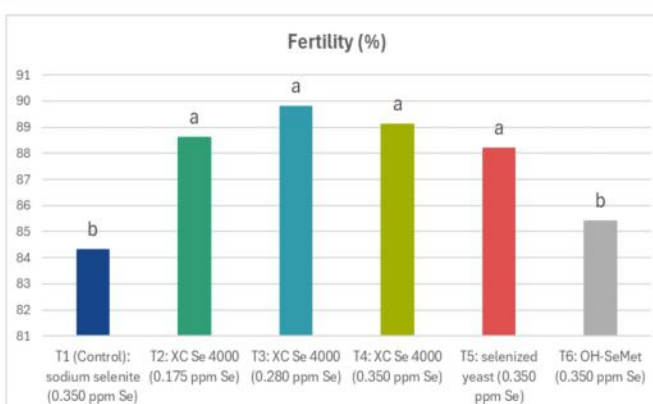
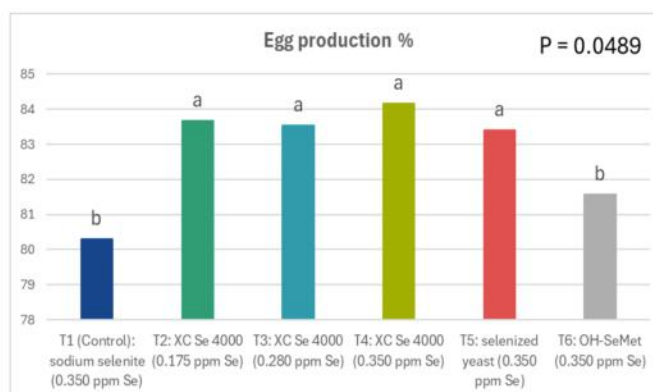
Selenium: Why L-Selenomethionine Is the Preferred Source

Selenium should be viewed differently from Cu, Zn, and Mn because its value depends on metabolic form, not only solubility. L-selenomethionine (L-SeMet) is the preferred source because it follows the methionine pathway and

can be incorporated directly into body proteins, eggs, milk, and meat. This creates a functional selenium reserve that animals can use during stress, reproduction, immune challenge, or reduced feed intake.

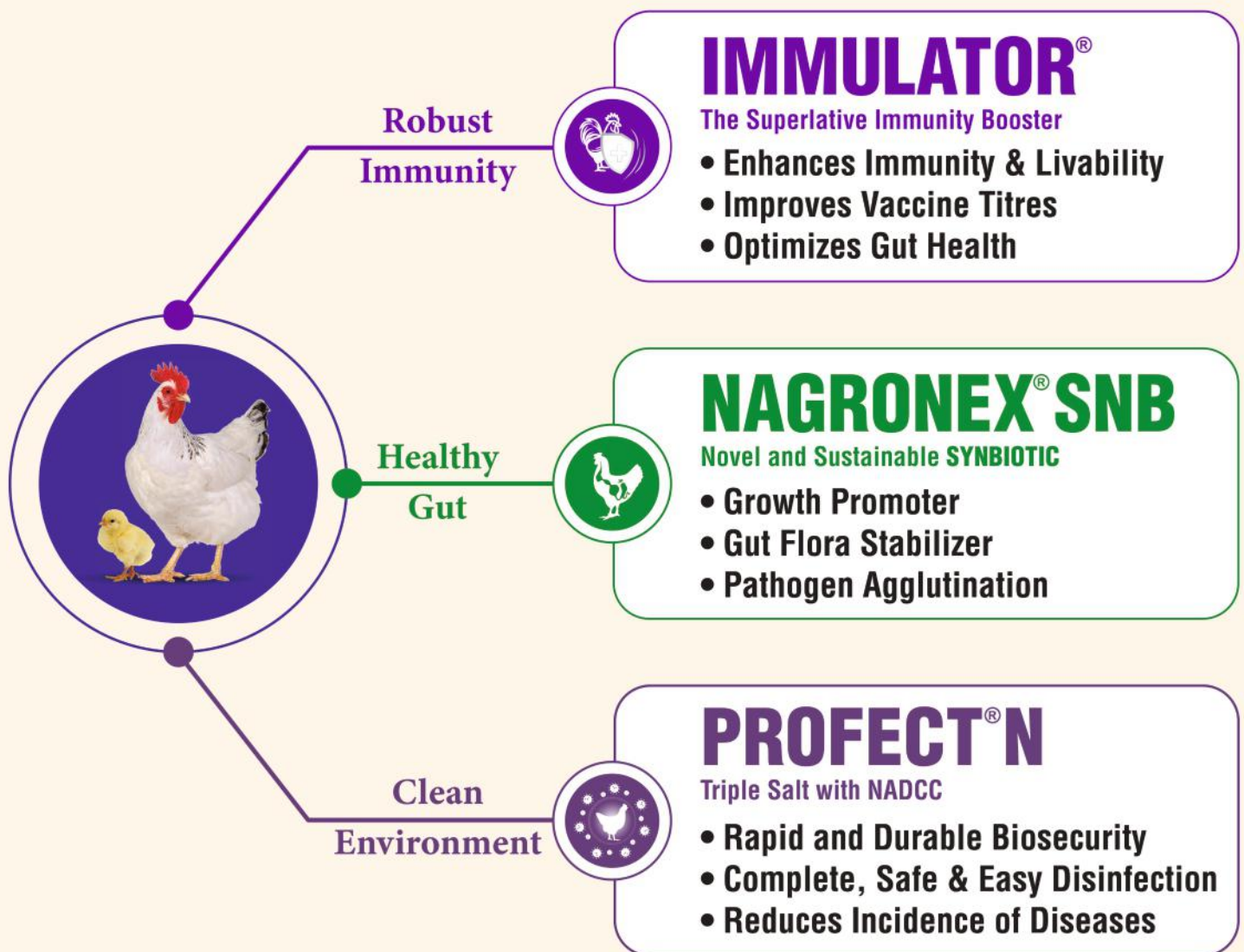
Not all organic selenium is the same. Selenium yeast varies considerably in L-SeMet content even between products and production batches. Under EU specification, selenium yeast should contain at least 63% of total Se as SeMet, yet in practice many selenium yeast products fall below this benchmark. Hydroxy-selenomethionine (OH-SeMet) must first be converted into L-SeMet before it can be incorporated into animal proteins. Scientific studies report conversion of around 80% or lower if liver health has been compromised.

A study by Federal University of Lavras in Brazil with Cobb 500 broiler breeders, Excential Selenium 4000 was compared with sodium selenite, selenium yeast, and OH-SeMet after 84 days of feeding, with eggs collected at week 39. Excential Selenium 4000 improved breeder performance (Figure 3), including egg production, fertility, hatchability, sperm motility, and sperm viability, and increased selenium deposition in eggs and day-old chicks in a dosedependent manner. Importantly, Excential Selenium 4000 at 0.175 ppm Se, or half the selenium yeast dose (0.350 ppm Se), achieved a comparable deposition response, demonstrating the efficiency of direct 100% L-SeMet delivery. Offsprings of Excential Selenium 4000 group showed stronger antioxidant status, antioxidant enzyme activity, and better early weight gain during the first three weeks.





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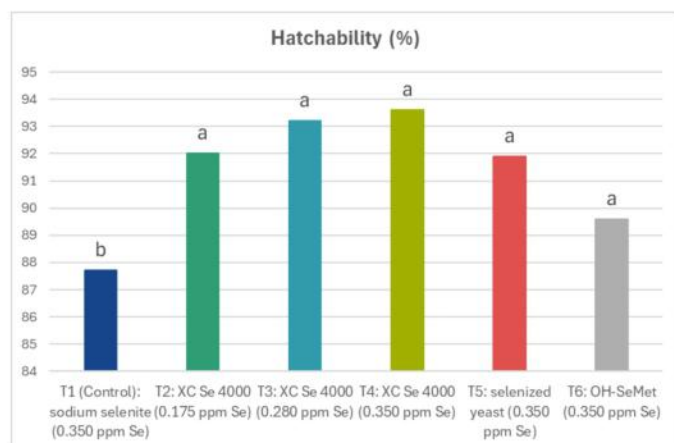


Figure 3. Effect of selenium source and concentration on female broiler breeder performance.

In ruminants, L-SeMet also improved meat tenderness in bull calves and showed positive trends for growth, feed efficiency, and carcass weight in sheep, supporting its role in selenium reserves, antioxidant protection, reproductive transfer, meat quality, and performance.

In short, L-SeMet is the most precise and bioavailable selenium source when the goal is to build reliable selenium reserves and improve selenium transfer into animal tissues and products. This supports more predictable deposition, stronger antioxidant capacity, improved reproductive transfer, and consistent biological responses across species.

Ferrous Glycinate: Efficient Iron Delivery

Iron is essential for hemoglobin and myoglobin formation, oxygen transport, energy metabolism, immunity, enzyme activity, growth, and skeletal development, making source efficiency especially important in fast-growing broilers, young calves, and diets with high antagonistic pressure.

Ferrous glycinate (Fe-Gly) is a precision iron source in which glycine binding helps keep iron stable before absorption while allowing efficient release and uptake at the target site. By improving iron delivery and limiting reactive free iron in the intestinal lumen, it supports gut compatibility, feed stability, and reduced mineral waste.

Broiler study (*Kwiatkowska et al., 2018*) tested whether Fe-Gly could maintain broiler tibia quality at lower iron levels than the Ross 308 recommendation. In a 42-day trial, 200 male broilers received 40 mg Fe/kg as ferrous sulphate or Fe-Gly, or reduced Fe-Gly at 20 or 10 mg Fe/kg. Tibia traits, strength, geometry, cortical properties, and mineral composition in both reduced Fe-Gly groups were maintained or improved versus ferrous sulphate, suggesting that lower Fe-Gly inclusion may be sufficient because of higher bioavailability.

Overall, ferrous glycinate is one of the best iron-source options when efficient iron utilization, lower gut reactivity, and reduced mineral excretion are priorities.

Potassium Iodate: A Reliable and Stable Source of Iodine

Iodine is essential for thyroid hormone synthesis, supporting metabolism, thermoregulation, growth, reproduction, and productivity. In poultry, it supports thyroid activity, feed efficiency, hatchability, and iodine deposition; in ruminants, it supports fertility, milk production, fetal development, and calf vitality. Because requirements are low, but deficiency risks are serious, iodine must be supplied in a stable form.

Potassium iodate (KIO_3) is preferred because its oxidized form is more stable than iodide sources under air, humidity, heat, trace minerals, and reactive premix conditions. This helps preserve iodine during storage, pelleting, transport, and feeding. After ingestion, iodate is converted to iodide for thyroid hormone synthesis, so its main advantage is protecting iodine before it reaches the animal. Compared with potassium iodide, it offers stronger storage stability; compared with calcium iodate, it provides the same iodate concept with a different carrier and good premix compatibility.

Overall, potassium iodate is a reliable iodine source for precise poultry and ruminant supplementation, especially where premix complexity, goitrogenic pressure, or storage conditions require consistent iodine delivery.

Cobalt Sulphate: A Practical Cobalt Source for Rumen Vitamin B_{12} Synthesis

Cobalt requires a different nutritional logic from most trace minerals. In poultry, cobalt itself is less central when vitamin B_{12} is supplied directly. In ruminants, however, cobalt is essential because rumen microbes use it to synthesize vitamin B_{12} , which supports propionate metabolism, glucose formation, protein metabolism, appetite, growth, reproduction, immunity, and milk production. Inadequate cobalt may lead to poor intake, weak growth, anemia, fertility problems, and lower productivity.

Specifically for rumen conditions, Cobalt sulphate is a practical ruminant source because it is soluble, rumen-available, and cost-effective. Compared with cobalt carbonate, it is more readily available in rumen fluid; compared with organic cobalt, it often delivers similar practical outcomes at lower cost when cobalt supply is adequate.

In ruminants, *Raths et al. (2023)* found similar growth and carcass responses among inorganic and organic cobalt sources when cobalt was sufficiently supplied, suggesting source differences may be small under adequate nutrition.

Overall, cobalt sulphate is preferred in ruminants for rumen microbial vitamin B_{12} synthesis. Its value lies in rumen availability and cost efficiency.

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Preferred Trace Mineral Sources

Mineral and Preferred source	Why this source is superior	Poultry relevance	Ruminant relevance
Copper — Hydroxy copper	Low neutral-pH solubility, gradual release, and lower antagonism	Supports growth, immunity, pigmentation, enzymes, and feed stability	Protects rumen fermentation, hoof health, fertility, and immunity
Zinc — Hydroxy zinc	Strong covalent bonds reduce premature dissociation and interactions	Supports footpad health, feathering, gut integrity, immunity	Supports hoof health, udder health, fertility, immunity
Manganese — Hydroxy manganese	Controlled release and lower reactivity than sulphate sources	Supports skeletal development, eggshell quality, breeder performance	Supports reproduction, skeletal health, enzyme function
Selenium — L-selenomethionine	Only selenium form that can be incorporated into animal protein as a reserve	Improves body weight, FCR, uniformity, meat tenderness, breeder-offspring selenium transfer	Improves selenium reserves, meat tenderness, carcass value, immune and reproductive support
Iron — Ferrous glycinate	Glycine binding improves utilization and reduces free luminal iron	Supports iron status, gut health concept, and skeletal quality at lower dosage	Useful in young animals or deficiency-risk situations
Iodine — Potassium iodate	Stable iodine source with reliable retention in premix and feed	Supports growth, hatchability, thyroid activity	Supports metabolism, fertility, milk production, calf vigor
Cobalt — Cobalt sulphate	Soluble and available to rumen microbes, which is the biological target	Less critical if vitamin B ₁₂ is supplemented	Essential for vitamin B ₁₂ synthesis, propionate metabolism, energy production

Conclusion

Modern mineral nutrition is moving from simple supplementation to precision delivery, where each mineral source is selected according to its chemistry, site of action, and biological role. Hydroxy copper, zinc, and manganese improve stability and reduce unwanted reactivity; L-selenomethionine builds a true selenium reserve; cobalt sulphate remains the practical choice for rumen vitamin B12 synthesis; potassium iodate ensures stable iodine delivery; and ferrous glycinate supports efficient iron utilization. Together, these source-specific strategies help poultry and ruminant nutritionists design more stable, efficient, and biologically valuable mineral programs.

References are available upon request.

By Sopaphan Pruekvimolphan

Technical Manager, Orffa (Thailand) Ltd.

Jolien van Soest

Global Solution Manager

Mineral Nutrition, Orffa Additives B.V.,

The Netherlands.

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Re-thinking Litter Management in Poultry: Addressing Flies and Odour Beyond Conventional Interventions

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Introduction

Litter management is a cornerstone of sustainable poultry production, directly impacting bird health, environmental safety, and community acceptance. Among the many challenges faced by poultry producers, fly infestation and persistent odour remain the most difficult to control. These issues not only affect farm hygiene but also pose risks of disease transmission, regulatory scrutiny, and strained relationships with neighbouring communities. While physical and chemical interventions are widely used, their limitations have become increasingly evident, prompting the need for more holistic solutions.

The Scale of the Problem

In layer farms, manure accumulates over extended periods. High organic content, combined with moisture and warmth, provides an ideal environment for microbial decomposition. This decomposition releases ammonia and volatile organic compounds (VOCs), causing characteristic odours. Simultaneously, manure becomes a breeding ground for flies, especially the housefly (*Musca domestica*), which thrives in moist litter. These flies are more than a nuisance; they act as mechanical vectors for pathogens such as *Salmonella*, *E. coli*, & *Campylobacter*. Odour emissions, meanwhile, not only reduce the quality of farm air but also raise complaints from nearby communities, often escalating into regulatory challenges.

Physical Interventions and their Limitations

Producers have long relied on physical interventions such as:

- Frequent manure removal to reduce breeding material.
- Ventilation systems to disperse odour and maintain drier litter.
- Litter drying and aeration using mechanical turners.
- Screens and traps to reduce adult fly populations.

While these practices offer temporary relief, they often fail under real-world conditions. For instance:

- Frequent manure removal is labour-intensive and costly, particularly in large-scale operations.
- Ventilation disperses odour but does not eliminate its source.
- Mechanical drying is inconsistent, especially during humid or rainy seasons.
- Screens and traps reduce adults but do not address the root cause, fly breeding in litter.



