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	Control	0/10	0	<2	<2	0	0	0
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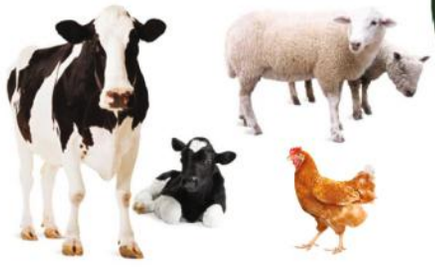

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From the Editor's Desk

Evolving Poultry-North!

Poultry operations are evolving encouragingly in North India. A recent development worth noting is the introduction of a brake for heavy broilers weighing over 2.2 Kg. This is to avoid oversupply when the demand is seasonally low. After some deliberations, the Breeder association leader representing the broiler farmers' problems negotiated successfully with an integrator to arrive at a resolution.

It is very insightful to note how democratically a long-term solution was arrived at in the mutual interest of the producers and the farmers in the industry.

We also expect associations and federations to take a proactive and lead role in resolving the problems of the farmers across all regions of the country.

We must always welcome a change for the better!

Victims and perpetrators of terrorism can never be equated – As a very strong statement by Sri Raj Nath Singh at the SCO Summit. It was a similar stance by President Donald Trump, who does not miss the opportunity to hyphenate as equals when addressing India and Pakistan.

The West has always mentioned India and Pakistan in the same breath and has gotten used to it. It is becoming beyond their perception that India has moved far ahead so as to not only challenge the West but also overtake many of them. The same fear is with China that it is undigestible that INDIA can progress in leaps and bounds and challenge them everywhere. None can dictate terms to India, and that is a shocking revelation to the global powers. The West had for decades created and set image of India and viewed it always in the same template. The new emerging INDIA is shaking them out of their fondly imagined perception of India.

Europe and America are creating a divide between the global North and the global South. It is very difficult to understand the collective psychology of the EU, where they always end up shooting themselves own the foot. Before the Ukraine war, all the energy, in the form of gas and oil, wheat, and edible oils, came from Russia and Ukraine. Post-war, the supplies have been disrupted, causing huge losses to their European economies.

Recently, INDIA has been the largest oil supplier of processed crude oil in the form of diesel and aviation fuel to Europe. Now EU wants to sanction this channel too- so what does it translate to? It will further choke crucial oil supplies to the EU from India. For India, the entire Global South is an open, welcoming market.

America's tariff threat is like water on a duck's back for India. India has the last laugh in such threats, as it never works!

The dignity and independence of India do not seem to be acceptable to the global north. Nevertheless, this is the stark reality with sooner or later, the rest of the world needs to digest.

INDIA has all the ingredients needed to become a superpower, and nothing is going to stop it!

Editor

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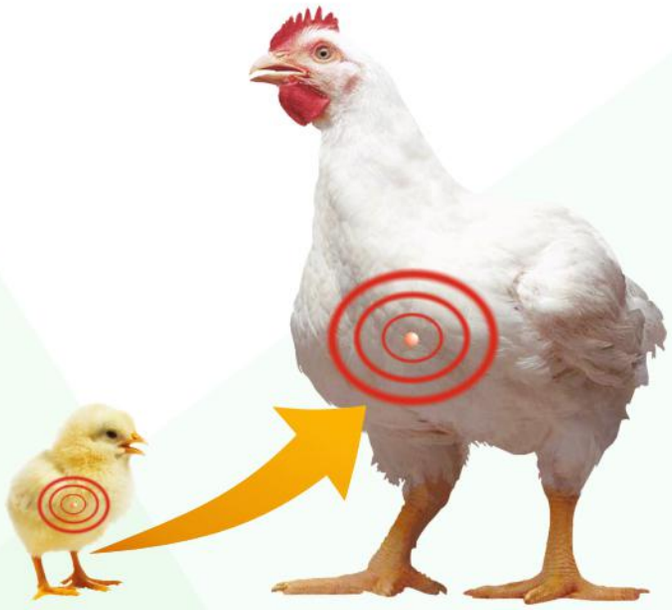

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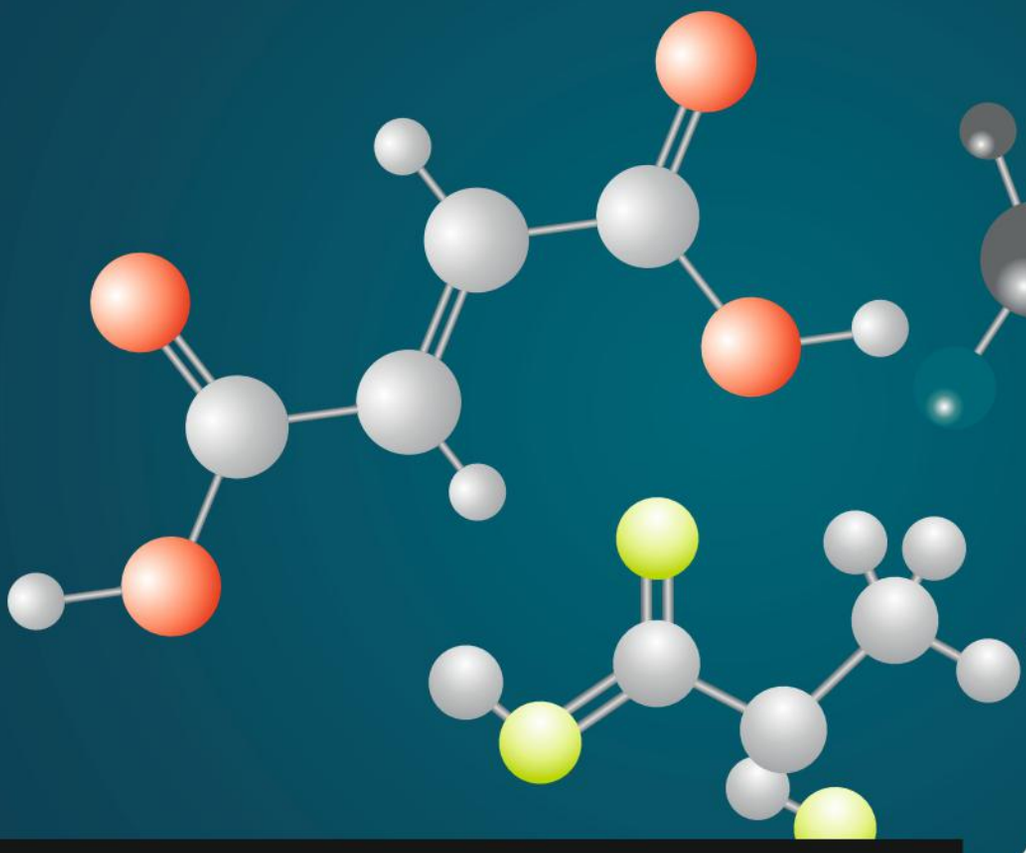

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एनकाउंटर न0 265- भारतीय फीड इंडस्ट्री का महत्वपूर्ण रोल होने के बावजूद भी पोल्ट्री में 'कसक' क्यों ?

भारत में फीड मिल्स बहुत सी आ गयी हैं और आती ही जा रही हैं। इंटीग्रेशन भी बढ़ता जा रहा है। समझ में नहीं आ रहा है यह फीड कहाँ बिकेगी ? इंटीग्रेटर भी बहुत बड़े–बड़े आयातित प्लांट लगा रहे हैं। मेरे लिए यह शुभ संकेत है परन्तु फिर वही सवाल खटकता है, यह फीड कहाँ बिकेगी ? लगभग सभी बड़े लेयर फार्म अपनी ही फीड बनाते हैं।

पोल्ट्री फीड में पड़ने वाले कई इंग्रेडिएंट्स से अब काफी मात्रा में अल्कोहल एवं इथेनॉल निकाला जा रहा है। इससे निकलने वाला बाईप्रोडक्ट पोल्ट्री के लिए उपलब्ध होगा। पोल्ट्री फीड में मक्का, बाजरा एवं राइस एवं राइस कटिंग मुख्य है जिसके लिए भारत में यह नया बाजार खुल गया है – देखिये इसका क्या असर पोल्ट्री फीड इंडस्ट्री पर पड़ता है ?

दुर्भाग्य से पोल्ट्री एक ऐसी इंडस्ट्री है भारत में, जहाँ अंडे या ब्रायलर का भाव लागत के हिसाब से नहीं, बल्कि आढ़ती की मनमर्जी से निकलता है। यह न्याय संगत नहीं है, सदियों से, जिसका खेद है। इससे ज्यादा खेद है, यह अन्याय सदियों से पोल्ट्री इंडस्ट्री झेल रही है, जहाँ 'सक्षम' नेताओं की कमी नहीं। ऐसा लगता है उनके मस्तिष्क को किसी ने 'वशीभूत' कर लिया है – झुकी–झुकी नजरों से सब झेलते रहते हैं। पोल्ट्री में सदियों से देखा जा रहा है कि पोल्ट्री में लगभग सभी विभाग अच्छा लाभ सदैव अर्जित करते हैं परन्तु एक विशाल विभाग जो बहुसंख्यक अर्थात किसान है जो अंडो या ब्राइलर्स उत्पादन में लगा है, उसके भाग्य में नफा कम समय के लिए और घाटा अधिक समय के लिए लिखा है। दुःख है वह विभाग जैसे ब्रीडर्स, फीड मिलर्स, फार्मा कम्पनीज, आढ़ती, खुदरा व्यापारी एवं साज–सामान बनाने वाले, ट्रे बनाने वाले यह सभी जिनके बलबूते पर पैसा कमा रहे हैं मिल जुलकर उनको अच्छा जीवन देने की कोशिश क्यों नहीं करते ? जिस डाल (किसान) पर इनके फलने–फूलने वाले वर्ग के आशियाना बने हैं उसी को क्यों स्वयं काट रहे हैं ?

लिखते–लिखते अभी खबर मिली है कि ब्रीडर एसोसिएशन नॉर्थ मीटिंग करने जा रही है कि चूजे का रेट कैसे बढ़ाया जाये? करना भी चाहिए क्योंकि अभी तक वह चूजा 40–50 रूपए का एक बेच रहे थे जब किसान 'डूब' रहा था बाजार भाव के कारण तब यह जागे नहीं, अब जागे हैं जब चूजा 10 रूपए का भी नहीं बिक रहा है। अगर ब्रीडर एसोसिएशन मीटिंग करती है कि ब्रायलर उद्योग को कैसे पटरी पर लाया जाए या उठाया जाए जिसमे किसान का भी हित हो और ब्रीडर का भी हित हो तो यह साहसी कदम होगा। मात्र चिक्स के रेट बढ़ाने के लिए 'ट्रिक' के विषय में बात होगी तो यह बेवकूफ एसोसिएशन कहलाएगी।

चलिए अब बात करते हैं उस मुद्दे की जिसके लिए यह लेख लिखना शुरू किया था। बात करनी थी फीड के सन्दर्भ में परन्तु पोल्ट्री इंडस्ट्री कुछ ऐसी उलझी हुई है कि जिस कारण इधर–उधर भटक गया।

पोल्ट्री उत्पादन के कुल खर्च का लगभग 70–75% फीड इंडस्ट्री अर्थात फीड मिल्स को जाता है। यह ब्रायलर हो या अंडो का उत्पादन इसका अधिकाँश शेयर फीड मिल्स को जाता है। यह महत्वपूर्ण भाग है एवं उच्चस्तरीय उत्पादन के लिए इसकी गुणवत्ता उच्चतम होनी चाहिए। क्या सचमुच ऐसा है ? क्या सभी फीड मिलों या ब्रांड के लिए 'हाँ' किया जा सकता है ? शायद नहीं।

कारण स्पष्ट है फीड मिल्स, जैसे पहले लिखा है बढ़ती जा रही है– अलग–अलग इलाके हैं, अलग–अलग लोग हैं, उनके अलग कंसलटेंट हैं और तरह तरह के इंग्रेडिएंट्स उपलब्ध हैं। जैसा मैंने कहा अलग–अलग लोग हैं तो निश्चित रूप से उनकी सोच भी अलग–अलग होगी। कुछ अपने ब्रांड की गुणवत्ता एवं साख पर अधिक जोर देते हैं या सदैव ध्यान रखते हैं। कुछ मध्य में होंगे या कुछ की सोच "मौकाप्रस्त" होगी। इसे साबित करने के लिए आपको उदाहरण दे रहा हूँ।

एक कोरिया की कंपनी भारत में बड़े पैमाने पर फीड का उत्पादन करना चाहती थी। बड़े पैमाने पर सर्वे एवं अध्यन करने के बाद उन्होंने तय किया कि किसी फीड मिल से अपने फॉर्मूले पर फीड बना कर एवं दूसरी कंपनियों के साथ तुलनात्मक अध्यन करने के बाद ही निर्णय लिया जायेगा अपने को भारत में स्थापित करने का। इसके लिए उन्होंने मुझसे संपर्क किया और गुडगाँव स्थित ट्रायल फार्म पर ट्रायल करवाया ,मैंने उन्हें पहले ही कह दिया था कि "मुझे नहीं पता चलना चाहिए कि किस बोरी में कौन सी ब्रांड की फीड है"।

उन्होंने ऐसा ही किया और 5 अलग–अलग ब्रांड की फीड बोरियों में डाल कर A-B-C-D-E करके दिया। ट्रायल शुरू हुआ। हर सप्ताह वेट लेते रहे, 6 सप्ताह तक। कोरियन सुबह 5 बजे ही फार्म पर पहुंच जाते। 6 सप्ताह पर जब आखिरी दिन वेट हो रहा था, उन्होंने मुझसे पूछा "क्या हम 3 ब्रायलर ले जा सकते हैं"? मैंने उन्हें कटवा कर दे दिया। अभी तोल चल ही रही थी– दोनों कोरियन चले गए। मेरे पास एक हिन्दुस्तानी डॉक्टर छोड़ गए। सारी तोल खत्म हो गयी और उसने पाँचों कोड तौल लिए और फोटो ले ली। इसके बाद हम लोग चाय वगैरह पीने लगे। वह कहने लगा आज स्टाफ वाले पूछ रहे थे कि "आज ब्रायलर नहीं खिलाओगे"? मैंने पूछा "कितने चाहिए"? उसने आठ कहा मैंने तुरंत कटवाने को कह दिया। यह एक अच्छा मौका था। मैंने कहा "अब ट्रायल खत्म हो चुका है–रिकॉर्ड भी हो चुका है, मुझे डिकोड दे दो"। उस मासूम ने दे दिया। इसमें चार विदेशी कंपनी थी और एक भारतीय कंपनी थी उन्नत फीड।

जब डाटा एनालाइज हुआ तो खुशी भी हुई और आश्चर्य भी हुआ। खुशी इस बात की थी कि टॉप पर कोरियन एवं भारतीय कंपनी थी। भारतीय कंपनी मात्र 15–20 ग्राम से ही पीछे थी। यह अंतर इन्सिग्नीफिकेंट कहलाता है। आश्चर्य इस बात का था कि बाकी तीन विदेशी कंपनी 50–75 ग्राम से पीछे थी। FCR में भी काफी अंतर था।

गंगा फीड का एक ही लक्ष्य – समृद्ध व सम्पन्न हो फार्मर हमारा ।

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आश्चर्य इसलिए कि इनके अच्छे न्यूट्रिशनिस्ट एवं अच्छी लैब थी। जब यहाँ इतना अंतर आ सकता है तो हमारी असंख्य फीड मिलों के रिजल्ट में कितना अंतर आता होगा? हमारे पास तो कोई रिकॉर्ड नहीं है परन्तु फील्ड में जो दिखा है काफी अंतर है। यही नहीं कुछ फीड के कारण बिमारी की समस्या भी आती जाती है। यह अंतर बहुत कम हो सकता है अगर यह सभी ईमानदारी से यह ठान लें कि हमारे ब्रांड की 'साख' सबसे ऊँची रहे।

अब एक और उदाहरण, क्या खेल फीड के साथ हो रहा है? एक लेयर फार्मर उसका फ्लॉक 20 सप्ताह का था। उसकी समस्या थी उत्पादन तो बढ़ रहा है परन्तु जो गति होनी चाहिए वह कम है। बड़ी समस्या है अंडे का वजन नहीं बढ़ रहा है। यह ब्रीड अंडे के साइज के लिए बहुत मशहूर है। मैंने पूछा "प्री लेयर फीड चल रहा है या फेज वन"? उसे मालूम नहीं था। मैंने सुझाव दिया कि "5 ग्राम प्रति लेयर के हिसाब से सोया मील की टापड्रेसिंग कम से कम 15 दिन कर लें"। साथ में उनसे कहा कि "20 लेयर का अलग–अलग वजन करके मुझे भेज दें और कंपनी से बात करें कि फीड में कितनी प्रोटीन एवं एनर्जी है"? उन्होंने जो होना चाहिए वह बता दिया जो असल में था नहीं। सोया टाप ड्रेसिंग के बाद अंडा भी तेजी से बढ़ा और अंडे का वजन भी। शायद कंपनी सचेत हो गयी थी क्योंकि समय से पीक प्रोडक्शन आया वह भी बहुत अच्छा। किसान ने जो बॉडी वेट भेजा वह 10–20 प्रतिशत कम था, जिसे अतिरिक्त सोया और शायद फीड में सुधार ने ठीक किया होगा।

यह कहानी यहीं खत्म नहीं होती है, जब फ्लॉक 30–31 सप्ताह का होता है तो पुनः अंडे का कुछ वजन कम होने लगा और उत्पादन में भी कुछ गिरावट आने लगी। उस फार्मर का फोन आया। मैंने कहा "पीक बहुत अच्छा गया है। अतः 4–5 दिन के लिए विटामिन्स पिला दें– इसके बाद 4–5 दिन के लिए कैल्शियम पिला दें"। उसके यह सब करने के बाद फोन आया कि उत्पादन घटना तो रुक गया है परन्तु अंडे का वजन अभी भी कम है। मैंने फीड मंगवाया और टेस्ट के लिए भेजा। फेज वन फीड था और कुल 14% प्रोटीन निकली। कंपनी को रिपोर्ट भेजा, जाग उठी, उत्पादन भी बढ़ा और अंडे का साइज भी। ऐसा कई बार हुआ। एक बार तो टेस्ट में कुल 13% प्रोटीन निकली जबकि मैंने यहाँ के हालात देख कर किसान को कह दिया था कि तुम फेज वन ही लगाना।

एक और समस्या थी वहां का सुपरवाइसर इतना ट्रेंड हो गया था कि मालिक से हर 10–15 दिन पर विटामिन AD3EC और B-COMPLEX की डिमांड करता और जो सचमुच अंडा घटना शुरू हो चुका था वह बढ़ने लगता। मैंने किसान से कई बार कहा कि कंपनी से बात करो और कहो "कि फीड में प्रोटीन और विटामिन्स की कमी के कारण बार–बार समस्या आती है"। कुछ दिनों के लिए ठीक हो जाता, फिर वही होता। फिर समस्या आई तो मैंने पूछ लिया "क्या फीड उधार आती है"? उसका जवाब था "कैश पर आती है परन्तु सन् 2020 के बाद हालत बहुत खराब हो गयी थी कोरोना के कारण। कंपनी ने काफी साथ दिया लेकिन कर्ज 6–7 लाख हो गया। कंपनी ने कहा यह पैसा यहीं रोक दो, धीरे–धीरे देते रहना, आगे कैश लेते रहो। अब ऐसे ही चल रहा है। पिछला अभी भी कम नहीं हुआ"। जब वह यह बात बता रहा था तो एक पुरानी बात याद आई।

दिल्ली के सेन्टयूर होटल में एक मीटिंग चल रही थी जिसमे अधिकाँश फीड बनाने वाले थे। कुछ लोगों ने कहा "अजीब विडम्बना है किसान फीड लेता रहता है, जब उसका 3–4 लाख उधार हो जाता है तो किसी दूसरे से फीड लेने लगता है या कोई दूसरा तोड़ ले जाता है"। सभ्भरवाल साहब काफी दिग्गज, दिलेर, मुँह फट और साफ दिल के आदमी थे। अब तो वह कनाडा में हैं और राजशाही ढंग से अपने कार्य में व्यस्त हैं। उन्होंने जो बात कही उस पर सभी हंस पड़े। उन्होंने कहा "घबराने की कोई बात नहीं। ऐसी हालत में मैं क्या करता हूँ बताता हूँ। एक फार्मर हर 10 दिन पर फीड बनवा कर ले जाता था। मेरे लगभग 4 लाख रूपए दबे रहते थे। एक बार वह समय से नहीं आया। मैंने सोचा 2–4 दिन बाद आ जायेगा और 10 दिन गुजर गए वह नहीं आया। शाम को फैक्ट्री बंद होने के बाद चार बोतल ठंडी बियर ली और कुछ नमकीन ली और 20 किलोमीटर उसके फार्म पर पहुंच गया। वह सकपकाया पर मैंने पूछा तुम ठीक तो हो, 20 दिन हो गए तुम आये नहीं, चिंता हो गयी तुम बीमार तो नहीं पड़ गए"। कहने लगा "मैं बिलकुल ठीक हूँ। 'क' फीड वाला आया और कहने लगा हमसे फीड लो तुम्हे सस्ती पड़ेगी। उस चक्कर में उससे बनवा कर लाया"। मैंने कहा "वह तीन तरह की मक्का मंगवाता है, दो तरह की सोया और 2–3 तरह की खलियाँ। तुम्हे प्लेट में अच्छा माल सजा कर दिखा देगा। तुम उस चक्कर में फीड बनवा लोगे। फैक्ट्री के बिलकुल अंदर चले जाओ हर तरह का माल वहां मिल जायेगा"। उसे बात समझ में आई। क्योंकि सब कुछ मंगवा कर उसने दिखाया था,अंदर नहीं ले गया। मैंने कहा "तुम कैश फीड ले जाओ। बाकी चार लाख धीरे–धीरे जब हो देते जाना"। वह फिर से फीड लेने आ गया। 6 महीने हो गए। एक लाख रूपए कम हो गए। उसके खाते में 50000 रूपए ही कम हुए जो वह दे गया था। बाकी 50000 रूपए मैंने फीड फार्मूलेशन में जगलरी करके बचा लिया है। यह उसके खाते में कम नहीं हुआ। इस तरह से यह चार लाख रूपए अपने तरीके से निकाल लूंगा और चार लाख रूपए जैसे वह दे रहा है निकल आएगा। बताइये मेरा पैसा कहाँ मारा गया, मैं तो डबल फायदे में हूँ। इस पर सभी हंस पड़े। शायद यही यहाँ इस लेयर फार्मर के साथ हो रहा है। यह तरीका सही नहीं है परन्तु जिस फीड मिलर ने आप पर इतना पैसा लगा रखा है, वह कहीं से तो निकालेगा।