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Chemical Interventions and their Drawbacks

Chemical interventions, including insecticides, larvicides, disinfectants, and litter amendments, are common tools in poultry waste management. However, their limitations are increasingly recognized:

- Insecticide resistance develops rapidly in fly populations, reducing effectiveness over time.
- Chemical residues may contaminate litter, raising concerns for composting.
- Ammonia-binding chemicals like alum or lime can lower odour temporarily but require repeated application, adding to costs.
- Overreliance on chemicals may disrupt the microbial balance of litter, sometimes worsening odour generation.
- Moreover, environmental and consumer concerns around chemical residues and sustainability are pushing farms to move away from sole reliance on these methods.



The Recurrent Fly Cycle: Why Larval Control is Critical

Flies are persistent because of their rapid and recurring life cycle. A single housefly can lay hundreds of eggs on moist manure, which hatch into larvae (maggots) within 24 hours. These larvae then pupate and emerge as adults in less than 10 days under favourable conditions. As long as litter provides moisture, warmth, and nutrients, this cycle continues relentlessly.

Targeting only adult flies is a short-lived strategy. Even if adults are eliminated, new generations emerge within days, re-establishing the infestation. The only sustainable way to control flies is to break the cycle at the larval stage. Interventions that dry litter, stabilize nutrients, or directly suppress larval development can drastically reduce fly populations at their source. By focusing on larvae, producers can prevent future outbreaks rather than constantly chasing adult flies with traps and insecticides.

Why Current Approaches Fall Short

The persistence of fly and odour issues highlights a critical point: physical and chemical interventions primarily address symptoms, not causes. Flies proliferate because manure remains nutrient-rich and moist enough to sustain their lifecycle. Odours persist because microbial breakdown of uric acid and proteins continues unchecked. As long as litter remains biologically unstable, these problems will resurface despite repeated interventions.



Moving Toward Sustainable Management

The limitations of current strategies underscore the need for integrated, biology-centred approaches that stabilize manure at the source. By modifying microbial activity and nutrient dynamics within the litter, it becomes possible to:

- Reduce ammonia release and odour formation.
 - Limit the conditions favourable for fly breeding.
 - Improve litter value as a safe, nutrient-rich organic fertilizer.
- Such approaches not only provide long-lasting results but also align with the poultry industry's push toward sustainability, biosecurity, and circular economy practices.



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ABTL's Integrated Protocol

To overcome the limitations of conventional methods, many farms are now adopting biological interventions that harness the power of microbes and enzymes to stabilize litter. Among the proven approaches are ABTL's flagship solutions - Flyzyme and Envirozyme, which are applied directly on the litter.

- **Flyzyme:** A microbial–enzymatic formulation that accelerates litter decomposition while disrupting the housefly life cycle. By enhancing the breakdown of organic matter, Flyzyme creates conditions that are unfavourable for maggot survival, effectively killing larvae and preventing their progression into adult flies. This approach tackles the problem at its source, ensuring long-term control over fly populations.
- **Envirozyme:** A specialized blend of enzymes and beneficial microbes aimed at reducing odour emissions from poultry litter. By stabilizing nutrients and limiting the microbial breakdown processes that release ammonia and volatile organic compounds, Envirozyme significantly lowers foul smells. This not only improves in-house air quality for birds and workers but also minimizes complaints from surrounding communities.

Together, these biological tools provide a dual benefit - Flyzyme strengthens decomposition and halts fly breeding at the larval stage, while Envirozyme tackles odour by stabilizing litter nutrients.

Supporting Evidence from Field Trials

Field evaluations conducted under commercial poultry farm conditions have validated the efficacy of these biological interventions.

Parameter	Initial Litter Condition	After Flyzyme+ Envirozyme Application
C:N ratio	10-12:1	25-30:1 (optimum)
Fly larvae survival(%)	High (70-80%)	<10%
Odour intensity (qualitative)	Strong, Persistent	Significantly reduced
Ammonia release (ppm range)	80-120 ppm	30-40 ppm
Litter stability& fertilizer value	Poor, Unstable	Stabilized, Nutrient-rich

These outcomes demonstrate that combined microbial enzymatic interventions such as Flyzyme + Envirozyme can significantly improve litter quality by achieving nutrient stabilization (optimum C:N ratio), odour reduction, and fly control at the larval stage; results not consistently attainable with physical or chemical interventions alone.

Conclusion

Poultry litter management is more than a sanitation task; it is a critical determinant of farm performance, environmental impact, and community relations. While physical and chemical interventions remain widely used, their shortcomings in controlling flies and odour are increasingly evident. Tackling these challenges at their biological root, rather than applying temporary fixes, represents the path forward for resilient and sustainable poultry production.



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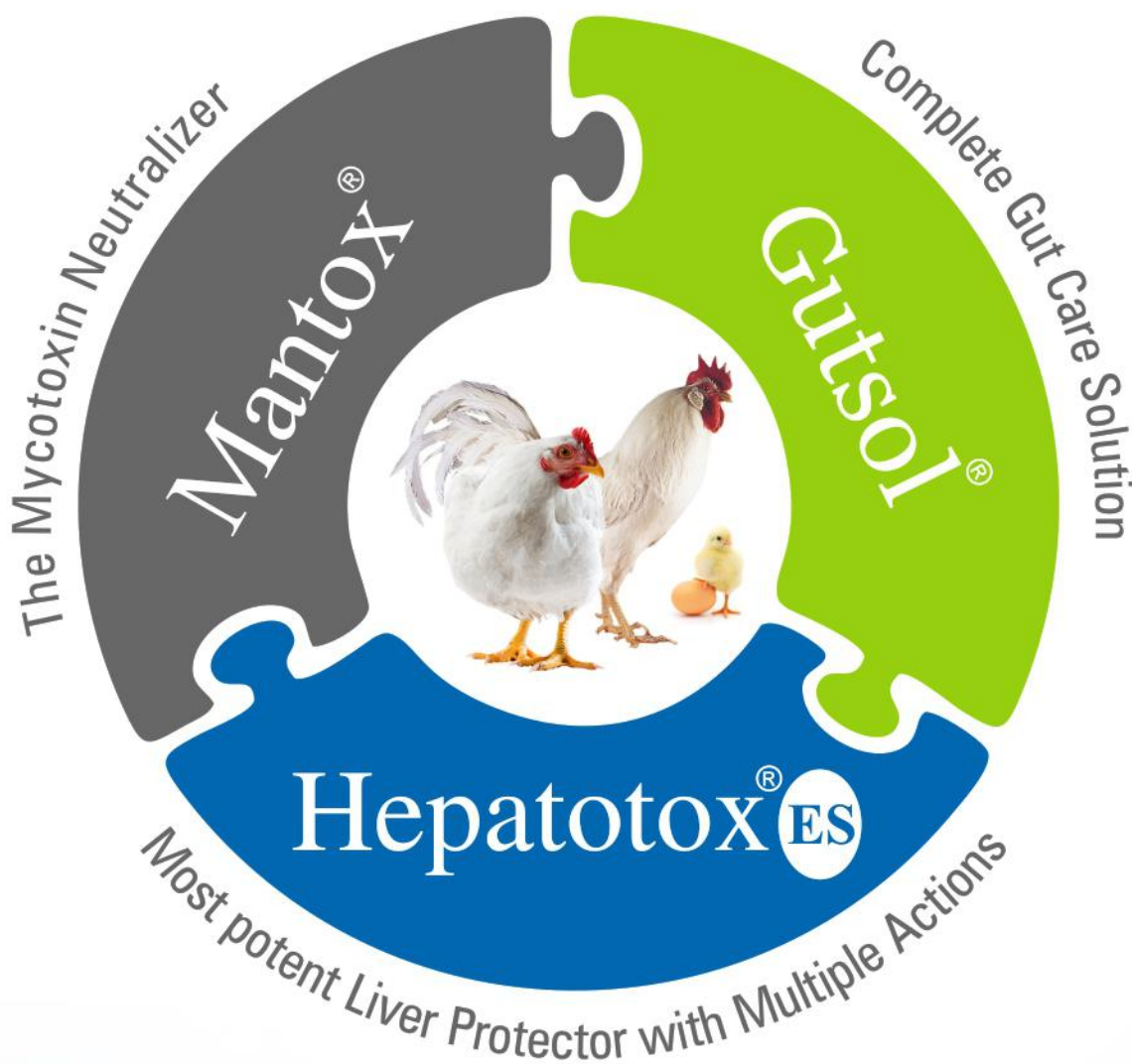
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Omega-3 Enriched Eggs through Nutritional Manipulation

Introduction

One of the most economical and nutrient-dense sources of animal protein is eggs. Consumer interest in functional foods, which offer health advantages beyond basic nutrition, has grown in recent years. One example of a functional food is omega-3 enriched eggs, which are made by altering the laying hens' diet to raise the amount of omega-3 fatty acids in the egg yolks.

What are Omega-3 Fatty Acid-

Essential polyunsaturated fatty acids that are crucial to human health are omega-3 fatty acids. Alpha-linolenic acid (ALA), eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA) are the three main omega-3 fatty acids. They have been shown to improve immune system performance, brain development, cardiovascular health, and inflammation reduction.

Nutritional Manipulation Through Omega-3 Enrichment-

By feeding laying hens foods high in omega-3, the amount of omega-3 in their eggs can be raised. Typical feed components include:

- Both flaxseed and flaxseed oil
- Fish oil
- Microalgae, or algae meal
- Chia seeds
- Canola oil

The omega-3 fatty acids from these feed ingredients are absorbed and deposited in the egg yolk, producing eggs with far higher omega-3 levels than regular eggs.

Benefits of Omega-3 Enriched Eggs-

- Boost cardiovascular health in people.
- Encourage the growth of the brain and eyes.
- Make omega-3 fatty acids accessible and reasonably priced.
- Boost the eggs' market worth.
- Fulfil the increasing demand for functional foods from consumers.

Challenges-

Despite their advantages, there are certain difficulties in producing eggs enhanced with omega-3:

- Specialised components result in higher feed prices.
- When using a lot of fish oil, there could be a fishy taste.
- Omega-3 fatty acids undergo oxidative degradation while being stored.

Types of Omega-3 Fatty Acids-

1. **ALA, or alpha-linolenic acid** present in canola oil, flaxseed, and chia seeds.essential fatty acid that humans are unable to produce.
2. **EPA, or eicosapentaenoic acid** mostly found in marine sources and fish oil.promotes heart health and aids in the reduction of inflammation.

Dr. Shivangi Singh Assistant Professor
(Department of Animal nutrition) School of
Veterinary Science Abhilashi University Mandi H.P.

Dr. Priya Jagota, Assistant Professor
(Department of Animal Nutrition) School of
Veterinary science Abhilashi University Mandi H.P

3. **DHA, or docosahexaenoic acid** crucial for both visual and brain development.important structural element of brain tissues.

Mechanism of Omega-3 Deposition in Eggs-

When laying hens eat feed high in omega-3 fatty acids:

- The gut is where fatty acids are absorbed.
- Carried by the bloodstream.
- Deposited in the yolks of developing eggs.
- Higher quantities of omega-3 fatty acids are found in the resulting eggs.

Effect on Egg Quality-

- Increases omega-3 concentration in yolk.
- May slightly alter yolk color.
- Generally does not affect shell quality.
- Improves nutritional value of eggs.

Human Health Benefits-

Cardiovascular Benefits-Reduces blood triglycerides, Supports normal blood pressure.

Brain Function-Improves cognitive function, Essential for fetal and infant development.

Eye Health-DHA contributes to retinal development.

Anti-inflammatory Effects-Helps reduce chronic inflammation.

Economic Consideration-

- The price of the components of omega-3 feed.
- Extra costs associated with production.
- Higher costs are offset by a premium selling price.
- Profitability rises with increased demand.

Factors Affecting Omega-3 Enrichment-

- Type of omega-3 source used.
- Inclusion level in feed.
- Age and breed of hens.
- Feeding duration.
- Storage conditions of eggs.

Advantage for Poultry Industry-

- Production of value-added eggs.
- Higher market price and profitability.
- Improved consumer acceptance.
- Opportunity for niche marketing.

Conclusion-One effective example of nutritional manipulation in poultry production is omega-3 enriched eggs. Producers can improve the nutritional value of eggs and provide consumers a healthier food product by altering the feed of laying hens. Omega-3 enriched eggs are anticipated to be crucial to the poultry industry's future due to growing health and nutrition consciousness.

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PRESENTATION

Powder : 10 kg & 25 kg

Liquid : 1 Ltr & 5 Ltr



Genetic Selection for Growth

Efficiency and Its Association with Recurring Reproductive and Metabolic Conditions in Broiler Breeder Hens: A Narrative Review

Dr Pradip P. Linge
Founder and CEO of
GrinMicro Bioscience Pvt. Ltd.

Abstract

Modern broiler breeder hens are the female parents of fast-growing, feed-efficient broiler chickens and carry many of the same genetic traits selected for in their meat-type offspring. Field reports from commercial breeder operations describe a recurring cluster of production and health problems, including suboptimal peak production, hepatic lipidosis, mid- and late-cycle reproductive decline, excess body weight despite feed restriction, abdominal fat deposition, disorganised follicular development and egg-yolk peritonitis, delayed recovery from disease challenge, reduced hatchability with early embryo mortality, late-cycle fertility decline, deteriorating eggshell quality, and transient non-laying episodes. These conditions are conventionally managed as largely independent problems through feed restriction, lighting programmes, and targeted nutrient supplementation. This narrative review surveys the published literature relevant to each condition and considers a proposed, but not yet directly confirmed in broiler breeders, unifying physiological contributor: an inherited tendency toward altered insulin signalling in broiler-derived genetic lines, which has been hypothesised to influence AMP-activated protein kinase (AMPK) activity in metabolically active tissues. Evidence for individual components of this pathway is drawn primarily from studies in broiler chicks, laying hens, and other intensively selected livestock species that exhibit comparable trade-offs between production traits and reproductive fitness, including dairy cattle, double-muscled beef breeds, broad-breasted turkeys, and brachycephalic dog breeds. Direct experimental evidence linking AMPK activity to each of the eleven conditions in broiler breeder hens specifically remains limited. This review is intended to synthesise existing knowledge and identify priorities for targeted research rather than to establish causation.

1. Introduction

The broiler breeder hen occupies an unusual physiological position. She carries the genome of a bird selected almost exclusively for rapid, efficient growth of her offspring, yet her own productive role requires the opposite: a controlled body weight and a steady, sustained rate of egg production over more than a year of lay. This tension between the traits favoured by broiler selection programmes and the physiological requirements of a long-lived breeding female has been described in the poultry science literature as the "broiler breeder paradox" (Decuyper et al., 2006; Decuyper et al., 2010). Feed restriction during rearing and lay is the primary management tool used to reconcile this conflict, and it is generally effective at controlling body weight and supporting acceptable reproductive output. However, a cluster of production and health problems continues to be reported in well-managed commercial flocks even where feed restriction, lighting, and nutrition programmes are followed closely.

Figure 1. Representative modern broiler-type bird, illustrating the fast-growth, heavy-bodied conformation selected for in broiler genetic lines and inherited by their breeder parents.



This review considers eleven such conditions as they are commonly described in the field: peak production below breed-standard targets, low egg output associated with pale or enlarged livers, a gradual decline in reproductive performance after week 40, excess body weight despite restricted feeding, abdominal fat accumulation with hepatic lipidosis, disorganised follicular growth associated with egg-yolk peritonitis, slow recovery following disease challenge, reduced hatchability with early embryo mortality, declining fertility beyond week 55, deteriorating eggshell quality after peak, and transient non-laying episodes affecting a subset of hens at defined ages. These are typically managed as separate problems, each with its own established set of interventions. The purpose of this review is twofold: first, to summarise the genetic and physiological background relevant to each condition as it is currently understood; and second, to examine a hypothesis, developed by analogy with better-characterised species, that a shared metabolic pathway involving insulin signalling and AMPK may contribute to several of these conditions simultaneously. This hypothesis is presented as a direction for further research rather than as an established explanation, and each section notes where supporting evidence is indirect or drawn from species other than the broiler breeder hen.

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2. Genetic Selection and Reproductive Trade-offs: A Pattern Across Species

Selection for rapid growth and high feed efficiency in broiler chickens has been one of the notable achievements of applied animal genetics, substantially reducing the time and feed required to reach market weight over the past several decades (Decuyper et al., 2010). The broiler breeder hen inherits many of the same genes that underlie this efficiency, including a strong appetite and a tendency to deposit tissue quickly, even though her own reproductive role calls for a different metabolic priority: sustained follicular development and ovulation rather than fast somatic growth. Feed restriction is used specifically to manage this conflict, and its reproductive benefits in broiler breeders are well documented (Bruggeman et al., 1999).