इसी प्रकार एक फार्म पर 2 सप्ताह के ब्रायलर में बम्बूलफुट की समस्या आ रही थी, संख्या बढ़ती जा रही थी। बुरादा वगैरह चेक हुआ–ट्रीटमेंट भी करवा दिया। सुधार का नाम नहीं ले रहा था। अंत में फीड टेस्ट के लिए भेजा। उसमे स्टेफलोकोक्स बहुत ज्यादा निकला, जिसके कारण यह समस्या भयावह थी। ट्रीटमेंट में एंटीबायोटिक दे कर ठीक किया। फीड मिल इतने ज्यादा बैक्टीरिया को कहती है यह तो "कुछ भी नहीं, इससे कुछ नहीं होगा"। यहाँ भी शायद फीड उधार चल रहा था।

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For the use only of Registered Veterinary Practitioner. **Composition:** Marek's Disease virus, Serotype 1, RN1250 strain at least 952 PFU/dose Excipient q.s. 1 dose. **Indication:** This product has been shown to be effective for the vaccination of healthy 18 to 19 day old embryonated chicken eggs and healthy one-day-old chickens against very virulent Marek's disease. **Dosage and administration:** Administer only as recommended. In Ovo Administration: Dilute vaccine at 4,000 doses per 200 mL diluent. Inject a 0.05 mL dose into each embryonated egg. Subcutaneous Injection: Dilute the vaccine at 1,000 doses per 200 mL diluent. Inject 0.2 mL per chicken. **Age-** This vaccine is recommended for in ovo vaccination of 18 to 19-day-old embryonated chicken eggs. This vaccine is also recommended for subcutaneous vaccination of healthy one- day-old chickens. **Pregnancy and Lactation:** Not applicable. **Contraindications:** None known **Special warnings and precautions:** Do not mix with other products, except as specified on the label. 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 **Withdrawal period:** - Do not vaccinate within 21 days of slaughter. **Shelf Life and Storage:** Shelf life is 36 months, ampoules: 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, Pirojsha Nagar, Eastern Express Highway, Vikhroli (E) | Mumbai 400079 Last review date: 09/08/2024"Additional information is available on request."

सारी फीड मिलों से निकलने वाली फीड का स्टैंडर्डाइजेशन कैसे हो यह एक जटिल समस्या है। सबके पास लैब हो नहीं सकती। मिल जुल कर हम फीड के लिए 'साँझा चूल्हे' की तरह साँझा लैब खोल नहीं सकते क्योंकि हम किसी एक मुद्दे पर एकजुट हो नहीं सकते।

इसके लिए किसानों को ही कोई रास्ता चुनना पड़ेगा। आपका फ्लॉक चाहे ब्रायलर या लेयर या ब्रीडर हो यही आपके लिए बिलकुल सही फीड एनालिटिकल का काम कर सकते हैं। कैसे ? बस आपको दो फीड लेनी पड़ेगी। एक जिस पर आश्रित हैं, उसे 80 या 90 प्रतिशत लें और दूसरी मात्र 10–20 प्रतिशत लें। हर फ्लॉक में इसी अनुपात में लगा दें, अलग–अलग। डीप लीटर है तो एक या दो पेन में, केज है तो आप आसानी से अलग डाल सकते हैं। फीड में यदि कोई समस्या होगी तो एक फीड में आएगी। कोई बिमारी हुई या जाड़े–गर्मी का तनाव हुआ या कोई मैनेजमेंट में गड़बड़ी होगी तो लगभग एक ही समस्या दोनों फीड में आएगी।

इस प्रकार आप आसानी से फैसला कर लेंगे कि समस्या फीड की है या कोई बीमारी का प्रकोप है। भले ही आप अपनी फीड बनाते हों, बनाइये परतु यहाँ भी 10–20 प्रतिशत बाहर के किसी अच्छे ब्रांड का उपयोग करें और अपनी 'फ्लॉक लैब' को चालू रखें। ऐसा ना करने पर जब कोई समस्या आएगी तो एक डॉक्टर आपको लम्बी चौड़ी लिस्ट दवाओं की देगा। आप कुछ दिन चलाएंगे फिर दूसरे के पास जायेंगे। वह भी एक लिस्ट दे देगा। इस तरह से दवा का खर्चा होता रहेगा परन्तु समस्या का निदान होता नहीं दिखता। 'फ्लॉक लैब' से सबसे बड़ा जो फायदा है कि तुरंत यह कन्फर्म हो जायेगा कि फीड की समस्या है या नहीं। यदि नहीं तो बीमारी या मौसम या मैनेजमेंट पर ही ध्यान दें।

एक हरियाणा के अच्छे फीड मिलर का फोन आया। यह केस हाल ही सन् में 2024 का है। कानपूर–इलाहबाद रोड पर एक अच्छे बड़े ब्रायलर फार्म पर चिक्स में काफी मोर्टिलिटी हो रही थी। बेहर हाल जब कंपनी स्टाफ वहां ले गया तो सब ठीक–ठाक हो चुका था और ग्रोथ भी अच्छी थी। फार्मर का बार–बार कहना था "फीड बदलते ही सब ठीक हो गया"। मैंने कहा "पहले और अब की फीड के बारे में कुछ भी कहना ठीक नहीं। अब सब कुछ ठीक है तो मैं पहले की समस्या पर कैसे टिपण्णी कर सकता हूँ"? मैंने उनसे शुरू से अब तक का रिकॉर्ड माँगा। उसका अध्यन कर रहा था। एक दिन की मोर्टिलिटी 300 पार कर चुकी थी, परन्तु दूसरे ही दिन 75 पर आ गयी और उसके बाद 20–25 मोर्टिलिटी थी, फिर बिलकुल नार्मल हो गयी। यहाँ मैं चौंका फीड बदलने के बाद भी मोर्टिलिटी चल रही थी, एका–एक कम कैसे हुई। उससे पूछा "यहाँ आपने क्या किया"? उत्तर दिया "एक डॉक्टर ने आकर अमीकासीन. जैनटा वगैरह का तीन शाट लगवाया"। मैंने कहा "वह डॉक्टर काफी अकलमंद था"। आप खुद सोचिये अगर इस शाट ने काम किया तो फीड कहाँ से दोषी थी ? कई डॉक्टर से उन्होंने संपर्क किया था, जब उनके पर्चे काम नहीं आये तो सारा दोष फीड पर मढ़ दिया। इसलिए कहता हूँ दो फीड रखिये और फ्लॉक को लैब की तरह इस्तेमाल करे ताकि समस्या आने पर इधर–उधर भटकना ना पड़े। 'तुक्केबाजी' या अँधेरे में बटेर ना पकड़ा जाए।

यह हकीकत है कि पोल्ट्री फार्मिंग की कुल आय का लगभग 75% फीड इंडस्ट्री को चला जाता है। मात्र 25% बचे जिसमे चिक्स, लेबर, दवा इत्यादि के अलावा अपना खर्च भी शामिल है। यह 75% हम बंद बोरी को देते हैं जिसमे क्या है, क्या नहीं– हमें कुछ नहीं मालूम। भरोसे और ब्रांड की साख को यह पैसा दे रहे हैं। 75% देने के बाद भी इनकी और से सर्विस न के बराबर है। इतनी फैक्टरियां खुल गयी है, क्या सभी की साख एक जैसी है ? यह महत्वपूर्ण प्रश्न है, इस पर चर्चा होनी चाहिए। कम से कम हर बोरी पर स्टाम्प लगाएं इसमें कितना प्रोटीन है और कितनी एनर्जी है ? कम से कम जो अच्छी कंपनियां है वह इस मुहीम को शुरू करें, उनपर भरोसा और उनकी साख बढ़ेगी। जो नहीं लगाएगा उस पर से किसानों का विश्वास उठेगा। इससे हमें ज्यादा से ज्यादा अच्छी फीड मिलने की सम्भावना बढ़ जाएगी। इस विषय पर CLFMA और PFI को विचार विमर्श करना चाहिए।

फीड एनालिटिकल लैब की कमी के कारण और जो हैं उनके बहुत ज्यादा चार्जेज के कारण फार्मर तो फार्मर फीड फैक्ट्रियां भी टेस्टिंग से कतराती हैं और राम भरोसे काम चला रही है।

डिजीज डाइग्नोस्टिक लैब भी बहुत कम हैं। बहुत कम फार्मर या कंसलटेंट इस्तेमाल करते हैं। सभी अपनी 'आँखों की लैब' से काम चला लेते हैं। कभी यह 'तुक्का' सही बैठता है, तो कभी गलत बैठता है।

हर हाल में इंडस्ट्री और किसान को जागने की जरूरत है।

हम अक्सर सस्ती और महंगी फीड के चक्कर में धोखा खा जाते हैं। यह जरूरी नहीं की सस्ती फीड से आपको लाभ होगा या महंगी फीड से आपको नुक्सान हो। वास्तव में यह निर्भर करता है, फीड की गुणवत्ता पर। एक महंगी फीड कम खाकर ज्यादा वजन देती है या अंडा देती है, आपका FCR कमाएगा। इसके विपरीत सस्ती फीड खिलाकर यदि FCR ज्यादा आता है तो दोनों की कीमत निकाल लें। आपको पता चल जायेगा, वास्तव में कौन सी फीड सस्ती पड़ रही है या अधिक लाभदायक है। केवल आँख बंद करके बोरी की कीमत पर ना जाएँ।

Mr. Shabbir Ahmad Khan

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POULTRY FEDERATION OF INDIA

36th PFI AGM

8 - 9 October, 2025

At Ramada Hotel, Lucknow

POULTRY FEDERATION OF INDIA

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President

Mr. Sanjeev Gupta
Vice - President (H.Q.)

Mr. Ravinder Sandhu
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Mr. Ricky Thaper
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Mr. Rahul Khatri
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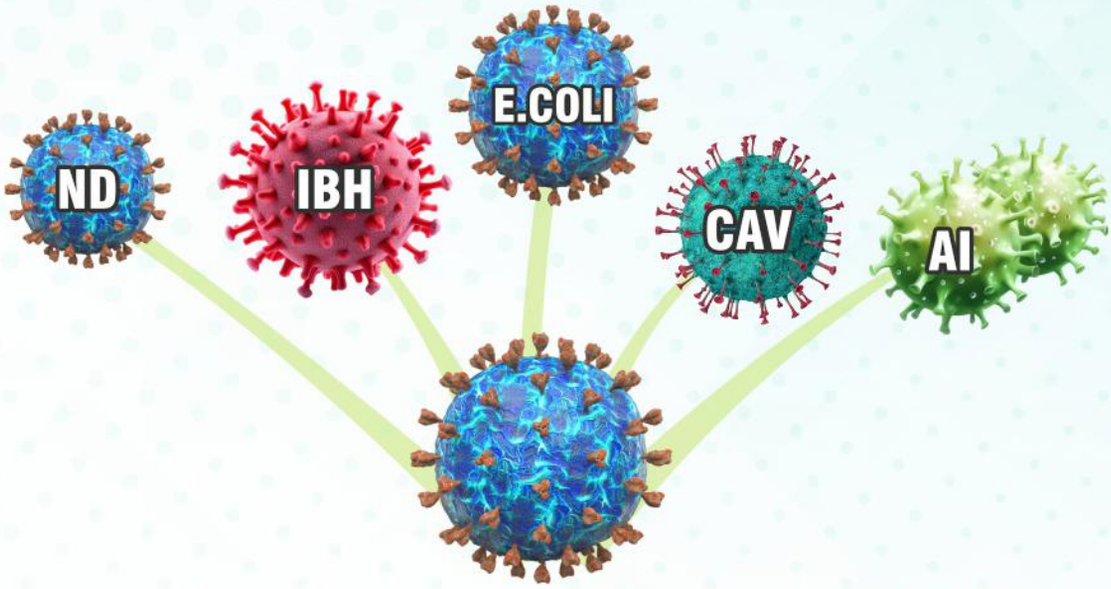

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Novus International Announces Strategic Business Realignment to Drive Future Growth and Innovation

NOVUS Made of More

Novus International, Inc., the leader in intelligent nutrition, today announced a strategic business realignment designed to accelerate innovation, strengthen operational agility, and unlock long-term value for its global customer base. The transformation will result in two separate business units under the NOVUS umbrella - one dedicated to liquid methionine solutions and the other focused exclusively on specialty feed ingredients.

This new structure reflects NOVUS's continued evolution as a science-driven, customer-focused company committed to helping producers achieve more. Both units will be structured as separate platforms, each with dedicated profit and loss accountability and the autonomy to focus on their core capabilities.

NOVUS CEO Dan Meagher will continue to lead the parent organization and provide strategic oversight across both businesses.

Dan Meagher
Novus CEO

"Each unit now has the clarity and freedom to innovate faster, respond smarter, and continue delivering solutions that meet the evolving needs of producers around the world," Meagher said. "This is a bold, forward-thinking step that allows us to go further in our commitment to deliver value for our customers, our teams, and our partners."

Dave Dowell has been appointed President of the Methionine Business Unit, while Ed Galo will lead the Specialty Business Unit as President.

NOVUS has long been recognized for pioneering advancements in liquid methionine technology and for its leadership in specialty nutrition through intelligent feed solutions. The formation of these focused business units reinforces this leadership and unlocks new potential to scale innovations globally.

"This realignment is not a division - it's an evolution," Meagher said. "An evolution that enables us to better serve the industry by doing what we do best - Deliver more science, more insight, and more inspiration. This is how we continue to show the world that we're Made of More™."

Both business units will maintain uninterrupted service for dairy, poultry, and swine producers globally. Customers can continue to expect the same levels of excellence, innovation, and integrity that have defined NOVUS for more than 30 years.

For more information on NOVUS and its innovative nutrition solutions, visit novusint.com.

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Advances in Poultry Nutrition:
The Promise of Selenium Nanoparticles

Parag Acharya, Anand Prakash, Jessy Bagh

Role of Poultry in Food Security and Emerging Nutritional Strategies

Food security stands as one of the most critical global concerns of the 21st century. It goes beyond ensuring the availability and accessibility of food to also include its nutritional quality, safety, and long-term sustainability. With the global population continuing to grow, providing a consistent supply of nutrient-dense food is essential for public health, economic stability, and sustainable development.

Among all food-producing sectors, the poultry industry plays a pivotal role in supporting global food security. It is characterized by rapid production cycles, high feed efficiency, and relatively low production costs, making it an affordable source of animal protein. Poultry meat and eggs are rich in high-quality protein, essential amino acids, and micronutrients, which are particularly important in low- and middle-income countries where nutritional deficiencies remain widespread.

Chickens account for over 90% of the global poultry population and contribute nearly 89% of poultry meat and 92% of global egg production. The demand for poultry products is projected to rise sharply, with poultry meat consumption expected to increase by 121% and egg consumption by 65% between 2005 and 2050, driven by rising incomes, urbanization, and shifts toward animal-based diets.

Challenges in Poultry Production

Despite its growth and significance, the poultry industry faces considerable challenges. Rising input costs—such as feed, vaccines, medications, and labour—alongside the growing threat of infectious diseases and abiotic stressors like pollution and climate variability, threaten production efficiency and profitability.

Among these, heat stress (HS) is one of the most severe constraints, especially in broiler chickens. Elevated environmental temperatures compromise feed intake, growth rate, immune function, carcass quality, and survival. These negative impacts highlight the need for innovative and sustainable solutions that can improve poultry resilience and overall welfare.

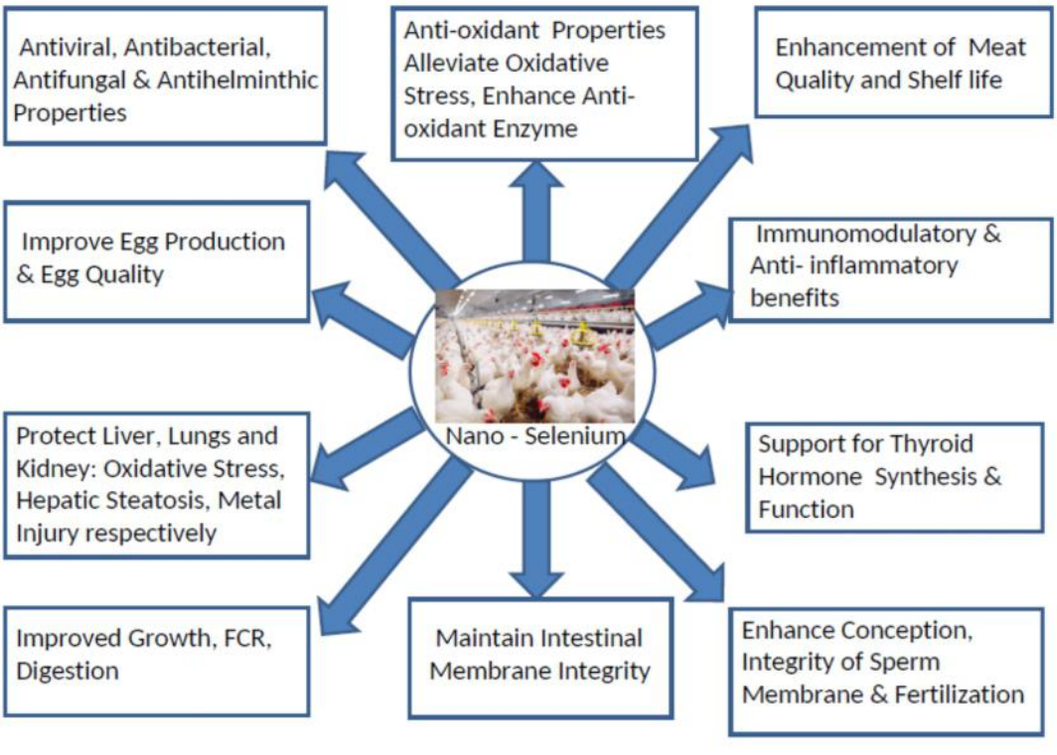
Advancements in Nutritional Interventions

To overcome these challenges, several strategies have been employed to support poultry health and productivity. These include improved genetics, modern housing and ventilation systems, and the incorporation of functional feed additives—such as growth promoters, nutraceuticals, trace elements, and antioxidants—into poultry diets (Alagawany et al., 2020).

Trace minerals are of particular interest due to their roles in metabolism, immune function, and antioxidant defence. Selenium is an essential part of at least 25 selenoproteins, including glutathione peroxidase (GPx), a powerful antioxidant enzyme that protects birds from cellular damage.

It helps maintain cellular homeostasis, boosts immunity, enhances growth, and supports fertility(Abd El-Hack et al., 2017). Adequate selenium levels are crucial for maintaining cellular homeostasis, immune competence, and reproductive efficiency in poultry (Hassan et al., 2020). Traditionally, poultry diets use either inorganic selenium (sodium selenite) or organic selenium (selenium-methionine). But these have limitations—either in bioavailability or cost. Nano-Se bridges the gap, offering the effectiveness of organic selenium with better safety and efficiency.

Figure 1. Schematic overview of the biological effects of nano-selenium in poultry.



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- CEFTIOFUR SODIUM STERILE VET IHS
- CEFTIOFUR VET IHS
- CEFTIZOXIME SODIUM STERILE
- CEFTRIAXONE SODIUM (STERILE)
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Nanotechnology in Poultry Nutrition

In recent years, nanotechnology has emerged as a promising tool in animal nutrition. The application of nanominerals in poultry feed has gained increasing attention due to their enhanced bioavailability and efficiency. Nanoparticles reduce antagonistic interactions in the gastrointestinal tract and allow for lower effective dosages with higher biological uptake. Furthermore, their use may help reduce environmental contamination by minimizing mineral excretion.

Nanoparticles have also shown antimicrobial properties, reducing pathogenic bacteria while promoting beneficial gut flora, which can improve gut health and overall performance For instance, zinc nanoparticles have been reported to boost broiler growth rates (Mohammadi et al., 2015), while selenium and silver nanoparticles have demonstrated potential in enhancing antioxidant status and mitigating oxidative stress.

Nano-Selenium: A Promising Nutritional Tool

Selenium (Se), named after the Greek goddess Selene, was discovered in 1817. Initially regarded as toxic, its importance as an essential trace element was only recognized in the 1950s (Schwarz and Foltz, 1957). Selenium naturally occurs in both inorganic and organic forms. The inorganic forms include selenate (Se^{6+}), selenite (Se^{4+}), and selenide (Se^{2-}), whereas the organic forms, present in plant and animal tissues, include selenomethionine (SeMet) and selenocysteine (SeCys).

Selenium plays a central role in the structure of at least 25 known selenoproteins, with SeCys situated at their active sites. These selenoproteins are involved in essential physiological functions such as DNA synthesis, antioxidant defence, redox regulation, protein repair, thyroid hormone metabolism, and selenium transport and storage in body tissues. Selenium's role in the activity of selenoproteins like glutathione peroxidase is critical for oxidative stress management, immune modulation, and metabolic regulation. The use of nano-Se in poultry diets shows promise in enhancing growth, improving feed efficiency, and increasing resistance to stressors such as heat stress. Its unique physicochemical properties enable it to act more effectively at the cellular level, supporting redox balance and boosting immune function under challenging environmental conditions.