This trade-off between a selected production trait and reproductive fitness is not unique to broiler breeders. In dairy cattle, decades of selection for milk yield have produced animals that frequently cannot consume enough feed to match early-lactation milk output, a mismatch associated with elevated rates of ketosis, hepatic lipidosis, and reduced fertility (Roche et al., 2009; Overton & Waldron, 2004; Figure 2).

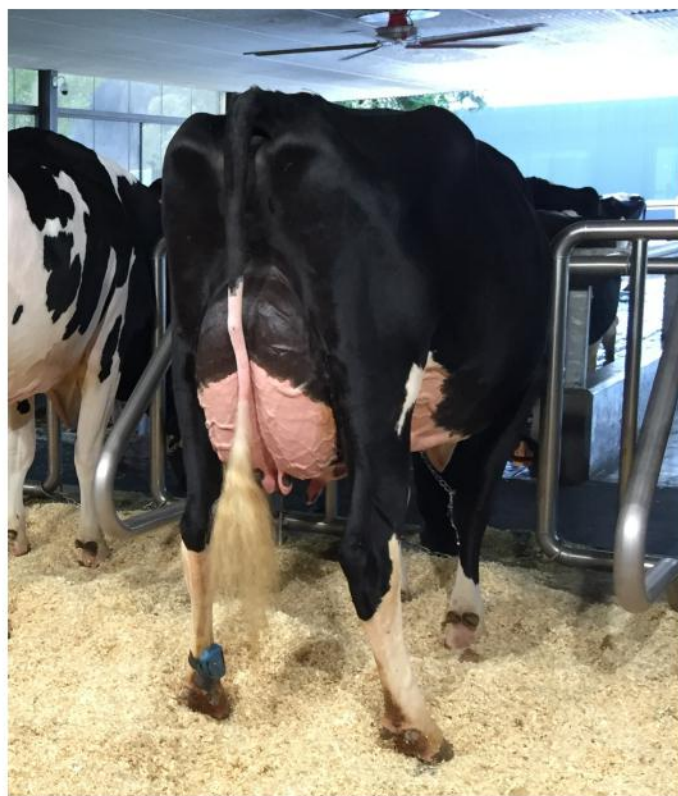


Figure 2. High-yield dairy cow, illustrating a comparable production-reproduction trade-off in another intensively selected livestock species.]] In double-musled beef breeds such as the Belgian Blue, a mutation in the myostatin gene that produces markedly increased muscle mass is also associated with delayed puberty, reduced fertility, and a narrowed birth canal that necessitates caesarean delivery in most calvings (Bellinge et al., 2005). In turkeys, sustained selection for increased body weight has been

shown experimentally to reduce egg production and reproductive performance in selected lines relative to unselected control populations, to the point that natural mating in heavy commercial strains is now largely replaced by artificial insemination (Nestor, 1977). In dogs, breeds selected intensively for a brachycephalic head conformation, including the English Bulldog, show a high prevalence of dystocia related to fetopelvic disproportion, with the great majority of litters delivered by caesarean section rather than natural birth (Wydooghe et al., 2013; Evans & Adams, 2010). Similar production-reproduction trade-offs have been described in pigs selected for lean growth and in farmed salmon selected for rapid growth. Taken together, these examples illustrate a general pattern in which intensive selection for a single valuable trait is frequently accompanied by a cost elsewhere in the animal's physiology, and reproduction is commonly among the traits affected. This comparative context motivates, but does not by itself demonstrate, the hypothesis that a shared metabolic mechanism could similarly link several distinct field conditions in the broiler breeder he

3. A Proposed Metabolic Contributor: Insulin Signalling and AMPK

AMP-activated protein kinase (AMPK) is a cellular energy sensor conserved across vertebrate tissues that is activated when cellular energy status declines, and that broadly promotes energy-conserving processes while restraining energy-consuming ones, including lipid synthesis (Hawley et al., 2003; Shackelford & Shaw, 2009; Ferrer et al., 2017). In mammalian liver, AMPK activation has been shown to inhibit lipogenic enzyme activity via phosphorylation of sterol regulatory element-binding protein (SREBP) pathway components, reducing hepatic fat accumulation (Li et al., 2011; Zhao et al., 2019). In hen granulosa cells, AMPK activation has been shown to modulate the response of ovarian follicles to insulin-like growth factor 1 (IGF-1) and to influence progesterone secretion, indicating a role in follicular signalling in poultry specifically (Tosca et al., 2007; Cai et al., 2017). Separately, studies in broiler-type chicks have reported evidence of altered insulin sensitivity relative to layer-type strains from an early age, a finding that has been interpreted as consistent with the selection pressure for rapid early growth (Shiraishi et al., 2011; Saneyasu et al., 2020).

Because insulin signalling and AMPK activity interact within shared intracellular pathways in other species, it has been proposed that the altered insulin sensitivity documented in broiler-type chickens could, by extension, be associated with reduced AMPK activity in breeder hens carrying the same genetic background. This extension has intuitive appeal given the tissue-level roles AMPK plays in lipid metabolism and follicular signalling described above, both of which are relevant to the conditions considered in this review.

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However, it should be noted clearly that direct measurement of AMPK activity across the reproductive, hepatic, and ovarian tissues of broiler breeder hens under field conditions has not, to the authors' knowledge, been comprehensively reported, and the pathway described here should be regarded as a working hypothesis that draws on findings from related tissues, related species, and early-life broiler physiology rather than as an established mechanism in adult breeder hens.

4. Field-Observed Conditions in Broiler Breeder Flocks

4.1 Suboptimal Peak Production

Many commercial flocks fail to reach the 85-87% hen-day production typically expected at peak, or reach it later than the breed-standard timeline, with the shortfall usually emerging between weeks 27 and 32 and persisting through the remainder of the peak-lay period. Feed restriction, precise light stimulation timed to target body weight, and close monitoring of flock uniformity are the primary tools used to manage this window, and they are generally effective. Where a shortfall persists despite well-executed feed and light management, the biological literature summarised in Section 3 suggests that reduced cellular energy signalling in developing follicles is a plausible, though unconfirmed, contributor, since AMPK-dependent signalling has been shown to influence the follicular response to reproductive hormones in hens (Tosca et al., 2007).

4.2 Low Egg Output with Hepatic Lipidosis

Hens with reduced egg output not infrequently show, at post-mortem, enlarged, pale, and friable livers consistent with fatty liver syndrome. Laying hens naturally transport substantial quantities of lipid through the liver to support yolk formation, and dietary energy control together with choline and methionine supplementation, which support hepatic lipid export, are the standard management responses (Zhao et al., 2019). These measures act primarily on lipid clearance rather than on the rate of hepatic lipid synthesis. Given the demonstrated role of AMPK as a restraint on lipogenic enzyme activity in mammalian liver (Li et al., 2011), reduced AMPK activity has been proposed as a contributor to cases where lipid accumulation continues despite adequate choline and methionine provision, although this mechanism has not been directly confirmed in the breeder hen liver (Figure 3).

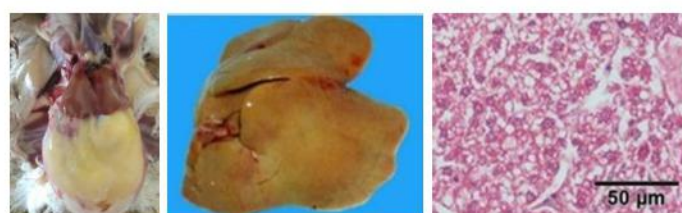


Figure 3. Hepatic lipidosis in a broiler breeder hen. 1) gross abdominal appearance at necropsy. 2) enlarged, pale, friable liver at post-mortem. 3) histological section showing diffuse hepatocellular vacuolation (scale bar 50 µm).

4.3 Reproductive Decline After Week 40

Past week 40 of lay, some flocks show a gradual decline steeper than the standard production curve, with less consistent egg timing and a higher incidence of double-yolked or soft-shelled eggs, despite feed intake and body weight remaining on target. Late-lay feed reduction, consistent lighting, and calcium-to-phosphorus adjustment are the established management responses. This pattern of gradual decline over many months of sustained lay is consistent with a cumulative process rather than an acute nutrient shortage, and a mild but persistent reduction in cellular energy signalling, building incrementally across the laying cycle, has been proposed as one possible contributor to this cumulative wear, though this remains a hypothesis rather than a demonstrated mechanism specific to this condition.

4.4 Excess Body Weight Despite Restricted Feeding

Individual birds or whole flocks can exceed the standard weight curve even while on a correctly executed restricted feeding programme, often accompanied by greater abdominal fat deposition and reduced flock uniformity. Feed grading, skip-a-day or 5:2 feeding schedules, and fibre dilution are used to manage this once restriction is already at practical welfare limits. Because two hens on an identical ration can reach different body weights, differences in how efficiently individual birds convert and store feed energy, rather than differences in intake, are likely to explain much of this residual variation. Reduced AMPK activity relative to insulin signalling has been proposed as one contributor to this efficient-storage phenotype, by analogy with its role in mammalian energy partitioning, but this has not been directly tested in breeder hens.

4.5 Abdominal Fat Accumulation and Hepatic Lipidosis

At post-mortem, some birds show marked abdominal fat together with hepatic lipid accumulation even when their outward body condition scores appear normal, indicating that external scoring can underestimate internal fat deposition. Dietary energy control, choline and methionine supplementation, and periodic post-mortem sampling are the standard approaches used to monitor and manage this risk. Because this condition shares its proposed hepatic mechanism with the fatty liver picture described in Section 4.2, and because breeding for lean muscle in the broiler offspring appears to have shifted fat deposition toward abdominal and hepatic depots in the parent hen, these two conditions may share a common underlying contributor, consistent with the proposed role of AMPK in restraining lipogenesis in both tissues (Li et al., 2011; Zhao et al., 2019).

4.6 Disorganised Follicular Growth and Egg-Yolk Peritonitis

Some hens show a disorganised hierarchy of ovarian follicles rather than the normal smooth size sequence, a pattern associated with egg-yolk peritonitis, in which a released yolk enters the body cavity instead of the oviduct.



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Biosecurity, vaccination, and consistent lighting and feeding schedules are used to reduce known triggers, but these measures act on external risk factors rather than on the internal hormonal fine-tuning that governs orderly follicular recruitment. AMPK-dependent signalling has been shown to modulate the granulosa cell response to reproductive hormones in a manner that varies appropriately by follicle size in hens (Tosca et al., 2007; Cai et al., 2017), and a weakening of this graded response has been proposed as a plausible internal contributor to follicular disorganisation, alongside the established infectious and management risk factors (Figure 4).



Figure 4. Disorganised ovarian follicular hierarchy recovered at post-mortem from a broiler breeder hen, showing follicles of irregular size and maturity rather than the normal smooth size sequence.

4.7 Delayed Recovery Following Disease Challenge

Following a disease challenge, some flocks recover production and shell quality more slowly than others despite receiving comparable supportive care once the acute illness has resolved. Increased dietary protein and micronutrients, electrolyte support, and enhanced biosecurity during the recovery window are the standard responses, and they act principally by supplying additional raw material for repair. Tissue repair and immune response draw on the same cellular energy systems implicated elsewhere in this review, and AMPK is known to play a role in cellular stress response and in clearance of damaged cellular components in other species (Shackelford & Shaw, 2009). Birds with a genetically reduced capacity for AMPK activation may therefore have less metabolic reserve available during recovery, though this has not been directly measured in broiler breeders recovering from field disease challenge.

4.8 Reduced Hatchability and Early Embryo Mortality

Some flocks show lower-than-expected hatchability with a disproportionate share of embryo mortality occurring in the first week of incubation, despite eggs appearing normal externally. Breeder nutrition through pre-lay and peak, careful egg handling and storage, correct mating ratios, and tightly controlled incubation parameters are the established management levers, and they act on factors external to the yolk itself or on the incubation environment. Because the first week of embryonic development relies heavily on the nutrient and cellular quality the hen has deposited in the yolk, maternal metabolic status during yolk formation is a plausible contributor to variation in early embryo survival that incubation management cannot address, consistent with the proposed role of AMPK-related pathways in hepatic lipid handling described above, although this connection to yolk composition and early embryo viability specifically requires direct confirmation (Figure 5).



Figure 5. Early embryo mortality in a broiler breeder hatching egg, showing an underdeveloped embryo at candling/break-out examination.

4.9 Declining Fertility Beyond Week 55

Past week 55 of lay, fertile egg percentage can decline faster than expected even where male fertility parameters and mating behaviour appear normal, which typically directs management attention toward the male. Female-side contributors, specifically the hen's sperm-storage tubule function and the precision of her ovulation timing, are less commonly investigated but are also known to decline with age and cumulative reproductive demand. Where the cumulative metabolic strain proposed in Section 4.3 continues to build through late lay, a corresponding decline in the cellular systems supporting sperm storage and ovulation timing has been proposed as a female-side contributor to late-cycle fertility loss that complements, rather than replaces, standard male-focused evaluation.

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4.10 Deteriorating Eggshell Quality After Peak

Eggshell quality commonly declines faster than expected after peak lay, with thinner, weaker, or irregularly shaped shells and increased breakage, typically monitored through shell strength and thickness measurement. Calcium and phosphorus adjustment, calcium particle size management, and vitamin D3 supplementation address calcium supply and availability, which is necessary but may not be sufficient if the enzymatic machinery of the shell gland responsible for building the shell's carbonate structure is itself functioning suboptimally. Because this enzymatic activity depends on cellular energy status, reduced AMPK signalling in shell gland tissue as hens age past peak has been proposed as a contributor to shell quality decline that operates independently of calcium supply, though this has not been directly measured in the shell gland of ageing broiler breeder hens.

4.11 Transient Non-Laying Episodes

Within a typical flock, a subset of hens, commonly estimated at 8-10%, temporarily cease laying for approximately four to five weeks, most often around weeks 31-33 and again around weeks 40-45, with the majority subsequently returning to production. These pause points coincide with the periods of highest metabolic demand described elsewhere in this review, namely the transition into peak and a second point in mid-lay. Because most affected hens recover without intervention, this pattern is often treated by farms as an unavoidable background loss rather than as a condition to actively manage. It has been proposed that these pauses represent a temporary, protective suspension of follicular development occurring when cumulative metabolic strain crosses a threshold, rather than a permanent reproductive failure, which would be consistent with the observed pattern of recovery, though the underlying trigger and its relationship to insulin signalling and AMPK activity specifically remain to be tested directly.

5. Discussion: A Common Thread Among Diverse Conditions?

Considered individually, the eleven conditions summarised above affect distinct organ systems and are conventionally treated as unrelated problems, each with its own diagnostic approach and management response. The comparative and mechanistic literature reviewed in Sections 2 and 3 raises the possibility that several of these conditions could share a common contributing pathway, specifically an inherited tendency toward altered insulin signalling in broiler-derived genetic lines that may be associated with reduced AMPK activity across multiple tissues, including the liver, ovarian follicles, shell gland, and reproductive tract. Because AMPK influences lipid metabolism, hormone-responsive follicular signalling, cellular stress response, and enzymatic activity in several of these tissues, a single weakened signalling pathway could plausibly manifest as different problems in different organ systems, which would be consistent with the tendency for these conditions to co-occur within affected flocks.

This synthesis should be treated as a hypothesis rather than a demonstrated causal chain. The individual pieces of supporting evidence are drawn from a mixture of sources: some directly involve hen granulosa cells or broiler chicks (Tosca et al., 2007; Cai et al., 2017; Shiraishi et al., 2011; Saneyasu et al., 2020), while others are drawn from mammalian liver physiology (Li et al., 2011; Zhao et al., 2019) or from comparative examples in other intensively

selected livestock species (Roche et al., 2009; Bellinge et al., 2005; Nestor, 1977; Wydooghe et al., 2013). No single study to date has traced this pathway through from insulin signalling to AMPK activity to each of the eleven field conditions within the same population of broiler breeder hens. Established causes of each condition, including infectious disease, nutritional deficiency, and management error, should continue to be investigated and ruled out as a matter of routine diagnostic practice; the pathway proposed here is intended to be considered as an additional line of investigation once these established causes have been addressed, particularly in flocks that display more than one of these conditions concurrently.