The Science behind the Benefits

- Nano-selenium (nano-Se) supplementation offers significant health advantages in poultry, including cholesterol reduction, protection of vital organs, and enhanced immune responses—particularly important during vaccinations such as those for Newcastle disease.
- Nano-Se, due to its nanoscale size and larger surface area, offers improved intestinal absorption and bioavailability when compared to conventional selenium sources. This is largely due to its ability to form nanoemulsions that enhance mucosal permeability. Although selenium does not directly influence feed intake or growth, its functional effects on performance are attributed to its incorporation into selenoproteins—such as thioredoxin reductase (TrxR) and glutathione peroxidase (GSH-Px)—which are vital in maintaining cellular redox balance and protecting against oxidative stress (Gangadoo et al., 2016).
- Moreover, nano-Se supports intestinal epithelial integrity, promoting better digestion and nutrient absorption (Gangadoo et al., 2018). A deficiency of selenium can lead to oxidative imbalance, impaired cellular function, and reduced overall productivity and reproductive performance in poultry.
- Available evidence suggests that dietary inclusion of SeNPs at a concentration of 0.9 mg/kg can positively influence gut health. Specifically, such supplementation has been associated with an increase in beneficial microbial populations, such as *Lactobacillus* and *Faecalibacterium* species, along with a higher production of short-chain fatty acids (SCFAs), notably butyric acid (Gangadoo et al., 2018). These findings highlight the potential of SeNPs to favourably modulate gut microbiota, which in turn may support enhanced immune function and improved intestinal integrity in poultry.
- Studies have shown that birds receiving dietary nano-Se at levels ranging from 0.15 to 1.2 ppm exhibit improved antioxidant capacity and immune responses. Under heat stress, nano-Se supplementation enhances levels of key antioxidants like GPx, reduces lipid peroxidation (measured by MDA), and boosts immunoglobulins such as IgM and IgG more effectively than other selenium forms (Senthil Kumaran et al., 2015). In laying hens, a dietary inclusion of 0.25 ppm nano-Se was found to elevate GSH-Px activity (Radwan et al., 2015). Likewise, broilers under heat stress benefitted from nano-Se with improved immunity, antioxidant defences, and growth outcomes (Mahmoud et al., 2016).

Limitations and Potential Risks of SeNPs

While selenium nanoparticles (SeNPs) are generally considered safe when used within recommended limits, excessive supplementation can pose health risks. In broiler diets, SeNP inclusion should not exceed 1.0 ppm, with the optimal range typically falling between 0.3 and 0.5 ppm (Selim et al., 2015). Intake beyond this range has been associated with adverse effects, including alterations in liver structure and signs of toxicity. For instance, administering higher levels of SeNPs (up to 4.25 ppm) has been shown to cause cellular stress in broilers, disrupting carbohydrate and fatty acid metabolism due to changes in protein expression. These issues are largely linked to the enhanced and uncontrolled absorption of nanoparticles, a consequence of their small size.

Animal studies using mice have further demonstrated the toxic potential of excessive selenium intake. Doses of 5 mg/kg body weight led to stunted growth, while 6.4 mg/kg induced liver alterations. At 8 mg/kg, mice exhibited symptoms of anaemia and increased mortality. These findings underscore the importance of further research to better understand the safety profile, toxicity thresholds, and long-term effects of SeNPs in poultry before widespread application (Nabi et al, 2020)

Conclusion

Selenium (Se) plays a crucial role in poultry nutrition due to its diverse health-promoting properties. Among various selenium sources, selenium nanoparticles (SeNPs) have emerged as a superior alternative, primarily because of their enhanced bioavailability and reduced toxicity compared to traditional forms. Research findings suggest that SeNPs can significantly boost poultry health and productivity. Unlike inorganic selenium, SeNPs minimize mineral antagonism in the gut, facilitating better absorption and lowering selenium excretion into the environment. Incorporating SeNPs into poultry diets also enriches selenium levels in eggs and meat, offering the potential to produce high-value functional foods for human consumption. Nevertheless, more in-depth investigations are needed to understand how SeNPs function within the poultry system and to determine safe and effective supplementation levels across different bird growth phases before large-scale implementation.

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Climate-Smart Poultry:
Adapting to a Changing Environment

Prof. (Dr.) P.K. Shukla and Dr. Amitav Bhattacharyya
Department of Poultry Science,
College of Veterinary Science and Animal Husbandry,
Mathura- 281001 (U.P.)

The poultry industry, a vital component of global agriculture and food security, is now confronting significant challenges due to the growing impact of climate change. Rising temperatures, erratic rainfall, and frequent extreme weather events are directly affecting poultry health, feed availability, water resources, and overall productivity. These climatic stressors not only threaten the sustainability of poultry farming but also increase the cost of production and vulnerability of smallholder farmers. In this changing scenario, the concept of "Climate-Smart Poultry" has gained momentum as a comprehensive strategy to ensure sustainable poultry production that can withstand climate shocks while reducing environmental impact.

Climate change influences poultry farming in multiple ways. One of the most pressing issues is heat stress, which severely affects broiler and layer birds. High ambient temperatures reduce feed intake, slow down weight gain, decrease egg production, and increase mortality rates. Furthermore, warmer and humid conditions lead to the proliferation of disease-causing pathogens, increasing the risk of outbreaks like Newcastle disease, Avian Influenza, and parasitic infestations. Climate change also exacerbates water scarcity in arid and semi-arid regions, directly affecting bird health and hygiene. Moreover, the disruption in crop cycles caused by climate variability affects the availability and cost of feed grains such as maize and soybean, thereby threatening the economic viability of poultry operations.

To address these issues, the concept of Climate-Smart Poultry revolves around three core objectives: sustainably increasing poultry productivity and incomes; adapting and building resilience to the effects of climate change; and, where possible, reducing greenhouse gas emissions from the sector. These goals align closely with the principles of Climate-Smart Agriculture and require systemic changes in how poultry is bred, housed, fed, and managed.

One of the critical components of climate-smart poultry is the selection and development of genetically resilient bird breeds. Indigenous breeds like Kadaknath, Vanaraja, Gramapriya, and Aseel have shown better adaptability to extreme climates, resistance to diseases, and tolerance to heat. These birds perform well under low-input backyard systems and offer an alternative to commercial breeds that are often vulnerable to environmental stress. Advances in genetic research and breeding technologies can further enhance traits like feed efficiency, disease resistance, and heat tolerance, making poultry farming more resilient and productive under changing climatic conditions.

Climate-adaptive poultry housing and infrastructure are equally important in mitigating the impacts of climate change. Traditional poultry sheds with open sides are no longer adequate. Modern poultry houses need to be designed with improved ventilation, insulated roofing, and cooling systems such as foggers and fans. These changes can maintain an optimal temperature inside the poultry house, thereby reducing heat stress on birds. Rainwater harvesting and waste recycling systems can be integrated into poultry infrastructure to promote resource conservation. For small and marginal farmers, cost-effective and locally adaptable housing solutions using bamboo, thatch, or mud bricks can provide thermal comfort and economic feasibility.

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Feed and nutrition management also play a vital role in climate-smart poultry systems. During periods of heat stress, birds require additional electrolytes, antioxidants, and vitamins to maintain their physiological balance. To cope with feed scarcity and price volatility, farmers can explore alternative feed sources such as rice bran, sunflower cake, cassava, kitchen waste, and insects like black soldier fly larvae. These alternatives reduce dependence on conventional grains and lower the feed cost. Precision feeding techniques, such as nutrient-specific formulations and automatic feeders, ensure efficient nutrient utilization and minimize wastage, thereby improving productivity and environmental sustainability.

Health and biosecurity measures must be strengthened to cope with the changing disease dynamics triggered by climate variability. The emergence of new pathogens and vectors due to rising temperatures demands updated vaccination schedules and robust disease surveillance systems. Biosecurity protocols such as controlled access, regular disinfection, and rodent-proofing are essential to prevent disease outbreaks. Mobile veterinary services, weather-based disease forecasting, and digital tools for early warning can significantly enhance the preparedness and response capacity of poultry farmers.

Manure and waste management are crucial aspects of climate-smart poultry farming. Poultry manure, if improperly handled, contributes to greenhouse gas emissions such as methane and nitrous oxide. Technologies such as composting, vermicomposting, and biogas generation not only reduce emissions but also convert waste into valuable organic fertilizers and energy. Regular litter turning, the addition of microbial inoculants, and proper storage practices minimize ammonia volatilization and odour. The use of carbon footprint assessment tools helps farmers measure and manage emissions more effectively at the farm level.

Climate-smart poultry cannot succeed without enabling policies, research support, and capacity-building efforts. Government policies should support climate-resilient infrastructure through subsidies, insurance schemes, and incentives for adopting renewable energy solutions like solar-powered lighting and heating systems. Research and development institutions must focus on climate-resilient breeding, feed innovation, and disease control. Extension services and training programs are needed to educate farmers about climate-smart techniques and build local capacity. Mobile apps and digital platforms can facilitate real-time decision-making through weather updates, health alerts, and best practices.

In rural India and other developing countries, poultry farming is often managed by women and smallholder farmers. Climate-smart poultry models should be inclusive and supportive of gender equity. Empowering women with access to training, credit, and technology ensures greater participation and resilience at the grassroots level. Moreover, integrating poultry with crop-livestock systems creates opportunities for circular economy practices where poultry manure can be used as fertilizer, and crop residues serve as poultry feed, promoting sustainable resource utilization.

In conclusion, climate change is redefining the challenges and priorities of the poultry sector. Adapting to this new reality requires a shift towards climate-smart poultry systems that combine scientific innovation, traditional knowledge, and policy support. By enhancing resilience, optimizing resource use, and reducing environmental impact, climate-smart poultry holds the key to ensuring sustainable livelihoods, food security, and rural development in a changing world. As the sector moves forward, it must embrace a holistic, inclusive, and climate-conscious approach to secure its future amidst uncertainty.

EVENT CALENDER

AUGUST 2025

22-23 AUG. 2025 – CLFMA 58th AGM & 66th NATIONAL SYMPOSIUM 2025

Venue : Hyderabad at Taj Deccan, Road No.1, Banjara Hills, Hyderabad – 500034, India
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Web : www.clfma.org

SEPTEMBER 2025

10-12 SEPTEMBER 2025 – VIV SELECT CHICNA

Venue : Nanjing International Expo Center, Jiangsu, China
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SEPTEMBER 2025

16-18 SEP. 2025 SPACE

Venue : Rennes Expo-Park, France
Phone : +33 (0) 223482879
Email : c.berthier@space.fr info@space.fr
Web : www.space.fr

NOVEMBER 2025

25-27 NOVEMBER 2025 – VIV MEA

Venue : Adnec Center Abu Dhabi Khaleej Al Arabi Street Abu Dhabi, U.A.E.
Name : Renate Wiendels
Phone : +31 6 5133 2877
Email : Renate@vnueurope.com
Web : www.vivmea.nl

26-27-28 NOV. 2025 POULTRY INDIA

Venue : HITEX Exhibition Center Hydrabad
Name : Mr. Uday Singh Bayas (President) Ms. Radhika (SOM)
Phone : 7997994331 / 34
Email : info@poultryindia.co.in
Web : www.poultryindia.co.in

JANUARY 2026

27-29 JANUARY 2026 – INTERNATIONAL PRODUCTION & PROCESSING EXPO

Venue : Georgia World Congress Center, 285 Andrew Young International Blvd NW USA
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Sharing the Vision: VNU Europe Cements Partnership with the Poultry Federation of India for the launch of VIV Select India

Strong collaboration is key in successfully tapping into India's thriving animal protein and livestock industry

VNU Europe, the international division of Royal Dutch Jaarbeurs, and organizer of VIV Worldwide, is proud to announce it has entered into a partnership with the Poultry Federation of India (PFI). Signed by both parties earlier this year, the multi-year agreement is a strong testament to sharing the vision and commitment to further invest and enrich India's thriving animal protein and livestock industry.