6. Limitations of the Current Evidence Base

This review has several limitations that should inform how its synthesis is used. First, it is a narrative rather than a systematic review, and the literature search underlying it was not exhaustive; a systematic review with defined inclusion criteria would be a useful next step. Second, the central hypothesis linking insulin signalling to AMPK activity across multiple tissues in the adult broiler breeder hen is extrapolated substantially from early-life broiler chick physiology, from other cell types and species, and from comparative examples in other livestock, rather than from direct measurement in laying breeder hens under field conditions. Third, several of the field conditions described here, particularly the transient non-laying episodes described in Section 4.11, are supported mainly by field observation and industry experience rather than by published, peer-reviewed production data, and would benefit from formal epidemiological characterisation. Direct studies measuring AMPK activity and its regulators across the relevant tissues in broiler breeder hens at defined stages of the laying cycle, and correlating this activity with the incidence and severity of the conditions described here, are needed before the proposed pathway can be considered established rather than hypothesised.

7. Conclusion

Broiler breeder hens carry genetic traits selected for rapid, efficient growth in their meat-type offspring, and a growing body of comparative evidence across livestock species suggests that this kind of selection commonly carries a reproductive cost. A recurring cluster of field conditions in broiler breeders, spanning production, hepatic health, body condition, follicular development, disease recovery, hatchability, fertility, and shell quality, is currently managed largely as eleven separate problems. This review has summarised the biological literature relevant to each condition and outlined a hypothesis, drawn substantially from comparative and early-life physiology rather than from direct measurement in adult breeder hens, that altered insulin signalling and its downstream effects on AMPK activity may contribute to several of these conditions through shared cellular mechanisms. Testing this hypothesis directly in broiler breeder hens, across the relevant tissues and at defined stages of the laying cycle, represents a clear priority for future applied poultry research, alongside continued attention to the established nutritional, management, and infectious contributors to each condition.

Conflict of Interest

The author declares a professional interest in the poultry animal health sector. No specific products or commercial interventions are described or promoted in this review.



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Shri Dr Badal Singh delivered an in-depth presentation addressing the challenges associated with antimicrobial resistance (AMR) as a distinguished guest speaker.

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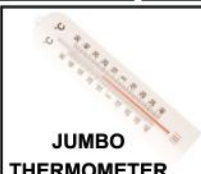
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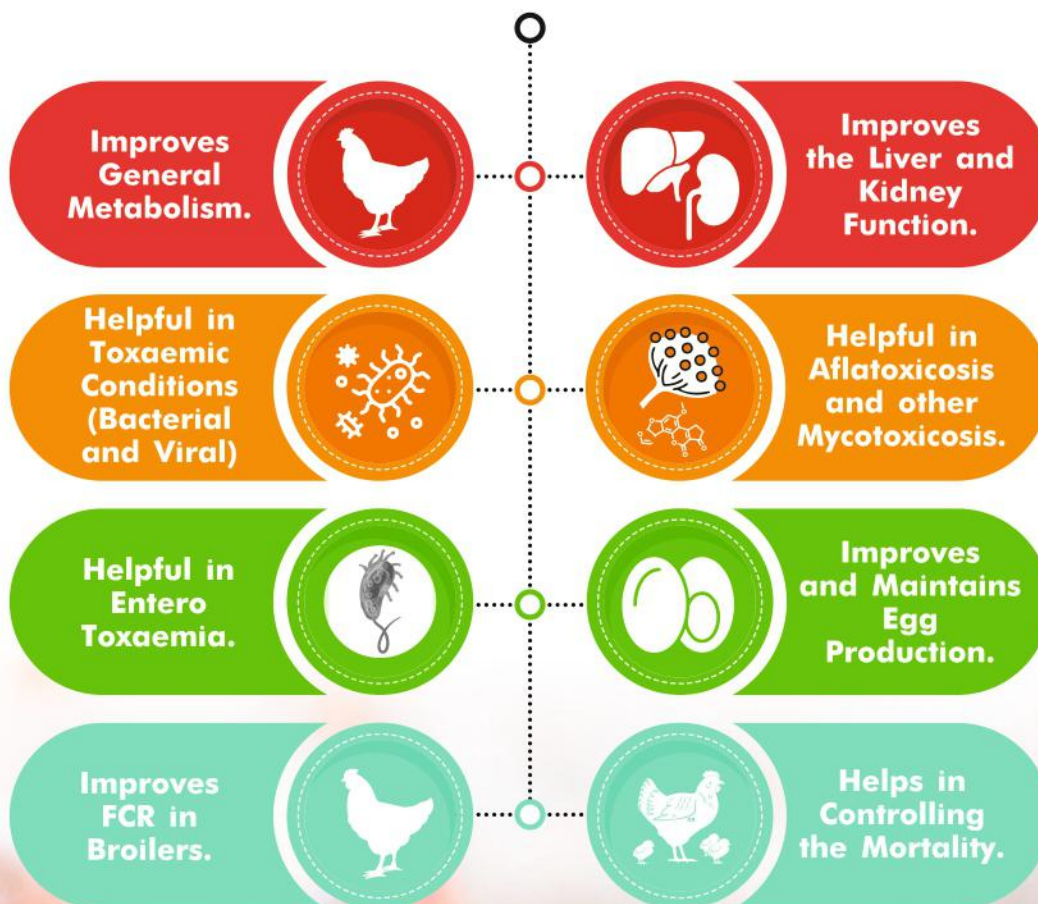
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Elucidating AGP Mechanisms of Action A Blueprint for Developing Next-Generation Alternatives

Dr. Prasanna Venkatesh

The Global Pivot: Navigating the Post-AGP Landscape

The global poultry industry is currently undergoing a fundamental transformation that transcends simple regulatory adherence. For decades, Antibiotic Growth Promoters (AGPs) were the cornerstone of production efficiency; however, the strategic landscape has shifted toward a precision physiological model. Transitioning away from AGPs is no longer merely a response to a regulatory burden, but a critical evolution necessary for maintaining global competitiveness. Producers who move beyond traditional antibiotics are not just complying with the law—they are securing their position in a market where "clean" production is the new baseline for commercial viability.

The Five Drivers of Changes

The shift away from traditional AGPs is mandated by several critical factors:

- **Consumer Demand for Clean Meat:** Modern consumers are increasingly sophisticated and demand protein raised without traditional antibiotics.
- **Export Market Access:** Major global regions, including the EU, Middle East, and South Asia, now enforce strict "Zero Tolerance" policies regarding AGP use.
- **Antibiotic Efficacy and AMR:** The preservation of antibiotic efficacy for human and veterinary medicine is a global priority to combat Antimicrobial Resistance (AMR).
- **Regulatory Bans:** We are seeing a progressive global phase-out of critical substances, such as Colistin and Bacitracin Methylene Disalicylate (BMD) etc.
- **Elimination of Withdrawal Periods:** Transitioning to alternatives eliminates the legal "withdrawal period" required before processing, greatly enhancing farm logistical efficiency.

To innovate the future, we must first master the history. We cannot effectively replace AGPs until we understand exactly why they were so successful for so long.

The "Unquestionable Results" of Traditional Growth Promoters

The success of AGPs was never in doubt because the results were measurable on the balance sheet. For several decades, the poultry industry has relied on AGPs to deliver consistent production results, specifically in improving Feed Conversion Ratios (FCR), enhancing nutrient utilization, and ensuring effective disease

control. These benefits collectively contribute to better litter quality, carcass quality, and overall farm profitability.

The Big Question:

We have seen these results for decades, but do we actually understand the science of *how* they were achieved?

Traditional Model:

The traditional "Textbook Model" of AGPs assumed they worked entirely through microflora management: killing pathogens to reduce microbial "nutrient theft" and toxins, resulting in a thinner intestinal wall and enhanced nutrient uptake. Modern genomic and physiological evidence has presented several paradoxes that render this model obsolete:

Paradox Category	Traditional Expectation	Scientific Reality
The Dosology Disconnect	AGPs function by bactericidal action against pathogens in the gut.	Doses used for growth promotion are significantly below the Minimum Inhibitory Concentration (MIC) required to kill bacteria.
The Spectrum Paradox	Antibiotics with distinct targets (e.g., Gram-positive vs. Gram-negative) should produce different growth outcomes.	Antibiotics with completely different antimicrobial spectra often yield identical growth enhancement results.
The Cross-Species Paradox	AGPs target specific microbiota compositions unique to the host species.	The same AGPs are effective in both pigs and poultry, despite these species possessing vastly different intestinal microbiota.
The Ineffective Paradox	Any antibiotic that significantly alters the gut microbiota should promote growth.	Many antibiotics cause massive shifts in microbiota composition but fail to produce any measurable growth enhancement.

The Eubiosis Trap The industry often pursues "eubiosis"—a theoretical microbial balance—as a strategic goal. However, "eubiosis" is frequently a marketing construct rather than a biological reality. The exact composition of a "perfect" microbiota is unknown and completely undefined. Furthermore, genomic evidence confirms that major microbial shifts occur naturally during growth phases regardless of intervention. Relying on microflora management alone is a strategic trap;

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This realization, coupled with the global imperative for **Antimicrobial Resistance (AMR)** stewardship, is driving the industry toward **"Total AGP Replacers."**

The goal is not merely to eliminate antibiotics to meet consumer demand for "clean meat," but to ensure the **Preservation of Antibiotic Efficacy** for human and veterinary medicine by mitigating the selection pressure that creates resistant pathogens

Advanced Mechanism of Action: Host-Centric Physiological Modulation

The new scientific consensus indicates that AGPs work primarily as **physiological modulators of the bird** rather than simple bactericides.

A. Immune Pacification and Anti-Inflammation

AGPs act as potent anti-inflammatory agents. At sub-therapeutic doses, they are selectively taken up by and **accumulate inside local gut inflammatory cells** (e.g., macrophages and heterophils). They down-regulate pro-inflammatory cytokines (IL-1, TNF-alpha) at the source, cooling the "inflammatory fire". This **modulates the gut immune system to a quiescent resting state**, redirecting metabolic energy that would have been wasted on inflammation back into growth and production.

B. The Nrf2 Pathway and Physical Barrier Protection

Sub-therapeutic doses of certain antibiotics (e.g., BMD, Tetracyclines) trigger a mild production of Reactive Oxygen Species (ROS). This acts as a cellular stress signal that releases **Nrf2 (Nuclear factor erythroid 2- related factor 2)** from its tether (KEAP1). Nrf2 then moves into the nucleus to initiate the transcription of critical antioxidant enzymes like **Superoxide Dismutase (SOD), Catalase, and Glutathione Peroxidase (GSH-Px)**. These endogenous antioxidants protect the structural integrity of the gut wall by shielding tight junction proteins (**Claudins and Zonula Occludens-1**), thereby preventing **"Leaky Gut Syndrome"**

C. Bile Salt Hydrolase (BSH) Inhibition

Certain AGPs physically bind to and inhibit the BSH enzyme produced by bacteria like *Clostridium perfringens*. In an antibiotic-free environment, high BSH production leads to unconjugated bile acids, which impairs fat absorption. AGPs **preserve the Conjugated Bile Acid (CBA) pool**, ensuring optimal lipid digestion and absorption.

D. Mitochondrial Hormesis and the "Cellular Vaccine"

AGPs cause a small, temporary slowdown in mitochondrial energy (ATP) production. This mild disruption triggers the **Mitochondrial Unfolded Protein Response (UPRmt)** and the production of **mitokines**. These signals permanently raise the bird's systemic threshold for future immune and inflammatory responses,

acting as a form of cellular "vaccination" that optimizes cell health. This occurs within the **"Hormetic Zone"**, where low-level stressors act as beneficial signals for intestinal resilience.

Anti-Virulence Mechanisms: Disrupting Gut Pathogens

When AGPs interact with bacteria, they do so by disarming them/reduces their virulence rather than eradicating them.

- **Quorum Sensing (QS) Inhibition:** Pathogens like *C. perfringens* use QS to sense population density via autoinducers. AGPs disrupt the synthesis or binding of these signals, forcing bacteria to act as **isolated individuals rather than a coordinated army**, preventing synchronized attacks on gut tissue.
- **Toxin Gene Downregulation:** Sub-lethal AGP concentrations stall bacterial ribosomes, altering mRNA stability. This suppresses the transcription of *plc* genes, directly reducing the production of **alpha-toxin and NetB toxin**, which are the primary drivers of Necrotic Enteritis.
- **Impairment of Adhesion and Motility:** AGPs cause **flagellar paralysis** (turning off genes for bacterial "propellers") and **fimbrial mutilation** (disabling the "velcro" hooks used for anchoring). Lacking these, pathogens are safely swept out of the gut by normal peristalsis.

The Challenge of Alternatives: Searching for Consistency

Many tools have been trialed to replace AGPs, primarily focusing on "Eubiosis" (gut balance). These include Probiotics, Prebiotics, Organic Acids, Enzymes, Bacteriophages etc, However, the central frustration of modern veterinary science is that **"variable results are the norm."** Most alternatives fail because they only address one side of the dual-action mechanism. A "Total AGP Replacer" must be efficient, consistent, and reproducible.

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Turmeric (<i>Curcuma longa</i>)	Curcumin and Curcuminoids
Thyme (<i>Thymus vulgaris</i>)	Thymol, Carvacrol, P-Cymene, G-Terpinene, and other phenolic compounds
Cinnamon (<i>Cinnamomum zeylanicum</i>)	Cinnamaldehyde
Indian Barberry (<i>Berberis aristata</i>)	Berberine
BSH Inhibitors	Natural Compounds



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This strategic shift ensures the consistent, reproducible performance metrics required for modern, intensive, antibiotic-free production cycles, directly supporting global mandates for clean meat production.



Dr. Prasanna Venkatesh

M.V.Sc (Animal Nutrition),

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- ❖ Enrofloxacin Hcl.
- ❖ Doxycycline Hcl.
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- ❖ Oxytetracycline Hydrochloride

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Control Rainy Season Losses Though Strategic Risk Management in Layer

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Dr. Sharad Durge¹ & Dr. William Chin²

Water is often called the most important nutrient in poultry nutrition. A laying hen consumes approximately 1.8-2.5 times water than feed on a weight basis. During the rainy season, water sources such as bore wells, open reservoirs, ponds, and storage tanks become vulnerable to contamination from surface runoff, sewage infiltration, organic matter, and microbial pathogens. Increased rainfall, high humidity, elevated temperatures, flooding, deterioration of water quality, feed spoilage, mycotoxin contamination, and increased pest pressure collectively reduce bird performance and increase production costs. Heavy rainfall can increase the microbial load of drinking water, introducing pathogens such as *Escherichia coli*, *Salmonella* spp., *Campylobacter* spp., and various protozoa. Increased turbidity and organic matter reduce the effectiveness of disinfectants and promote bacterial growth in pipelines and drinker systems. Contaminated water can result in enteritis, reduced nutrient absorption, poor feed conversion ratio (FCR), lower egg production, poor shell quality, and increased mortality. Field observations across South Asia indicate that farms experiencing water contamination during monsoon periods commonly report declines in egg production ranging from 3-10%, increased medication costs, and higher culling rates. Water contamination also facilitates the spread of diseases such as colibacillosis and salmonellosis, which further compromise flock performance. Poor drinking water quality and mycotoxin contamination are two of the most economically significant factors influencing egg production, feed efficiency, bird health, and mortality.

Water quality parameters of concern in poultry farms

Several water quality parameters become critical during the rainy season. Water with high microbial contamination can damage intestinal integrity and reduce nutrient utilization.

Particular attention should be paid to:

- Total bacterial count
- Coliform count
- pH (optimal 5.5-6.7)
- Total dissolved solids
- Nitrate and nitrite levels
- Iron and manganese concentration
- Water hardness
- Presence of biofilms in pipelines

Failure to monitor these parameters can result in chronic performance losses that are often difficult to diagnose.

Increased mycotoxin risk in feed

The rainy season creates ideal environmental conditions for fungal growth in crops and feed ingredients. High

humidity, elevated temperature, delayed harvesting, poor drying practices, and moisture accumulation during storage contribute to increased mycotoxin contamination. Mycotoxins are toxic secondary metabolites produced by fungi such as *Aspergillus*, *Fusarium*, and *Penicillium* species. Poultry are highly sensitive to mycotoxins because of their rapid metabolism and high nutrient demands. Studies conducted in India, Bangladesh, and Sri Lanka have consistently demonstrated higher mycotoxin contamination during wet and humid months. A study from Bangladesh reported that aflatoxin contamination in poultry feeds was highest during June, July, and August, corresponding to the peak rainy season. Moisture content showed a strong positive relationship with aflatoxin levels. Similarly, surveys of Indian poultry feeds have reported frequent contamination with aflatoxins, Fumonins and ochratoxin A, particularly in maize, groundnut cake, mixed feeds, and other commonly used ingredients. Published reports from industry also shows the similar trend of mycotoxins in year 2025.

Fig. 1. Mycotoxin trend in South Asia 2025

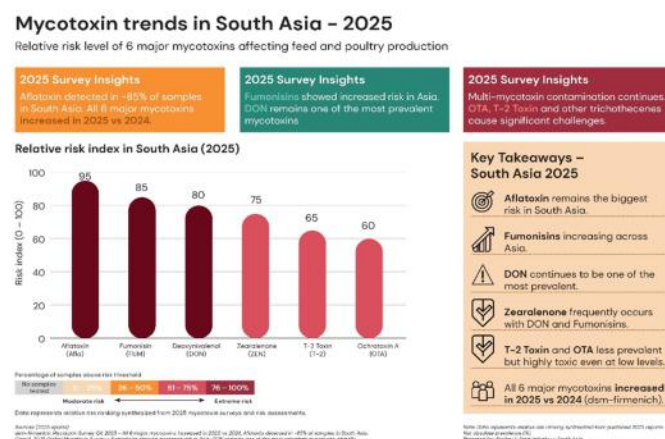


Fig. 2. Month wise trend and relative risk of mycotoxin in South Asia

Month-wise mycotoxin trend in South Asia – 2025

Relative risk index (0 – 100) for 6 major mycotoxins in feed & poultry production



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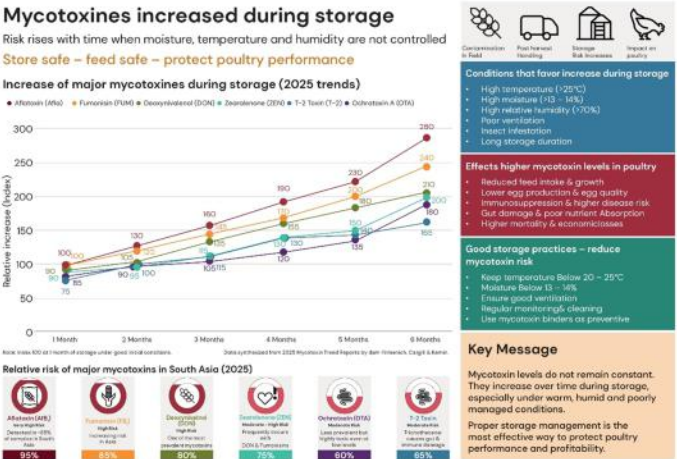
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Mycotoxins That Develop During Storage Under High Humidity and High Temperature

Even when crops enter storage with relatively low contamination, improper storage conditions can lead to rapid fungal proliferation and toxin production. Storage moisture above 13-14%, relative humidity above 70%, and temperatures between 25-35°C are highly favourable for fungal growth. Poor storage practices such as leaking roofs, inadequate ventilation, condensation, wet feed bags, and prolonged storage periods significantly increase the risk of toxin development.

Fig. 3. Growth of mycotoxins related to storage conditions and period of storage



Gut Health

a. Effects of poor water quality on gut health

The gastrointestinal tract is the primary interface between the bird and its environment. Poor-quality water introduces pathogens and excessive microbial loads that disrupt the normal gut microbiota.

Consequences include:

- Damage to intestinal villi
- Increased intestinal inflammation
- Reduced nutrient absorption
- Increased intestinal permeability ("leaky gut")
- Wet litter
- Increased incidence of enteric diseases

Gut inflammation diverts nutrients away from egg production toward immune responses. This results in lower egg output, poorer feed efficiency, and increased susceptibility to secondary infections.

b. Effects of mycotoxins on gut health

The intestinal tract is one of the first organs exposed to dietary mycotoxins. Even subclinical contamination can cause significant gut damage before visible clinical signs appear.

Mycotoxins can:

- Destroy intestinal epithelial cells
- Reduce villus height

- Increase crypt depth
- Impair digestive enzyme production
- Reduce nutrient absorption
- Alter gut microbiota balance
- Increase susceptibility to bacterial infections

Table 1. Water quality, major effect, clinical signs and postmortem findings in layer

Water Quality Issue	Major Effects	Clinical Signs in Layers	Characteristic Gross & Histopathological Lesions
High Bacterial Contamination (E. coli, Salmonella, Coliforms)	Enteritis, reduced nutrient absorption, immunosuppression, poor performance	Reduced feed intake, diarrhoea , wet litter, decreased egg production, increased mortality, poor FCR	Catarrhal enteritis, intestinal congestion, enlarged liver, airsacculitis, pericarditis, perihepatitis, villus damage
High Total Dissolved Solids (TDS) / Salinity	Water refusal, dehydration, electrolyte imbalance, wet litter	Excessive water consumption, watery drop pings, poor shell quality, reduced egg production	Enlarged kidneys, urate deposition, dehydration lesions, renal tubular degeneration
Excess Iron and Manganese	Biofilm formation, bacterial proliferation, reduced disinfectant efficacy	Reduced water intake, poor flock performance, recurrent bacterial infections	Thick biofilms in pipelines, chronic enteritis, secondary bacterial lesions
High Nitrate/Nitrite Levels	Reduced oxygen transport, metabolic stress, decreased productivity	Weakness, poor growth, reduced egg production, respiratory distress in severe cases	Cyanosis, tissue hypoxia, liver and kidney degeneration
Improper pH (<6 or >8)	Reduced water palatability, altered gut microbiota, poor medication efficacy	Reduced water intake, poor feed conversion, inconsistent flock performance	Mild enteritis, intestinal irritation, altered gut morphology
Fungal and Organic Contamination	Increased pathogen load, mold growth, gut dysbiosis, toxin exposure	Wet droppings, reduced egg production, poor immunity, increased disease outbreaks	Intestinal inflammation, liver enlargement, fungal colonization, lymphoid tissue depletion

During the rainy season in South Asia, gut health damage caused by poor water quality, coccidiosis, bacterial enteritis, and mycotoxin contamination can result in substantial economic losses in commercial layer farms. Intestinal damage reduces nutrient absorption, worsens feed conversion, lowers egg production by 5-15%, increases cracked eggs, weakens vaccine response, and raises medication costs. Mycotoxins such as aflatoxin, fumonisin, ochratoxin, and T-2 toxin further impair gut integrity and immunity, leading to chronic performance losses. Studies indicate that decreased egg production is the most common consequence of mycotoxin-associated disease in layers.

The economic consequences of water contamination and mycotoxin exposure are often substantial. Direct losses include reduced egg production, poor egg quality, increased mortality, and lower body weight. Indirect losses arise from increased veterinary costs, medication expenses, labor requirements, and premature culling.

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- Prevents fatty liver syndrome (FLS) and fatty infiltration, improves the integrity of hepatocytes, and optimizes liver function.
- Reduces carcass fat content and promotes lean meat production.
- Optimizes growth, feed conversion rate (FCR), egg production, livability, and hatchability.
- Aids in maintaining brain and nerve nutrition and improves neurotransmission.
- Helps prevent perosis and leg weakness.
- Assists in optimizing lipid and carbohydrate metabolism and improves energy utilization.

Mixing Ratio:

Broiler/Layer: 500 g per ton of feed or as per nutritionist/veterinarian guidance*

Breeders: 500g-1 kg per ton of feed or as per nutritionist/veterinarian guidance*

*500 g of HimChol-P can replace 1 kg of synthetic choline chloride (60%)

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Table 2. Mycotoxins, major effect, clinical signs and postmortem findings in layer

Mycotoxin	Major Effects	Clinical Signs in Layers	Characteristic Gross & HI stopathological Lesions
Aflatoxin (AFB₁) (<i>Aspergillus flavus</i> , <i>A. parasiticus</i>)	Hepatotoxic, immunosuppressive, reduced nutrient utilization, decreased egg production	Reduced feed intake, poor growth, pale comb, reduced egg production, poor shell quality, increased disease incidence, poor vaccine response	Enlarged pale -yellow fatty liver, liver haemorrhages, kidney swelling, bursal and thymic atrophy, hepatocellular degeneration, fatty infiltration and necrosis
Fumonisin (Fb₁) (<i>Fusarium verticillioides</i> , <i>F. proliferatum</i>)	Disrupts sphingolipid metabolism, gut barrier damage, immunosuppression	Reduced feed intake, poor FCR, reduced egg production, poor flock uniformity, increased enteric disease susceptibility	Enlarged pale liver, kidney degeneration, intestinal villus shortening, enteritis, bursal atrophy, lymphoid depletion, hepatocyte vacuolation
Deoxynivalenol (DON / Vomitoxin) (<i>Fusarium graminearum</i> , <i>F. culmorum</i>)	Feed refusal, intestinal inflammation, reduced protein synthesis, impaired immunity	Reduced feed consumption, poor growth, lower egg production, wet droppings, poor nutrient absorption	Catarrhal enteritis, intestinal irritation, villus damage, mild liver degeneration, lymphoid tissue depletion and intestinal inflammation
Zearalenone (ZEN) (<i>Fusarium graminearum</i> , <i>F. culmorum</i>)	Estrogenic effects, reproductive disturbances, immunomodulation	Reduced egg production, lower hatchability, poor fertility, reduced performance during chronic exposure	Ovarian dysfunction, follicular regression, mild liver degeneration, intestinal damage, lymphoid tissue depletion and reduced reproductive efficiency
T-2 Toxin & HT-2 Toxin (<i>Fusarium sporotrichioides</i> , <i>F. poae</i>)	Severe cytotoxicity, inhibition of protein synthesis, immunosuppression	Feed refusal, oral lesions, reduced egg production, depression, poor growth, increased mortality	Oral ulcers, necrosis of tongue and palate, proventricular erosion, intestinal ulceration, liver necrosis, bursal and thymic atrophy, severe lymphoid depletion
Ochratoxin A (OTA) (<i>Aspergillus ochraceus</i> , <i>Penicillium verrucosum</i>)	Nephrotoxic, immunosuppressive, reduced protein synthesis	Reduced feed intake, poor growth, decreased egg production, poor shell quality, increased disease susceptibility	Enlarged pale kidneys, nephrosis, tubular degeneration, liver degeneration, intestinal damage, bursal atrophy, lymphoid depletion and reduced vaccine response

Impact on layer performance and economic losses

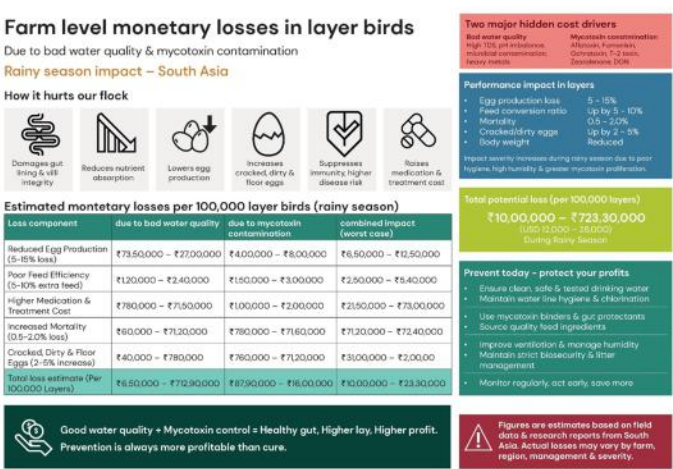
Typical effects include:

- Reduced egg production
- Reduced egg mass
- Poor shell thickness
- Increased cracked eggs
- Reduced feed intake
- Poor feed conversion
- Increased mortality
- Increased disease incidence
- Reduced vaccine response

Field reports have identified decreased egg production as one of the most common manifestations of mycotoxin exposure in layer farms. Severe aflatoxicosis outbreaks have caused mortality rates exceeding 30-60% in affected poultry flocks under extreme conditions.

For a 100,000 capacity layer farm, rainy-season gut health problems can easily cause losses of ₹10-30 lakh (USD 12,000-36,000) over a few months through reduced egg output, increased mortality, and higher treatment costs. Across South Asia, these losses amount to hundreds of millions of dollars annually.

Fig. 4. Estimated monetary losses due to bad water quality and mycotoxins in a 100,000 capacity layer farm



To do tasks to maintain water and feed quality

Table 3. Water and feed quality monitoring and corrective action to ensure feed safety

Area	Parameter to Check	Recommended Frequency	Acceptable Range/Condition	Corrective Action
Water Quality	pH	Weekly	5.5-6.7	Acidify or adjust pH using approved water conditioners
Water Quality	Total Dissolved Solids (TDS)	Weekly	<500 ppm (ideal <200 ppm)	Use filtration, RO treatment if excessive
Water Quality	Total Bacterial Count	Monthly	As low as possible	Clean tanks, flush lines, sanitization, chlorinate, oxidation of water
Water Quality	Coliform Count	Monthly	Nil or minimal	Shock chlorination, sanitize pipelines
Water Quality	Iron (Fe)	Quarterly	<0.3 ppm	Use iron-removal systems, aeration
Water Quality	Manganese (Mn)	Quarterly	<0.05 ppm	Oxidation and filtration treatment
Water Quality	Nitrate	Quarterly	<25 ppm	Change water source or treat water
Water Quality	Chlorine Residual	Weekly	2-5 ppm at drinker end	Adjust chlorinator dosage
Water Quality	Biofilm in Pipelines	Monthly	No visible slime	Use pipeline cleaners and sanitizers
Water Quality	Water Tank Cleanliness	Monthly	Clean, covered tanks	Wash and disinfect tanks regularly
Feed Quality	Feed Moisture	Every Feed Batch	<13%	Improve drying and storage conditions
Feed Quality	Mold Growth	Weekly	No visible mold	Discard affected feed immediately
Feed Quality	Feed Temperature	Weekly	Ambient temperature	Improve ventilation in feed storage
Feed Quality	Feed Odor	Weekly	Fresh odor	Remove musty or rancid feed
Feed Quality	Feed Storage Humidity	Daily	<70% RH	Improve warehouse ventilation
Feed Quality	Bag Condition	Weekly	Dry and intact	Replace damaged bags
Feed Quality	Mycotoxin Testing	Every batch/High-Risk Season	Below recommended limits	Use toxin binders and replace contaminated ingredients
Feed Quality	Stock Age	Weekly	FIFO principle*	Avoid prolonged storage
Feed Quality	Warehouse	Daily During	No leakage	Repair roof and wall leak
Feed Quality	Leaks Pest Infestation	Monsoon Weekly	No rodents/insects	immediately Implement rodent and pest control program



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*FIFO principle- meaning First In, First Out is an inventory management principle in which the oldest feed ingredients or finished feed are used first, and the newest stock is used last.

Biosecurity alterations required during the rainy season

The rainy season necessitates significant modifications to standard biosecurity programs. Water accumulation, mud, flooding, and increased movement of pathogens increase disease transmission risks.

Recommended biosecurity measures include:

- Increasing the frequency of disinfection
- Maintaining effective footbaths
- Restricting visitor access
- Preventing standing water accumulation
- Improving drainage around poultry houses
- Enhancing litter management
- Monitoring drinking water quality weekly
- Increasing sanitation of feed storage areas
- Implementing strict vehicle disinfection

Special attention should be given to farm entrances because contaminated mud can transport pathogens into poultry houses.

Importance of feed storage management during monsoon

Feed storage is one of the most critical control points for mycotoxin prevention. Feed ingredients should be dried to safe moisture levels before storage. Warehouses must remain clean, well ventilated, and protected from leaks.

Key recommendations include:

- Use pallets to elevate feed bags
- Maintain adequate airflow
- Inspect feed regularly for mold growth
- Apply approved mold inhibitors
- Follow first-in-first-out inventory management
- Avoid long-term storage during humid periods

Regular mycotoxin monitoring should be incorporated into quality assurance programs, especially for maize-based diets.

Importance of rodent control during the rainy season

Rodent populations often increase or migrate into poultry facilities during rainy periods as outdoor habitats become flooded. Rodents are important reservoirs and mechanical vectors of numerous poultry pathogens, including Salmonella and E. coli.

Rodents can:

- Contaminate feed and water
- Damage feed bags
- Spread pathogens
- Increase feed wastage
- Carry ectoparasites

A single rat can contaminate substantial quantities of feed through urine and feces. Therefore, integrated rodent management involving bait stations, environmental sanitation, structural maintenance, and regular monitoring is essential.