Rapid market expansion in India

India's animal protein and livestock sector stands as one of the world's most dynamic and rapidly expanding markets. With a growing population of over 1.4 billion people and rising disposable incomes, the demand for high-quality animal protein continues to surge. As consumer preferences evolve toward more protein-rich diets and sustainable food production practices, India presents unprecedented opportunities for innovation, technology adoption, and market expansion across the entire feed-to-food value chain.

Recognizing the opportunities, Mr. Ranpal Dhanda, President of PFI says, "This partnership with VNU Europe represents a pivotal moment for India's poultry and livestock industry. By combining our deep understanding of the Indian market with VNU Europe's global expertise and network, we are creating a powerful platform that will drive innovation, facilitate knowledge exchange, and accelerate the growth of our sector. This collaboration will help Indian producers access cutting-edge technologies and best practices while showcasing India's tremendous potential to the international community."

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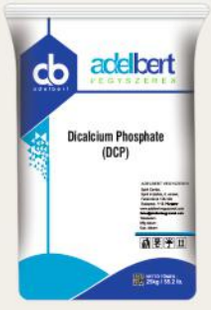

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VIV Select India 2026

As a product of the strategic partnership, VNU Europe and the Poultry Federation of India proudly present VIV Select India 2026, a premier Feed to Food trade show specifically designed for the Indian animal protein and livestock industry. This landmark event will bring together 150 exhibitors representing the complete industry supply chain, from animal nutrition and feed milling to animal health solutions, creating a comprehensive marketplace in one of the world's fastest-growing markets. Targeting 5000 visitors, VIV Select India 2026 is scheduled to take place from April 22-24, 2026, at the state-of-the-art Yashobhoomi Convention Centre in New Delhi, India.

The event also receives strong industry support from key organizations, including the Compound Livestock Feed Manufacturers Association (CLFMA) and the Indian Federation of Animal Health Companies (INFAH), ensuring robust engagement from across the entire sector and reinforcing the event's position as the definitive platform for the Indian market.

Exhibitor Sales Now Open

Exhibitor sales for VIV Select India 2026 are now officially open, offering companies an unparalleled opportunity to establish their presence in India's flourishing market. Exhibitors will benefit from direct access to India's key decision-makers, buyers, and industry leaders, while gaining valuable insights into local market dynamics and consumer preferences. The event provides a unique platform for launching new products, building strategic partnerships, and exploring distribution channels across one of the world's most promising animal protein and livestock markets.

By focusing on the complete feed-to-food value chain, VIV Select India 2026 will facilitate the knowledge transfer and technology adoption essential for meeting India's evolving protein needs while supporting the country's modernization goals.

"India represents one of the most exciting growth opportunities in the global animal protein and livestock industry," states Mr. Jeroen van Hooff, President & CEO of Royal Dutch Jaarbeurs and VNU Group. "Our partnership with the Poultry Federation of India reflects our strong, long-term commitment to supporting the country's agricultural development and helping both Indian and global businesses succeed in this fast-growing market. We are building more than just a trade platform—we are opening up direct access to knowledge, new partnerships, and sustainable business opportunities that create real impact for the future."

For more information, please visit www.vivselectindia.nl or reach out to Mr. Patrick van Rooij, Project Manager of VIV Select India, at patrick@vnueurope.com.

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- SWISS VITAMIN - B1

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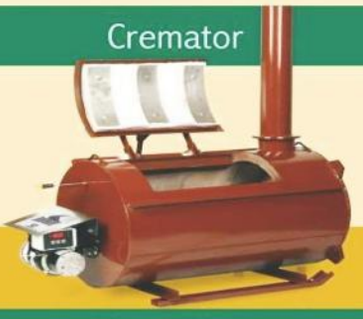

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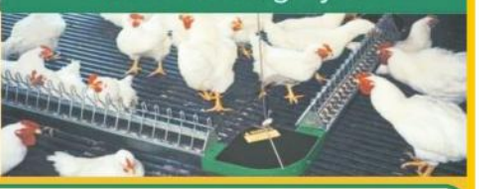

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Vice-Chancellors' Conclave Sparks Dialogue on Aligning Veterinary Education with Industry Needs Organized by IPEMA/Poultry India | In collaboration with Huvepharma Co-hosted by MAFSU, Nagpur

In a significant step toward bridging the gap between veterinary education and industry demands, the Indian Poultry Equipment Manufacturers Association (IPEMA)/Poultry India, in collaboration with Huvepharma and co-hosted by Maharashtra Animal and Fishery Sciences University (MAFSU), Nagpur, successfully conducted a one-day Vice-Chancellors' Conclave on **"Dynamics of Veterinary Education Ecosystem to Meet Animal Husbandry Industrial Needs."** Held on 7th July 2025 in Lonavala, the event witnessed the participation of leading academic heads, industry experts, and policymakers.

The conclave aimed to reimagine veterinary education in alignment with India's evolving livestock and poultry sectors, emphasizing interdisciplinary skills, entrepreneurship, and practical exposure. The platform facilitated active dialogues between academia, regulatory bodies, and industry to develop an agile, industry-ready veterinary workforce.

Key Participants and Addresses

Distinguished participants included Vice-Chancellors of veterinary universities, Directors of ICAR institutes, senior officials from the Veterinary Council of India (VCI), and industry stalwarts such as:

- **Mr. Uday Singh Bayas**, President, IPEMA/Poultry India
- **Dr. Dinesh Bhosle**, Vice President, Alltech Nutritional Alliance (ANA), India
- **Dr. Sandip Ingle**, Vice-President, VCI, New Delhi
- **Dr. R. G. Bambal**, Joint Commissioner, Department of Animal Husbandry & Secretary, VCI
- **Mr. O. P. Singh**, CEO, Huvepharma, Pune

The conclave commenced with a keynote address by **Dr. Niteen Patil**, Vice-Chancellor, MAFSU, who laid the foundation for discussions focused on modernizing curricula and strengthening industry-academia collaboration.

Poultry India Initiatives and 2025 Expo Preview

Highlighting Poultry India's role, **Mr. Uday Singh Bayas** shared the success of the 16th Poultry India Expo held in 2024, which attracted over 40,000 visitors and 400+ exhibitors from 50+ countries. He extended an invitation to the upcoming **17th Poultry India Expo**, scheduled for **25th–28th November 2025 in Hyderabad**, promising a larger, more impactful event with a dedicated **Knowledge Day** for academia on 25th November at Novotel, Hitech City.

Mr. O. P. Singh, CEO of Huvepharma, invited all dignitaries and reaffirmed the company's commitment to fostering industry-academia collaboration for sustained sectoral growth.

As a token of appreciation, IPEMA/Poultry India presented commemorative mementos to all speakers and extended personalized invitations for the 2025 Expo.

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Panel Discussions

The conclave featured four key panel discussions:

1. Insight of Challenges, Problems and Opportunities in Poultry Sector

Moderators: **Dr. Mahesh Patlapati** and **Dr. N. V. Kurkure** This session brought together experts from poultry research, production, and policy—including **Dr. R. N. Chatterjee**, **Mr. Ranpal Dhanda**, **Dr. Ajay Deshpande**, and **Mr. B. S. Rana**—to discuss pressing challenges and innovation opportunities.






2. Optimizing Dairy Sector Performance for Tomorrow's Needs

Moderators: **Dr. B. N. Tripathi** and **Dr. Dinesh Bhosle** Experts deliberated on strategies to enhance productivity, sustainability, and technological integration in the dairy sector.

3. Reimagining Small Ruminants, Pig, and Allied Sectors Optimization for Sustainable Future

Chair: **Dr. Manish Kumar Chatli**, Rapporteur: **Dr. Waqar Khan** This session highlighted innovations in underrepresented livestock sectors and their potential to contribute to nutritional security and rural livelihoods.

4. Integrating Veterinary Educational Institutions with Industry Needs




1. Moderators: **Dr. Niteen Patil** and **Dr. Shirish Upadhye** Panellists including **Dr. K. S. Anil**, **Dr. Mandeep Sharma**, **Dr. P. K. Shukla**, **Mr. O. P. Singh**, and senior VCI officials emphasized the need for aligning veterinary education with entrepreneurship, business management, public health, and cross-disciplinary innovation.






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Outcomes and Forward Path

The conclave underscored the urgent need to revise the **MSVE 2016** curriculum, which currently lacks components aligned with modern industrial and technological trends. Notably, VCI officials announced that the upcoming **MSVE 2024** framework—under active government consideration—will incorporate competency-based, flexible, and industry-integrated models of education.

India's livestock economy contributes 30.23% to agricultural GVA and 5.5% to GDP. However, the sector is served by just **67,784 registered veterinarians**, far below the estimated requirement of 1.1–1.2 lakh professionals, highlighting the pressing need for academic reforms.

Closing and Invitation

The conclave concluded with a vote of thanks from **Dr. Dinesh Bhosle**, who lauded IPEMA/Poultry India and Huvepharma for leading this vital conversation. MAFSU was also appreciated for its co-hosting support.

Looking ahead, all stakeholders were encouraged to participate in the **17th Poultry India Expo 2025**, themed **"One Nation, One Expo,"** which will showcase over 500 exhibitors, 50,000+ visitors, and 35,000 sqm of cutting-edge displays, promoting innovation, collaboration, and India's rise as a global poultry powerhouse.