Importance of pest control during the rainy season

Flies, beetles, mosquitoes, and other insects thrive under humid conditions. These pests contribute to disease transmission and flock stress. Darkling beetles can harbor pathogens such as Salmonella and E. coli. Flies act as mechanical vectors of enteric diseases, while mosquitoes may contribute to the spread of various viral infections.

Effective pest management should include:

- Litter management
- Insecticide rotation programs
- Removal of spilled feed
- Proper manure handling
- Elimination of standing water
- Structural repairs to prevent pest entry

An integrated pest management program significantly reduces disease pressure and improves flock performance.

The rainy season presents a complex set of challenges for layer farms throughout South Asia. Poor drinking water quality and increased mycotoxin contamination are among the most significant factors reducing productivity and profitability. Aflatoxins, fumonisins, DON, zearalenone, ochratoxins and trichothecenes become more prevalent during wet periods, while poor storage conditions further exacerbate toxin production. Both contaminated water and mycotoxins damage gut health, impair immunity, reduce nutrient utilization, and ultimately decrease egg production and flock performance. Effective management requires rigorous water quality monitoring, feed quality assurance, mycotoxin control programs, enhanced biosecurity, and robust rodent and pest management strategies. Farms that proactively address these seasonal risks are better positioned to maintain production efficiency, bird welfare, and profitability during the monsoon period.



Dr. Sharad Durge
Poultry Technical Manager
South Asia
dsm-firmenich



Dr. William Chin
OU Marketing Manager,
West GAPAC
dsm-firmenich



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Sodium Diformate

A Potent Antimicrobial Feed Supplement For Optimal Enteric Health

By Dr. Prasad Nagpure & Dr. Om Prakash Reddy

The critical shift away from AGPs

For decades, the poultry industry relied on Antibiotic Growth Promoters (AGPs) to improve gut health, suppress pathogenic bacteria, and enhance growth performance. However, their prolonged use has contributed significantly to antimicrobial resistance (AMR), leading to global restrictions and a growing need for sustainable alternatives. As the industry transitions toward antibiotic-free production, sodium diformate has emerged as one of the most effective non-antibiotic solutions, offering strong antimicrobial activity against pathogens such as *Salmonella* and *E. coli*, while supporting gut health, intestinal integrity, and production performance. Among available alternatives, sodium diformate, a double salt molecule—stands out as a scientifically proven organic acid with AGP-like benefits without the associated AMR risk.

Physico-chemical properties & architectural advantages of Sodium Diformate

Traditionally, liquid organic acids (formic, propionic) controlled feed borne pathogens but faced critical limitations: high volatility, corrosiveness to equipment, pungent vapors posing health hazards, and rapid dissociation in the upper GI tract (crop, proventriculus, gizzard), leaving minimal active molecules in the lower intestine (jejunum, ileum, caecum).

To overcome these barriers, sodium diformate (NaDF) was engineered—a crystalline double salt of equimolar formic acid and sodium formate linked by hydrogen bonds. This stable, non-volatile solid eliminates safety hazards while remaining undissociated in the acidic upper GI tract (pH 2-4), then releasing active formic acid only in the neutral lower intestine (pH 6-7), delivering antimicrobial pressure throughout the entire gastrointestinal tract.

Sodium diformate (NaDF) offers distinct advantages:

- **Industrial Stability and Low Volatility:** Being a dry, solid crystalline powder, NaDF is non-volatile and stable across typical thermal ranges encountered during commercial feed pelleting and extrusion processes.
- **Reduced Mechanical Corrosiveness:** Unlike liquid formic acid, the crystalline lattice structure significantly reduces corrosive impacts on standard carbon-steel mixing machinery, storage silos, and distribution systems.
- **Superior Acidification and Dissociation Kinetics:** Comparative titration studies show that NaDF

possesses a higher capacity to release active hydrogen ions (H⁺) and exhibits a more pronounced buffering stability than other conventional organic acid salts, such as single calcium formate or potassium diformate. Crystalline NaDF solutions consistently maintain a highly stable, low pH matrix of approximately 3.50 even under increasing mass inputs, presenting an optimal delivery platform for lower-gut acidification.

pH-RESPONSIVE STABILITY OF SODIUM DIFORMATE IN UPPER GI TRACT

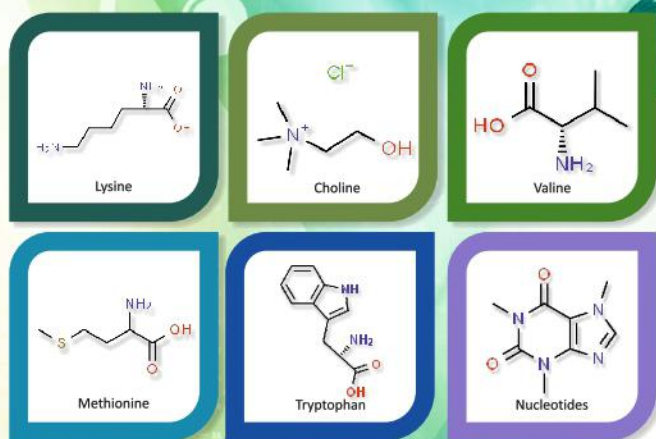
Sodium diformate (NaDF) possesses a unique pH-responsive double salt structure (HCOO⁻·HCOOH·Na⁺) that prevents premature dissociation in the acidic upper gastrointestinal tract. In the proventriculus and gizzard (pH 2-4), the high concentration of H⁺ ions shifts the chemical equilibrium toward the bound form, keeping NaDF stable and intact. However, when NaDF reaches the small intestine where pH rises to 6-7, the lower H⁺ concentration causes the equilibrium to shift, triggering dissociation into sodium and two molecules of formic acid. This pH-dependent release mechanism allows sodium diformate to deliver antimicrobial and digestive benefits throughout the entire GI tract—unlike free organic acids that are neutralized in the proximal gut—resulting in superior growth performance and FCR reduction at lower inclusion rates.

Formic Acid: The Antimicrobial Engine Behind Sodium Difformate's Efficacy

Formic acid is one of the most effective organic acids used in poultry nutrition due to its strong antimicrobial activity against a broad range of Gram-negative and Gram-positive pathogens. Its low pKa enables a high proportion of undissociated molecules to penetrate bacterial cells, disrupting their metabolism and growth. While free formic acid acts predominantly in the upper gastrointestinal tract, sodium diformate provides a controlled release of formic acid throughout the digestive system, extending antimicrobial activity across the entire gut length. This sustained action helps reduce pathogen load, improve feed hygiene, support gut health, and enhance performance, making sodium diformate a valuable tool in sustainable poultry production.

Mechanisms of Antimicrobial Action of Sodium Difformate

The direct antimicrobial potency of sodium diformate depends primarily on its ability to utilize the chemical characteristics of weak organic acids to circumvent the



To achieve high efficiency poultry farming, a finely balanced feed formula with high bioavailability of feed nutritional fractions especially of critical ingredients including limiting amino acids, trace minerals etc., are required. To attain this balance, supplementation becomes extremely crucial to attain maximum bird performance and productivity.

Supplementation of limiting amino-acids and other related nutritional ingredients including major and trace minerals can support in improving the bird performance by assisting in providing additional nutritional molecules, to make up for any deficiency of critical nutrients in feed and feed ingredients.

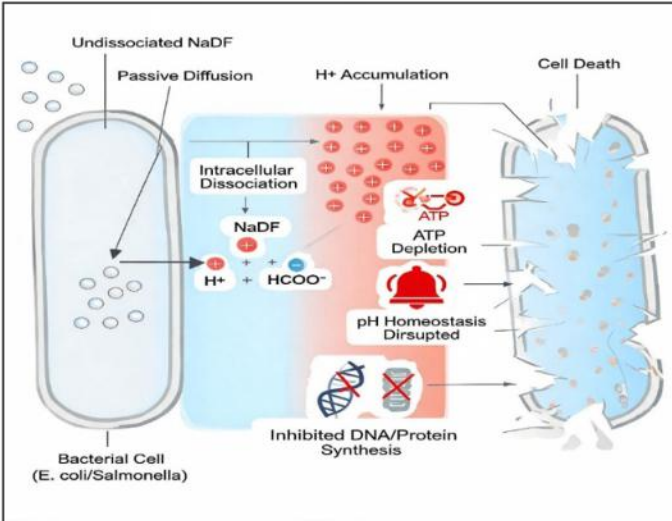
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defense mechanisms of Gram-negative pathogenic bacteria. This lethal process operates through two synchronized modes of action: *intracellular acidification* and *cellular structural disruption*.

I) Intracellular Accumulation and Acidification

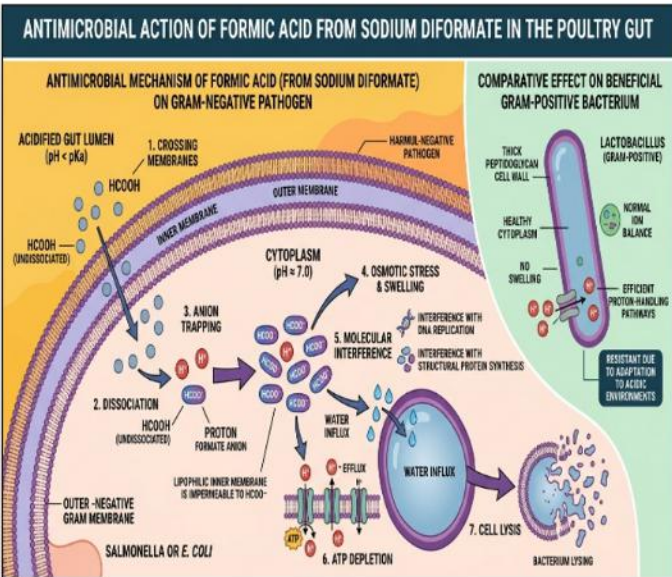
Sodium diformate (NaDF) is lipophilic when undissociated, allowing passive diffusion through bacterial membranes. Once inside the neutral cytoplasm (pH ≈ 7.0), it dissociates (pKa = 3.75), releasing H⁺ and HCOO⁻ ions. The H⁺ surge causes a sharp intracellular pH



drop, forcing the bacterium to activate ATP-dependent proton pumps to restore pH balance. This energy-intensive process depletes ATP reserves, leading to energy exhaustion, growth inhibition, and bacterial death.

II) Formate Anion Trapping & Antimicrobial Action

Formate anions (HCOO⁻) entering bacterial cells become trapped, creating osmotic stress, swelling, and structural damage. They inhibit DNA replication and protein synthesis. Combined with ATP depletion from pH regulation, this causes rapid membrane breakdown and bacterial lysis.



Broad-Spectrum Activity:

Gram-negative pathogens: Salmonella, E. coli, Pasteurella (MIC 1.56-3.13 mg/mL)

Gram-positive pathogens: Streptococcus, Clostridium perfringens, Staphylococcus (MIC 3.13-6.25 mg/mL)

Spare beneficial flora: Lactobacillus, Bifidobacterium remain unharmed

Intestinal Acidification and Eubiosis Stabilization

The structural integrity and functional capacity of the avian gut depend entirely on maintaining a stable, protective microbiome. The dietary administration of NaDF induces decreases in the pH of ileal contents. This drop in pH shifts the intestinal environment away from the optimal conditions required by pathobionts, establishing an effective physiological barrier against infection. Microbial population dynamics analyzed via plate counts and 16S rRNA sequencing confirm a targeted rebalancing of the gut microbiome. NaDF supplementation causes a clear linear increase in beneficial ileal *Lactobacillus* counts, while significantly reducing the populations of pathogenic *Escherichia coli* and *Salmonella* within the jejunum and ileum. This shift toward an optimal intestinal eubiosis minimizes the metabolic energy the bird must spend on immune defense against pathogens, allowing it to direct more nutrients toward growth and muscle development.

Minimum inhibitory concentrations (MICs) of selected organic acids against poultry-relevant bacteria

ORGANIC ACID	S. TYPHIMURIUM	E. COLI	C. JEJUNI	C. PERFRINGENS	S. AUREUS
FORMIC ACID	0.10	0.15	0.10	0.10	0.15
PROPIONIC ACID	0.15	0.20	0.20	0.25	0.25
LACTIC ACID	0.30	0.40	0.30	0.30	0.40

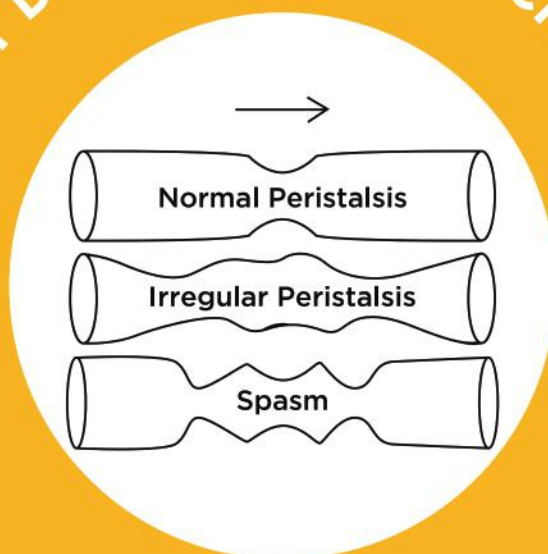
(Ref: Strauss & Hayler, 2001)

The table shows that formic acid had the strongest antibacterial activity, because it consistently produced the lowest MIC values against all tested bacteria. Propionic acid was intermediate, while lactic acid generally had the highest MIC values and was therefore the least potent.

Mitigation of Intestinal Inflammation and Prevention of Pathogenic Infections

Sodium diformate (NaDF) helps reduce subclinical intestinal inflammation by lowering pro-inflammatory cytokines such as TNF-α, thereby decreasing metabolic stress and supporting gut health. Under *Salmonella Pullorum* challenge, NaDF significantly reduces pathogen colonization in the cecum, liver, and spleen while protecting intestinal and systemic tissues from inflammatory damage. These effects contribute to improved disease resistance, intestinal integrity, and performance in antibiotic-free poultry production.

WET DROPPINGS IN CHICKEN?



- Action on enteropathogens
- Improves health of intestinal villi
- Enhances nutrient absorption
- Controls loose droppings

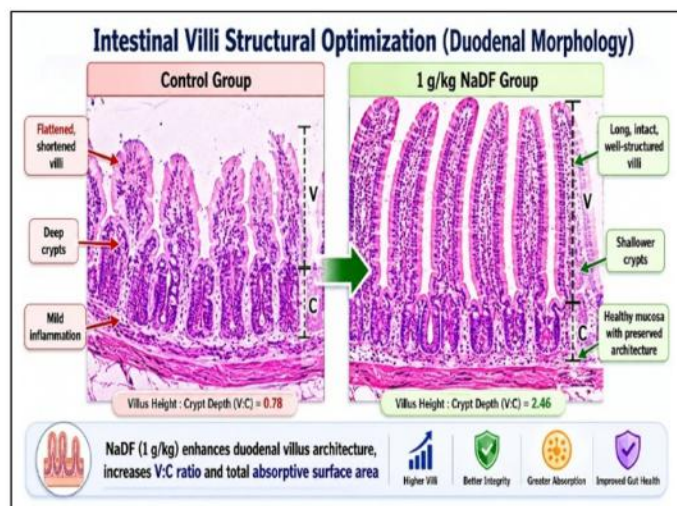
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THE CHICKEN GUT PLAYS A VITAL ROLE IN OVERALL HEALTH AND PRODUCTIVITY, AS ITS PRIMARY FUNCTION IS ENZYMATIC DIGESTION AND ABSORPTION OF ESSENTIAL NUTRIENTS. THE INTESTINAL TRACT OFFERS SPACE FOR BENEFICIAL MICROFLORA THAT AID IN DIGESTION AND NUTRIENT UTILIZATION. A HEALTHY GUT ENSURES EFFICIENT FEED CONVERSION AND OPTIMAL PERFORMANCE.



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Structural Enhancement of the Absorptive Surface and Biomarker Shifts

By reducing pathogen pressure and intestinal inflammation, sodium diformate (NaDF) promotes healthier gut morphology, characterized by increased villus height, reduced crypt depth, and an improved villus-to-crypt ratio. These structural improvements enhance nutrient absorption and digestibility.

Conclusion NaDF also strengthens the gut's antioxidant defense system by increasing the activity of key enzymes such as SOD, GSH-Px, and CAT while reducing oxidative stress markers like MDA, thereby maintaining intestinal integrity and supporting optimal performance throughout the production cycle.

Comparative Evaluation of Sodium Diformate vs Organic Acid Blends, AGPs, and Phytogenics in Poultry Nutrition

Parameter	Sodium Diformate	Organic Acids	AGPs	Phytogenics
Direct bacterial killing	★★★★★	★★★★☆	★★★★☆	★★★☆☆
Intracellular acidification	★★★★★	★★★★☆	No	No
ATP depletion	★★★★★	★★★★☆	Limited	No
Formate anion trapping	★★★★★	No	No	No
Feed hygiene effect	★★★★★	★★★★☆	No	No
Antiviral activity	No	No	No	Limited
Gut acidification	★★★★★	★★★★☆	No	★★★☆☆

Conclusion

The forced withdrawal of conventional antibiotic growth promoters from the global poultry industry requires a major transition toward scientifically proven, sustainable feed additives. Sodium diformate satisfies these requirements, functioning as a highly effective, dual-action antimicrobial and physiological optimizer. Its unique crystalline architecture solves the manufacturing and handling limitations of free organic acids, while its targeted chemical dissociation delivers powerful antimicrobial action along the entire length of the gastrointestinal tract.

By lowering intestinal pH, suppressing damaging pro-inflammatory responses, and eradicating dangerous Gram-negative pathogens like *Salmonella* and *E. coli*, NaDF effectively stabilizes the gut microbiome. These internal adjustments lead to improved intestinal structure, elevated growth-hormone profiles, and optimized feed conversion efficiency. As commercial poultry systems face increasing pressure to eliminate antibiotics entirely, sodium diformate represents a reliable, scientifically verified solution. Its implementation enables producers to maintain high standards of animal biosecurity, protect animal health, and maximize zootechnical performance within an eco-friendly framework.

Key Take-Home Message:

AGPs may have defined the past of poultry production, but the future belongs to scientifically validated, resistance-free antimicrobial technologies. Unlike conventional acidifiers that primarily modify gut pH, or phytogenics and probiotics that indirectly influence microbial populations, sodium diformate actively targets enteric pathogens through intracellular acidification and metabolic disruption. Combined with its feed hygiene benefits and proven impact on performance, sodium diformate represents one of the closest functional alternatives to AGPs currently available to the poultry industry, delivering consistent pathogen control.

By Dr. Prasad Nagpure & Dr. Om Prakash Reddy, Symbio Nutrients



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Importance of Nutrition in Layers

¹ Dr. Sheizal Minhas and ² Dr. Jujhar Singh Sidhu
^{1, 2} Animal Nutrition Department

In poultry farming, feed costs account for about 65-70 percent of the total cost. Therefore, feed management should be given priority. There are two main aspects of feed management, first, to reduce feed costs and second, to increase production through balanced diet. Balanced diet is very important for maintaining the health and productivity of birds. Deficiency of one or more nutrients can lead to reduced egg production or it can cause illness or death in poultry.

Nutrients consumed by chickens are used for two purposes, maintenance and production. Maintenance requirements are those that the chicken needs to stay alive and healthy, including maintaining the function of organ systems (immune system, heart and lungs, digestive system, etc.). Once the chicken's maintenance requirements are met, the excess nutrients consumed are used by the chicken for production. A diet that does not contain the proper balance of nutrients will likely result in low egg production. Therefore, it is important to provide chickens with a good quality, complete and properly balanced diet to increase egg production.

This article discusses the importance of nutrients for layers and nutrient considerations while creating a feeding program.

A balanced diet is mainly divided into 5 parts.

1. Protein

Protein is required for bodily functions such as tissue repair, disease prevention and production (especially growth and egg production), so nutritionists pay special attention to protein when making diets. Protein is made up of amino acids. The properties of protein depend on the structure of the amino acids. There are 20 types of amino acids found in protein. They are divided into two parts. Essential and non-essential. All amino acids are essential for bodily functions, but those amino acids that the bird can synthesize endogenously are called non-essential, and those amino acids that the bird obtains only through diet are called essential amino acids. Lysine, methionine, threonine, glycine, valine, leucine, isoleucine, tryptophan, histidine, arginine, phenylalanine are examples of essential amino acids for poultry. To supplement protein in chicken feed, soybean meal, canola meal, guar meal, sesame meal, fish meal, meat meal, mealworms etc. are mainly used.

2. Energy

Energy is mainly obtained from two sources in poultry feed - carbohydrate and fat.

- i. **Carbohydrate:** It is the readily available source of energy and also required for utilization of fat for energy production. Main source of carbohydrate for poultry is starch, mainly obtained from grains like corn, wheat, millet, rice, barley etc. Birds convert

excess energy in the form of carbohydrates into fat and store it in the body.

- ii. **Fat:** Fat in the body is a reserved form of energy and also provides insulation to the bird. Fatty acids such as linoleic acid and linoleic acid are essential in the diet, as the body cannot synthesize them. Fat contains 2.25 times more energy than starch. Fat is naturally present in many food items such as rice bran, full fat soy, peanuts, etc., but sometimes a pure form of fat such as oil has to be used to increase the amount of energy in the ration.

3. Minerals

Minerals are required for skeletal development, eggshell formation, metabolic regulation, and immune defense in poultry. In the body of chickens more than 25 minerals are found, of which 7 elements are known as macrominerals as they are required at higher concentration in the diet (>100 mg/Kg), such as calcium, magnesium, phosphorus, sodium, potassium, chlorine and sulfur and its obtained through diet. Calcium is essential for the formation of bones and eggshells. Oyster shell, Limestone are rich sources of calcium. Phosphorus is available from rice bran, wheat bran, bone meal, and dicalcium phosphate. Commonly used salt supplies sodium and chlorine in the body. Many minerals are used in large quantities, especially calcium and phosphorus, and some minerals such as copper, zinc, iron, cobalt, manganese etc. are required in trace amounts. Trace minerals are also dietary essential for the maintenance and egg production in layers.

4. Vitamins

Vitamins are essential for healthy growth and egg production. There are two types of vitamins.

- i. Fat-soluble
- ii. Soluble in water

The fat-soluble vitamins are A, D, E, and K. The water-soluble vitamins are all the B-complex vitamins and vitamin C. Most vitamins are naturally found in the diet of chickens. Chickens can synthesize vitamin C as needed. Vitamin A, B2 and D3 must be supplemented in the ration for better production performance especially in intensive system of rearing poultry. B complex supplementation prevents many deficiency disorders and improves disease resistance.

5. Water

Water is a very important for poultry, but this is usually overlooked. Water plays an important role in digesting food, moving the digested food through the digestive system, removing waste from the body, maintaining body temperature and metabolism. About 60-75 percent of a chicken's weight is water.

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The amount of water in the body decreases with age. Water is provided ad libitum to the birds. The quality of water should also be good, as shown in Table No. 1.

Table 1: Required amount of various elements in water

Serial No.	Elements	Maximum (ppm)	Required (ppm)
1.	Total soluble solids	400	<100
2.	Salt	1000	<500
3.	pH	6.0-8.0	6.8-7.2
4.	Calcium	500	200
5.	Bicarbonate	500	200
6.	Fluoride	2	0.5
7.	Ammonia	50	0
8.	Pesticide residue	0.004	0
9.	lead	0.05	0

Diet composition

Whenever chicken feed is prepared, the following aspects should be considered.

- Requirements of various elements according to age and production.
- Availability of food items according to your region, weather and season.
- Quality of feed ingredients.
- The nutritional content and price of ingredients.

Making ration for Layers

To prepare the ration, a poultry farmer must first check for which category of bird the feed is being prepared. The nutritional requirements of egg-laying chickens and broilers are different. The nutritional requirement of layers as per the BIS 2024 recommendation are given in Table 2.

Table 2: Nutritional requirements of layers base on B.I.S. 2024.

Age	Layer feed			
	0-8 Weeks	9-18 Weeks	19-45 Weeks	46-72 Weeks
Moisture (% maximum)	11	11	11	11
Crude Protein (% minimum)	20	16	18	16
Metabolizable Energy (Kcal/Kg, min)	2800	2500	2600	2400
Fiber (% max)	7	9	9	10
Fat content (% minimum)	2	2	2	2
Acid Insoluble ash (% max)	4	4	4	4.5
Calcium (% min)	1	1 (9-16 week) 2 (17-18 week)	3.75	4
Available Phosphorus (% min)	0.45	0.4	0.35	0.33
Lysine (% min)	1	0.7	0.7	0.65
Methionine (% min)	0.4	0.35	0.35	0.3
Salt (% max)	0.5	0.5	0.5	0.5
Vitamin A (IU/kg) min	9000	8000	8000	8000
Vitamin D ₃ (IU/kg) min	1800	1600	1600	1600
Choline (mg/kg, min)	500	200	400	400
Linoleic acid (% min)	1	1	1	1
Copper (mg/kg, min)	12	9	9	9

Various types of grains, husks, cakes or meals etc. are used in the ration. The selection of these commodities depends on the quantity, availability, quality and price of the nutrients in them. The recommended maximum usage of various feed ingredients is given in Table 3.

Table 3: Quantity of various commodities in ration

Inclusion rate (%) Maximum		
Age	Chicks	Growing and laying eggs
Corn	45	70
Wheat	35	30
Millet	30	60
Rice polishing	20	30
Oil-free rice bran	10	25
Peanut	30	20
Soybean meal	35	25
Mustard seed meal	5	5
Sunflower seed meal	10	20
Corn gluten	10	10
Fish meal	10	10
Meat scraps	5	5
Bone meal	2	2
Dicalcium phosphate	2.5	2.5
Limestone chips	2	8
Salt	0.5	0.5

Feed Additive

Feed additives are added to the diet of young chicks, growing chicks and laying hens. They can provide nutrition such as amino acids, vitamins and minerals, but these substances can also be non-nutritive as described below. They affect the growth rate of the birds, their resistance to diseases and the quality of the eggs.

Coccidiostat

This works on the symptoms of bloody stools in chicks or hens. Birds raised in the litter system (where chicks are raised on the ground) are more susceptible to this disease because the disease is transmitted from the litter as the birds are constantly in contact with the litter. To prevent coccidiosis, litter should be changed frequently and coccidiostats should be included in the diet. Coccidiostats should be used in rotation so that they do not become ineffective with continuous use.

Mold inhibitors

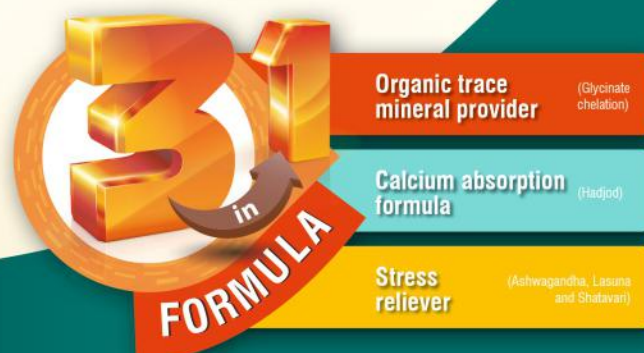
The quality of various products used in feed is not uniform. Due to high humidity and long storage, there is a risk of mold growth in the materials used in feed.

**When
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Type	Complete replacement of inorganic minerals (per metric ton of feed)	Partial replacement of inorganic minerals or top application (per metric ton of feed)
Broiler	500 g	250 g
Layer	500 g	250 g
Breeder	1 kg	500 g



Therefore, to prevent mold growth, mold inhibitors like formic acid, propionic acid etc., or toxin binders like activated charcoal or sodium bentonite are added to the feed. It helps in increasing shelf life of feed.

Preservatives

Germs also increase in feed over time. Due to moisture in the feed or keeping the feed bags in a damp place, germs multiply quickly and birds can get diarrhea and other diseases. Mild acid mixtures usually organic acids like citric acid, propionic acid etc., at low concentrations act as preservatives, these are mixed in 50 to 100 grams per quintal of feed. The pH in the feed decreases to some extent and germs cannot flourish at low pH.

Antibiotics and its alternatives

Antibiotics improve growth, improve egg production and reduces the feed cost of production. There is increased concern about antibiotic resistance of harmful microbes. Alternatives are being utilized such as probiotics, prebiotics, essential oils, phytoactives etc. in diet to substitute antibiotics while maintaining the production performance.

Table 4: An example of a ration for egg-laying hens

Serial No.	Names of ingredients	Quantity of ingredients (kg)
1	Corn	37
2	Bajra	27
3	Oil-free rice bran	1.6
4	Groundnut meal	8
5	Soybean meal	3
6	Guar meal	2
7	De-oiled mustard cake	3
8	DDGS	5
9	Fish meal	6
10	Dicalcium Phosphate (DCP)	1.4
11	Limestone powder	0.4
12	Limestone chips	5
13	Poultry Premix	0.6
	Total	100

¹ Dr. Sheizal Minhas and ² Dr. Jujhar Singh Sidhu

¹, ² Animal Nutrition Department

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Four Pillars. One Goal. Peak Poultry Performance.

Gut Health Livability Water Quality Feed Quality

Modern poultry production has evolved far beyond achieving rapid body weight gain. Today's commercial broiler operations are expected to deliver superior feed efficiency, excellent livability, consistent flock uniformity, reduced antimicrobial dependence, and maximum economic returns despite increasing challenges such as heat stress, feed ingredient variability, pathogen pressure, and climate change.

Success under these conditions depends on four interconnected pillars:



These pillars are not independent. An imbalance in any one of them can compromise the others, ultimately reducing production efficiency and profitability. Conversely, strengthening all four creates a resilient flock capable of expressing its full genetic potential.

1. Feed Quality: The Foundation of Productivity

Feed represents nearly 65-70% of total poultry production cost, making feed quality one of the strongest determinants of profitability.

However, modern poultry nutrition faces increasing challenges:

- Variable maize quality
- Fluctuating soybean meal protein
- Mycotoxin contamination
- Nutrient inconsistency
- Oxidized fats
- Poor pellet durability
- Anti-nutritional factors

Feed quality involves more than nutrient formulation.

It includes:

- Ingredient consistency
- Nutrient availability
- Digestibility
- Pellet quality
- Feed hygiene
- Free from contaminants
- Proper storage

Suboptimal feed quality leads to:

- Reduced nutrient digestibility
- Gut inflammation
- Increased undigested nutrients reaching the hindgut
- Dysbiosis
- Wet litter
- Poor FCR
- Reduced growth performance

Maintaining stringent raw material quality control, precise feed manufacturing practices, and effective mycotoxin risk management is essential for maximizing bird performance. Equally important is optimizing feed moisture, as appropriate moisture levels preserve pellet quality, minimize processing losses and dust, improve palatability, and enhance nutrient stability, ultimately contributing to better feed efficiency and production performance.

2. Water Quality: The Most Overlooked Nutrient

Water is frequently underestimated as simply a hydration source, yet it plays a fundamental role in poultry health, productivity, and welfare. Broilers typically consume approximately 1.6-2.0 times more water than feed, and water intake increases substantially during heat stress. Poor water quality immediately affects feed intake, digestion, medication efficacy, and bird performance.

Water quality encompasses:

Physical parameters

- Temperature
- Turbidity

Chemical parameters

- pH
- Hardness
- Alkalinity
- Total Dissolved Solids (TDS)

Microbiological parameters

- Total bacterial count
- *E. coli*
- Coliform bacteria

Poor-quality drinking water can:

- Reduce feed consumption
- Lower pepsin activity at high pH
- Impair nutrient digestion
- Damage gut microbiota
- Reduce vaccine effectiveness
- Increase pathogen transmission

Recent research emphasizes that water management should integrate microbiological control, physicochemical stability, and functional support for gut health rather than relying on a single treatment strategy. Routine monitoring of water pH, microbial load, and sanitation should therefore be considered an essential component of flock health management.

3. Gut Health: The Biological Engine of Performance

The gastrointestinal tract is no longer viewed simply as a digestive organ. It functions as the largest immune organ, a metabolic centre, and the primary interface between the bird and its external environment. Approximately 70% of immune cells are associated with the intestinal tract, gut-associated lymphoid tissue (GALT) making gut integrity fundamental to disease resistance and nutrient utilization.

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An ideal healthy intestine is characterized by:

- Gut integrity
- Gut immunity
- Gut microflora

Poor gut health results in:

- Dysbiosis
- Reduced nutrient digestibility
- Increased intestinal permeability ("leaky gut")
- Greater pathogen colonization
- Poor FCR
- Wet litter
- Reduced growth rate

Modern nutritional strategies increasingly focus on maintaining microbial balance using probiotics, prebiotics, postbiotics, phytogenics, organic acids, enzymes, functional amino acids, and precision nutrition rather than relying solely on antibiotic growth promoters.