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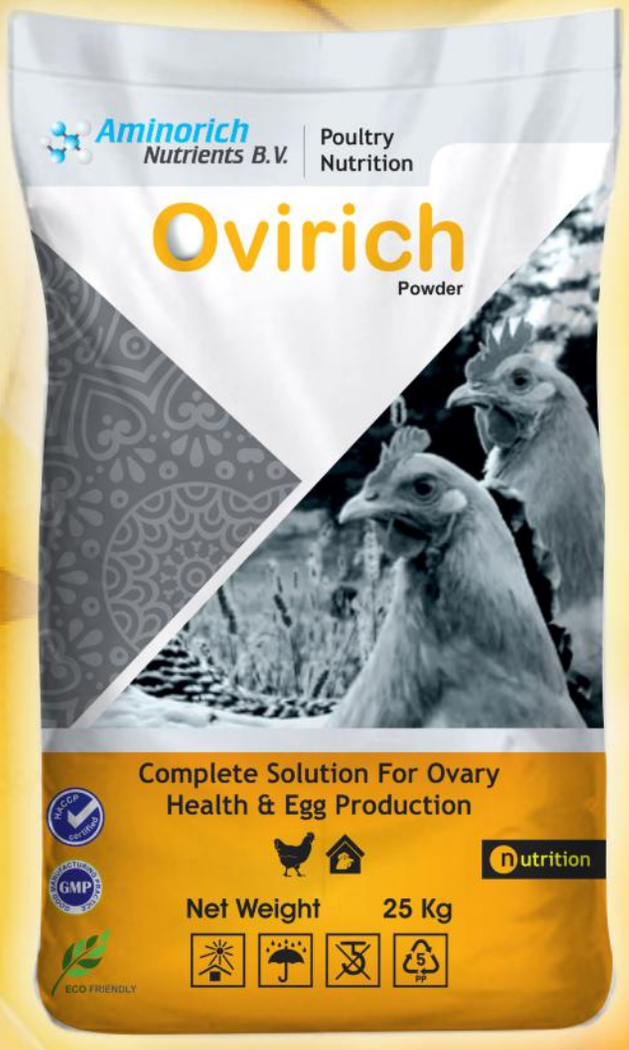

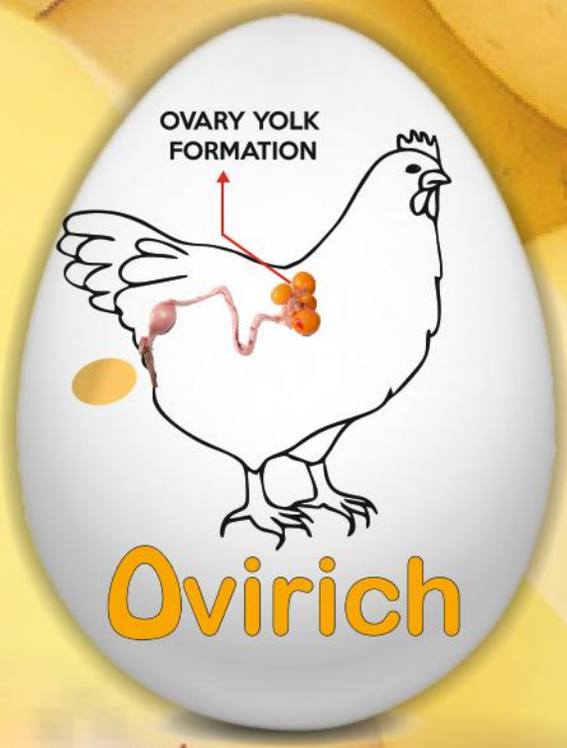

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Cutting-Edge Nutritional Approaches for Alleviating Heat Stress in Poultry:

From Cellular Protection to Systemic Resilience

1. Introduction :

Heat stress represents a critical environmental constraint in poultry production, particularly in tropical and subtropical climates. It occurs when ambient temperatures exceed the birds' thermoneutral range, limiting their capacity to regulate internal body temperature effectively. This thermal imbalance can lead to several physiological disruptions, including decreased feed consumption, metabolic disturbances, oxidative damage, weakened immune function, and electrolyte imbalances. In extreme cases, it may also increase mortality rates. Nutritional management plays an essential role in counteracting the detrimental effects of heat stress. By supporting vital metabolic processes, enhancing heat tolerance, and strengthening overall resilience, targeted nutritional strategies can significantly improve the birds' ability to cope with elevated temperatures.

Dr. Mohini Tripathi[1] (MVSc Scholar)
Dr. Shipra Tiwari[1] (MVSc Scholar)
Dr. Pawar Rutik Namdev[1] (MVSc Scholar)

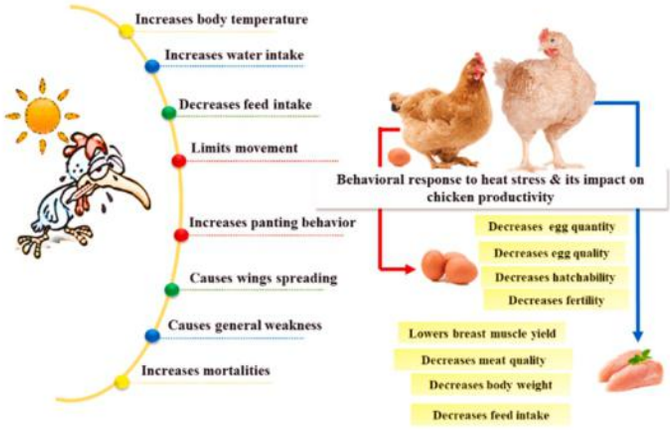
2.1. Optimization of Dietary Energy and Protein for Thermal Load Management

Heat stress leads to a significant decline in voluntary feed intake, compromising energy and nutrient availability necessary for growth, maintenance, reproduction, and immune competence in poultry. Targeted adjustments to dietary energy and protein content can reduce endogenous heat production and optimize productivity.

- Enhancement of Energy Density: Increasing dietary energy concentration through the inclusion of high-quality lipid sources (e.g., vegetable oils, animal fats) is recommended. Lipids possess a lower specific dynamic action (SDA) compared to carbohydrates and proteins, thus generating less metabolic heat during digestion and assimilation.
- Reduction of Crude Protein with Balanced Amino Acid Supplementation: Slightly reducing total crude protein helps minimize the heat generated during amino acid deamination and nitrogen excretion, particularly in hot climates. To maintain optimal growth and production, it is essential to supplement limiting amino acids in crystalline form—such as L-lysine, DL-methionine, L-threonine, and L-tryptophan—to ensure amino acid adequacy and reduce nitrogenous waste.
- Use of Highly Digestible Proteins: Incorporating highly bioavailable protein sources (e.g., soybean protein isolates, enzymatically hydrolyzed fish protein) helps reduce digestive workload and supports efficient nutrient utilization while minimizing intestinal fermentation and heat generation.

2.2. Electrolyte Balance and Regulation of Systemic Acid–Base Equilibrium

Heat stress-induced hyperventilation (panting) results in excessive CO_2 expulsion, leading to respiratory alkalosis, which disrupts blood pH homeostasis and reduces systemic buffering capacity. Nutritional strategies must aim to correct this imbalance.



- The Dietary Electrolyte Balance (DEB) is a key parameter in regulating acid–base physiology and is calculated as: DEB (mEq/kg) = $(Na^+ + K^+) - Cl^-$
- A DEB range of 250–300 mEq/kg feed is generally optimal for thermally stressed birds.
- Supplementation with sodium bicarbonate ($NaHCO_3$) aids in buffering excess alkalinity and improving systemic bicarbonate reserves.
- Potassium chloride (KCl) supports intracellular fluid balance and neuromuscular function, while electrolyte-enriched water supplements enhance fluid retention, osmoregulation, and thermotolerance.

Maintaining an optimal electrolyte profile helps prevent dehydration, supports cardiac and muscular function, and enhances overall resilience under heat load.

2.3. Nutritional Antioxidants and Redox Stabilization

Oxidative stress is a hallmark of heat-exposed poultry, with elevated reactive oxygen species (ROS) damaging lipids, proteins, and nucleic acids. Dietary antioxidants are critical for mitigating oxidative stress, preserving tissue integrity, and enhancing immune function.

- Vitamin E (α-tocopherol): A primary lipophilic antioxidant that stabilizes cell membranes and prevents lipid peroxidation.
- Vitamin C (ascorbic acid): A powerful water-soluble antioxidant that also functions as an anti-stress agent by lowering plasma corticosterone levels and supporting adrenal function. Poultry are unable to synthesize vitamin C endogenously, making exogenous supplementation essential during thermal stress.
- Selenium (Se): Acts as a cofactor for glutathione peroxidase (GPx), a critical enzyme in the detoxification of hydrogen peroxide and organic peroxides. Organic selenium forms (e.g., Se-enriched yeast) are preferred for better bioavailability.
- Zinc and Manganese: Integral to the activity of superoxide dismutase (SOD), which catalyzes the dismutation of superoxide radicals into oxygen and hydrogen peroxide, providing systemic antioxidant defense.

A synergistic approach combining these antioxidants has been shown to reduce oxidative biomarkers and improve poultry performance under heat stress conditions.

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2.4. Functional Osmolytes and Bioactive Feed Additives for Heat Resilience

Bioactive compounds and osmolytes enhance cellular integrity and physiological performance during episodes of elevated ambient temperature.

- Betaine (Trimethylglycine): Serves dual functions as a methyl donor in metabolic reactions and as an osmolyte that stabilizes cellular hydration by regulating intracellular osmotic pressure. Betaine supplementation improves intestinal morphology, enhances gut barrier function, and reduces energy expenditure associated with osmotic regulation.
- Chromium (Cr): Especially in its organic form (e.g., chromium picolinate or chromium propionate), chromium reduces circulating corticosterone, enhances glucose utilization, and improves growth and feed conversion efficiency under thermal challenge.
- Phytogenic Feed Additives (PFAs): Including essential oils, flavonoids, tannins, and saponins, PFAs exhibit anti-inflammatory, antimicrobial, and antioxidant properties. They also modulate gut microbiota and reinforce intestinal immunity.
- Probiotics and Prebiotics: Probiotics (e.g., *Lactobacillus*, *Bacillus*, *Bifidobacterium*) enhance gut microbial balance and improve mucosal immunity. Prebiotics (e.g., fructooligosaccharides, inulin) serve as substrates for beneficial bacteria and support gut health and systemic immunity, both of which are often compromised during heat stress.

2.5. Fortification of Micronutrients for Thermotolerance and Physiological Support

Micronutrient requirements escalate during heat stress due to both increased metabolic activity and reduced dietary intake. Specific vitamins and minerals support critical biological functions:

- Vitamin A: Maintains epithelial integrity and promotes mucosal immunity, providing a first-line defense against infection.
- B-complex Vitamins (B1, B2, B6, B12, niacin, pantothenic acid, folic acid): These coenzymes are vital for mitochondrial energy metabolism, neurotransmitter synthesis, and stress recovery pathways.
- Magnesium (Mg): Plays an essential role in neuromuscular transmission, enzymatic activation, and regulation of corticosteroid release, offering protective effects against neurogenic stress responses.

Periodic evaluation and reformulation of vitamin-mineral premixes are crucial to adapt to varying environmental challenges and flock performance dynamics.

2.6. Strategic Water Management for Thermoregulation and Hydration

Water is the most critical nutrient during heat stress. Birds increase their water intake to facilitate evaporative cooling, excrete excess body heat, and maintain fluid-electrolyte balance.

- Unrestricted access to clean, cool water (ideally maintained below 25°C) is essential to prevent dehydration and support physiological thermoregulation.
- Drinking water should be supplemented with electrolytes, vitamin C, organic acids, or acidifiers (e.g., citric acid, lactic acid) to promote rehydration, gut health, and nutrient utilization.
- Target a water-to-feed ratio of ≥2.5:1, particularly during heat waves, to meet the elevated water requirements for evaporative cooling and metabolic homeostasis.