Healthy gut architecture directly translates into:

- Improved nutrient absorption
- Better feed conversion
- Enhanced immune function
- Increased resilience against stress

4. Livability: The Ultimate Measure of Flock Health

Livability represents the percentage of birds that survive and remain productive throughout the production cycle. While body weight and FCR are important economic indicators, livability reflects the cumulative success of nutrition, management, biosecurity, immunity, environmental control, and disease prevention.

Every percentage increase in mortality results in:

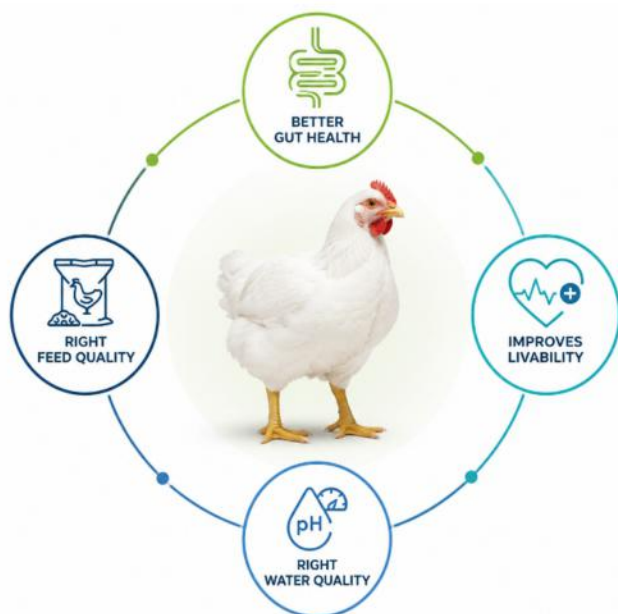
- Reduced saleable birds
- Increased production cost per kilogram of meat
- Poorer European Production Efficiency Factor (EPEF/EPI)
- Lower overall profitability

High livability is associated with:

- Strong immune competence
- Better vital organ support
- Lower incidence of metabolic/infectious diseases
- Reduced cellular stress
- Improved welfare standards

Modern poultry production therefore aims not merely to keep birds alive but to maintain healthy, productive birds capable of reaching their genetic growth potential.

Connecting the Four Pillars for Peak Performance



Right Feed quality, Right water quality, Better gut health and improved livability constitute an integrated biological system rather than independent management components. Each pillar influences the others through complex nutritional, physiological, microbial, and immunological interactions, collectively determining flock health, productivity, and profitability.

Feed quality provides the nutritional foundation for gastrointestinal development and function. Consistent ingredient quality, optimal nutrient availability, and high digestibility support intestinal integrity, maintain a balanced gut microbiota, and minimize the flow of undigested substrates to the hindgut. Conversely, poor-quality feed predisposes birds to dysbiosis, intestinal inflammation, reduced nutrient utilization, and impaired growth performance.

Water quality directly complements feed quality by facilitating digestion, nutrient transport, enzymatic activity, and metabolic processes. Microbiologically safe, chemically balanced water maintains intestinal microbial homeostasis, reduces pathogen exposure, supports water-administered therapeutic interventions, and enhances nutrient utilization. In contrast, contaminated or poor-quality water promotes biofilm formation, increases enteric pathogen load, compromises gut barrier function, and adversely affects flock performance.

Gut health represents the central biological interface linking feed and water quality with bird performance. An intact intestinal epithelium, balanced microbiota, efficient digestive function, and robust mucosal immunity optimize nutrient absorption while limiting pathogen colonization and inflammatory responses. Consequently, gut health acts as the primary mediator through which feed and water quality are translated into productive performance.

Livability is the ultimate indicator of the successful integration of these three pillars. High livability reflects efficient nutrient utilization, optimal gastrointestinal function, effective immune competence, reduced disease incidence, and improved resilience to environmental and management stressors.

Conversely, disruption of feed quality, water quality, or gut health initiates a cascade of physiological disturbances that reduce growth performance, impair feed efficiency, increase mortality, and compromise overall flock productivity.

Therefore, sustainable poultry production requires a holistic management approach in which feed quality, water quality, gut health, and livability are recognized as interdependent components of a single biological continuum. Optimizing each pillar simultaneously creates synergistic improvements in health, welfare, production efficiency, and economic return, whereas failure in any one component inevitably compromises the integrity and performance of the entire production system.

Conclusion

Modern poultry production is no longer defined solely by rapid growth or excellent feed conversion. Sustainable success is achieved by strengthening the four fundamental pillars—**Water Quality, Feed Quality, Gut Health and Livability**

When these pillars function together, they create healthier birds, greater resilience against production challenges, improved nutrient utilization, enhanced flock performance, and superior economic returns.

Ultimately, the future of poultry production belongs not to farms that simply grow birds faster, but to those that build stronger birds through integrated management of these four essential pillars.

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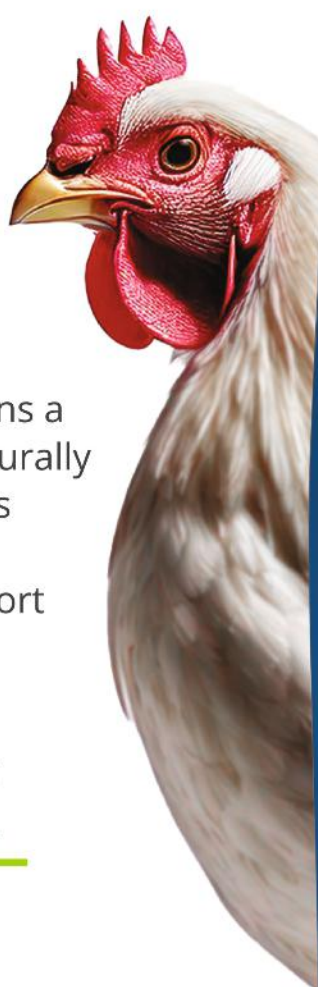
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Are Today's Birds Outgrowing Traditional Mineral Programs?

David Torres

Regional Technical Services, Director - Asia Pacific

Modern poultry genetics have transformed what is possible in commercial broiler production.

Today's birds reach market weight faster, convert feed more efficiently and deliver greater breast meat yield than birds raised just a decade ago. Remarkable advances in breeding and management have enabled producers to achieve higher levels of productivity while helping meet the growing global demand for poultry protein.

Yet as birds continue to evolve, an important question deserves greater attention:

Have mineral nutrition programs evolved at the same pace as modern poultry genetics?

For decades, poultry nutritionists have formulated diets according to established nutrient recommendations and breed specifications.

However, producers continue to observe noticeable differences in flock performance despite feeding diets that appear remarkably similar.

Feed conversion ratio, skeletal integrity, liveability, growth rate, carcass quality and overall consistency can vary significantly between flocks fed with similar nutritional programs. These differences are often attributed to genetics, health status, ingredient quality or management practices. While all these factors influence performance, another possibility is increasingly worth considering. **What if the challenge is not the amount of mineral included in the diet, but how much of that mineral is ultimately available to the bird?**

Modern Birds Demand More from Nutrition

The biological demands placed on today's broilers are extraordinary. Rapid growth requires continuous support for skeletal development, tissue formation, enzyme activity, antioxidant systems and consistent immune function. Every stage of growth places significant pressure on physiological systems that depend upon adequate nutrient availability. As a result, nutritionists are no longer focused solely on meeting nutrient requirements. They are focused on maximizing nutrient efficiency.

Over the last two decades, the industry has embraced innovations that support the use of synthetic amino acid, higher energy utilization, and better feed efficiency. Poultry nutrition has steadily evolved from supplying nutrients toward maximizing the value obtained from every nutrient included in the diet. The same evolution may now be occurring in trace mineral nutrition.

Formulation Is Only Part of the Story

Modern feed formulation software allows nutritionists to formulate diets with remarkable precision. Nutrient concentrations can be balanced accurately, and dietary specifications can be met consistently. Yet formulation only tells us what enters the feed. It does not necessarily tell us what reaches the bird.

Between feed intake and nutrient utilization lies a complex digestive environment where nutrients interact with numerous dietary compounds before absorption occurs. This distinction is particularly important when discussing trace minerals.

Although required in relatively small quantities, trace minerals play vital roles in many biological processes. They contribute to skeletal mineralization, connective tissue development, antioxidant systems, enzyme function, tissue maintenance and protein metabolism. These functions support the growth and performance expected from modern poultry genetics.

For these processes to function efficiently, minerals must remain available until they reach the sites where absorption occurs.

Why Mineral Availability Matters in Modern Broiler Nutrition

Not all minerals supplied in the diet remain equally available during digestion. Certain mineral sources may interact with phytate, fiber, other minerals and additional dietary components before absorption occurs. These interactions, commonly referred to as antagonisms, can reduce the amount of mineral available to the bird. Meeting a nutritional specification does not necessarily guarantee that the bird receives the full nutritional value of the minerals supplied. This distinction becomes increasingly important as production systems pursue greater precision and consistency.

Is More Always Better?

Historically, increasing trace mineral inclusion has often been viewed as a practical strategy to compensate for expected losses during digestion. While this approach may provide a sense of safety, it only enhances the problem due to an increase of the antagonism.

If a portion of the supplied mineral becomes unavailable



before absorption, simply increasing inclusion levels may not proportionally increase the amount utilized by the bird. This creates an opportunity to rethink how mineral programs are evaluated. Rather than asking: "How much mineral is included in the feed?" Nutritionists may increasingly benefit from asking: "How much of that mineral remains available for the bird to use?" The difference appears subtle, but it reflects a significant shift in nutritional thinking.

The Next Opportunity in Precision Nutrition

The poultry industry has evolved its nutritional strategies in response to genetic progress. However, as birds continue to achieve higher levels of performance, new opportunities to further optimize nutrient utilization continue to emerge.

Major advancement in feed efficiency have resulted from a better understanding of nutrient utilization rather than simply increasing nutrient supply. Trace mineral nutrition may represent the next stage of that evolution. As modern birds continue to push biological limits, evaluating mineral inclusion levels may no longer provide the complete picture.

Increasingly, nutritionists are looking further, considering nutrient availability, utilization and consistency as additional measures of nutritional value. This does not

suggest traditional mineral programs have become obsolete. Rather, it raises an important question: **Are today's birds placing nutritional demands that require us to think differently about trace minerals?** If nutrient availability plays a greater role in supporting modern flock performance, another question naturally follows: **Should all trace mineral sources be expected to perform the same during digestion?**

As nutritionists continue searching for ways to support nutrient efficiency, growing attention is being directed toward advanced mineral technologies that are designed to help protect minerals during digestion and support their availability at the point of absorption. Among these approaches, bis-chelated trace minerals are attracting increasing interest because of their potential to help bridge the gap between mineral inclusion and mineral utilization.

Understanding why that matters begins with a closer look at a common industry assumption:

Are all organic trace minerals really created equal?

To learn more about the differences between trace mineral sources, contact your local NOVUS representative, or visit novusint.com/minerals.

Open Positions

Position – Business Executives / Senior Business Executives

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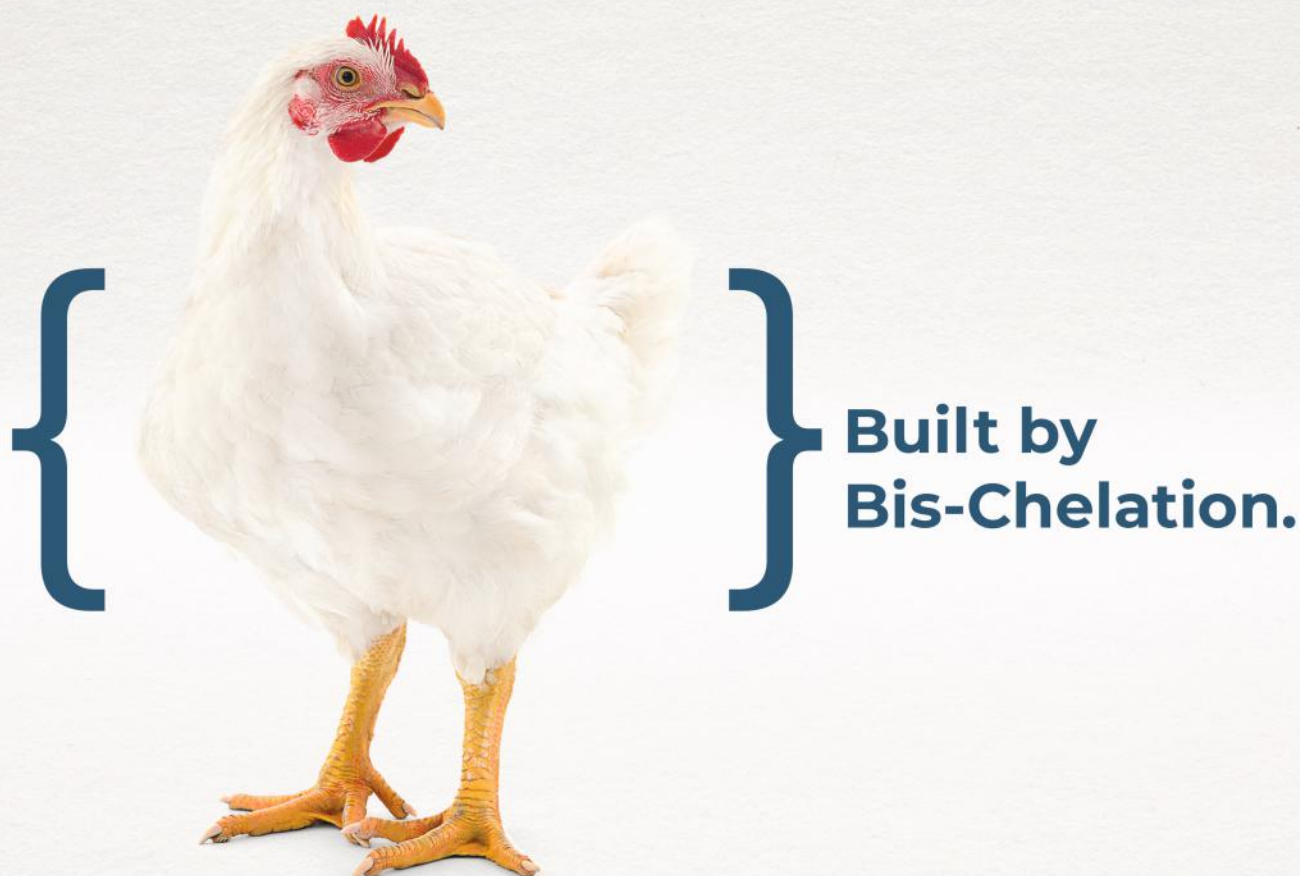
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Nirvana Country, South
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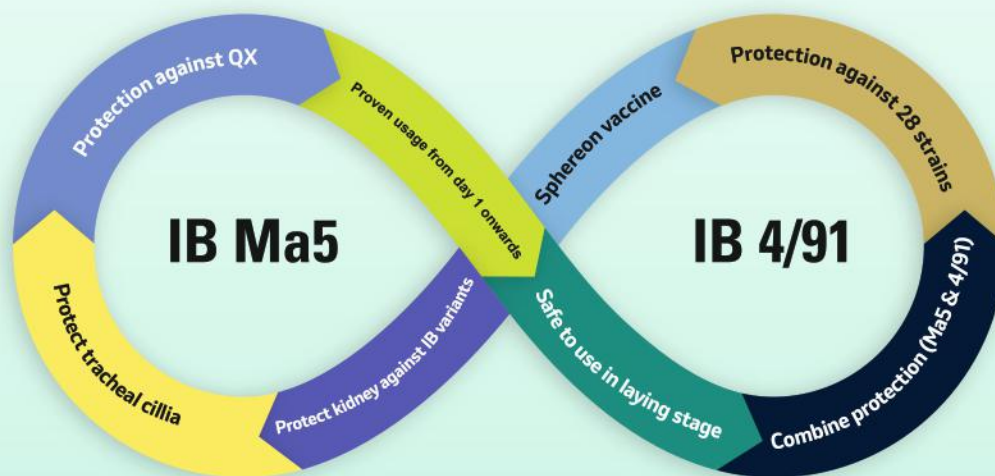


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