The inclusion of water quality management protocols (e.g., monitoring pH, total dissolved solids, microbial load) further ensures effective nutrient delivery and mitigates heat-related health issues.

3. Smart Feed Management for Heat-Stressed Birds

Optimize feeding routines to support intake and efficiency during hot conditions:

- Time it Right: Offer feed during cooler hours (early morning and late evening) to stimulate appetite.
- Go Pellet Smart: Use pelleted feed to boost nutrient density and reduce feed wastage.
- Trim the Fiber: Lower dietary fiber to minimize fermentation-related heat in the gut.

4. Quick-Glance: Nutritional Tools to Combat Heat Stress

Key Nutrient / Strategy	Purpose & Benefit
• **Lipid-Based Energy**	Lowers metabolic heat, maintains energy intake
• **Essential Amino Acids**	Supports lean growth with less heat from protein metabolism
• **Electrolyte Balance**	Regulates hydration, acid-base balance, and muscle function
• **Vitamins C & E**	Fight oxidative stress and strengthen immunity
• **Selenium, Zinc, Chromium**	Enhance antioxidant defenses, lower stress hormone levels
• **Betaine**	Acts as a cell protector and energy saver under heat stress
• **Probiotics & Prebiotics**	Promote gut health and immune resilience
• **Water Intake Management**	Vital for cooling, nutrient transport, and digestion

5. Conclusion: Building Heat Resilience Through Nutrition

Nutrition is a cornerstone of heat stress management in poultry. By incorporating energy-dense ingredients, fine-tuning electrolytes, and adding protective nutrients like antioxidants and osmolytes, producers can greatly reduce the harmful impacts of high temperatures.When combined with sound environmental and management strategies, these targeted nutritional interventions offer a powerful, integrated solution to maintain poultry health, welfare, and productivity even in extreme climates.

Dr. Mohini Tripathi[1] (MVSc Scholar)
Dr. Shipra Tiwari[1] (MVSc Scholar)
Dr. Pawar Rutik Namdev[1] (MVSc Scholar)
[1]Department of Livestock Products Technology,
College of Veterinary Science and Animal Husbandry,
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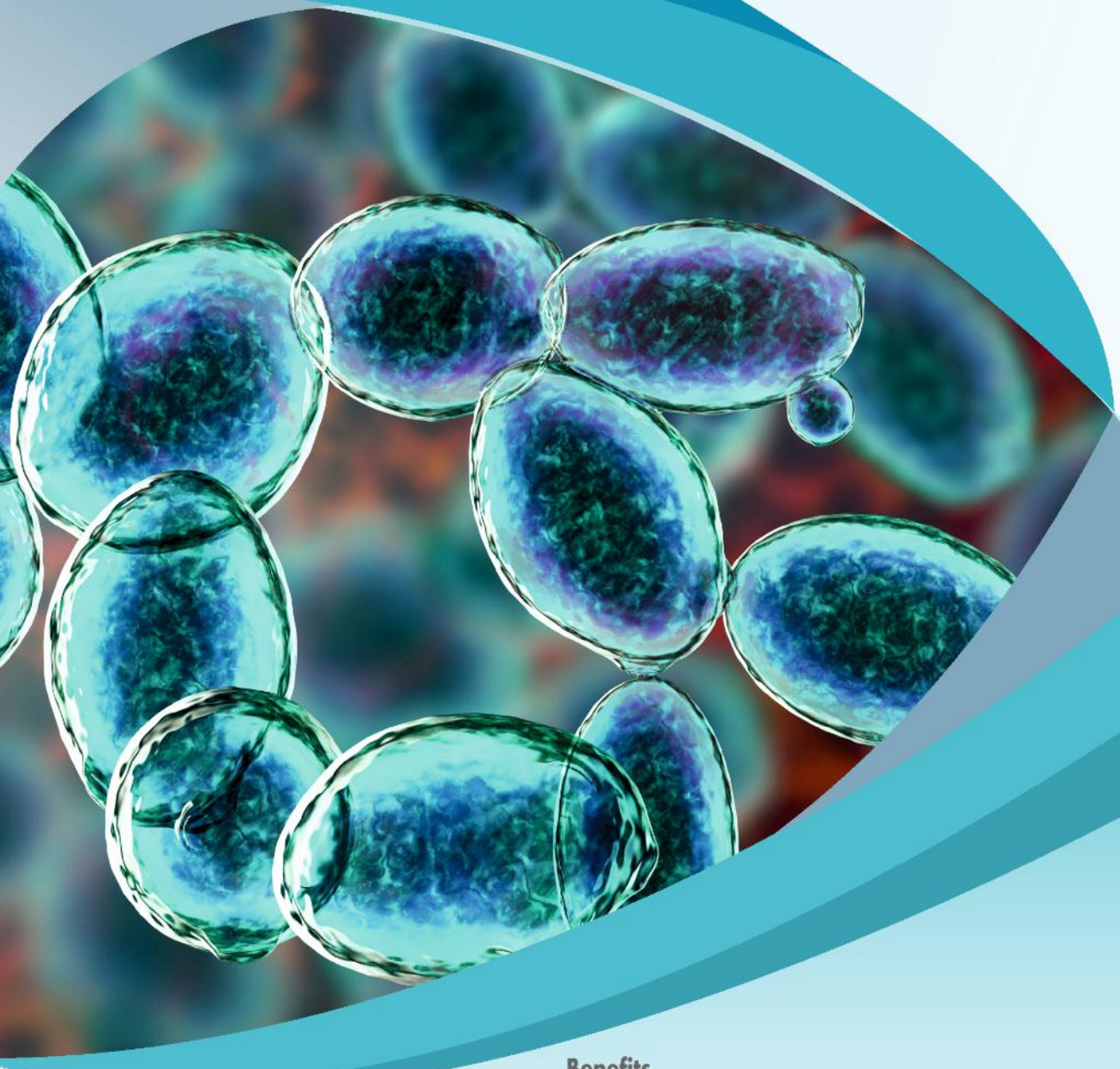

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Numida BioCare Pvt. Ltd. Expands Strongly into East India and Nepal with Appointment of Dr. Dharmendra Boruah as Business Head

Dr. Dharmendra Boruah
B.V.Sc & A.H

In a strategic move to strengthen its presence in East India and Nepal, Numida BioCare Pvt. Ltd. proudly announces the appointment of

Dr. Dharmendra Boruah as Business Head - East & Nepal.

Dr. Boruah brings with him over 15 years of rich experience across the veterinary, agro-tech, and commercial sectors. A graduate in Veterinary Science from the College of Veterinary Science, Khanapara (AAU), he has consistently demonstrated excellence in operations management, strategic planning, and team leadership.

Before joining Numida BioCare Pvt. Ltd. Dr. Boruah served as Operations Manager at Advanced Bio Agro Tech Ltd., where he effectively implemented Lean methodologies to streamline business functions. His previous roles include Techno-Commercial Manager at Noble Vetscience LLP, where he spearheaded marketing strategies and mentored sales teams, and Manager Techno-Commercial at Godrej Agrovet, Managing Customer relationships and driving business growth. His journey also includes an impactful stint at Virbac Animal Health India Pvt. Ltd. as Business Officer, offering technical support across stakeholder groups.

Known for his result-driven mindset, strategic vision, and strong technical foundation, Dr. Boruah is well-positioned to lead Numida Bio Care's expansion in this vital region. His appointment reflects the company's commitment to delivering innovative solutions and personalized support to customers across Eastern India and Nepal.

This new leadership marks a significant milestone in Numida growth journey, reinforcing its mission to bring science-backed, sustainable solutions to the animal health and nutrition industry-international-quality medicines backed by strong technical support.

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Dose :
Layer : Chick x Grower 500 gm/mt
Laying Hens : 250 gm/mt
Breeder : 500 gm/ton
Loose Dropping Control : Double the Dose

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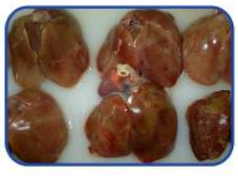
INCLUSION RATE :
Dose in water :
Prevention Broiler (5 to 7 days)
Prestarter : 15 to 20 ml/100 Birds
Starter : 15 to 20 ml/100 Birds
Finisher : 15 to 20 ml/100 Birds
Toxicity Control Treatment :
Double the Dose

IBH 25-30 ML / 100 BIRDS IN BROILER

BREEDER
32-40 ML/100 BIRDS

In Layer (5 to 7 days)
Layer Chicks : 15 to 20 ml/100 Birds
Grower : 15 to 20 ml/100 Birds
Layer : 15 to 20/100 Birds
Toxicity Control Treatment :
Double the Dose

In Breeder (5 to 7 days)
Chicks : 20 to 25 ml/100 Birds
Grower : 20 to 25 ml/100 Birds
Prelay : 20 to 25 ml/100 Birds
Layer : 20 to 25 ml/100 Birds
Toxicity Control Treatment :
Double the Dose



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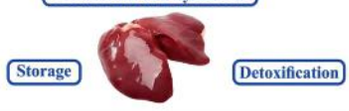

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A Series of Technical Meeting has been conducted by Ventri biologicals div. of VHPL for Layer farmers at Jind ,Panipat & Karnal on 25TH & 26TH June'25.

The theme of the seminar was to introduce newly launched VENGEM 9 - low pathogenic avian influenza (LPAI) vaccine to Layer farmers.

Mr. Shashi Bhushushan Kumar (AGM) welcome the entire guest and introduce Dr. Namdeo Bulbule Asst. General Manager, PDRC Pune .

Dr. Namdeo Bulbule spoke on topic "Introducing Vengem- Low Pathogenic Avian Influenza (LPAI) H9N2 in activated Vaccine: An Indian and Global Perspective" Low Pathogenic Avian Influenza (LPAI), particularly the H9N2 subtype, has emerged as a major concern for poultry health and production worldwide. Despite being classified as low pathogenic, H9N2 leads to substantial economic losses due to respiratory illness, drop in egg production, and increased mortality when combined with secondary infections. The virus is endemic across Asia, the Middle East, and parts of Africa, with increasing sporadic zoonotic cases in humans, including in India.

First identified in the U.S. in 1966 and later confirmed in Indian ducks in the 1970s–80s, clinical H9N2 outbreaks in poultry have been reported since 2003 in India. The virus spreads via secretions, contaminated feed, water, and fomites, and is further complicated by poor biosecurity and the presence of migratory birds acting as natural reservoirs.

India's poultry sector has taken proactive steps to manage H9N2. The government approved a national LPAI vaccination policy in 2022. ICAR-NIHSAD developed the first indigenous vaccine strain, leading to licensed commercial products such as **VENGEM** by Ventri Biologicals Pvt. Ltd. These vaccines have been instrumental in reducing virus load, improving productivity, and minimizing zoonotic risk.

On a global scale, countries like China, Egypt, and Pakistan have adopted routine vaccination, with WHO, FAO, and WOAH endorsing it as part of a comprehensive control strategy that includes surveillance and farm-level biosecurity.

This report highlights the importance of One Health collaboration, continuous surveillance, and sustainable vaccination strategies. India's efforts—spanning policy, research, and public-private partnerships—serve as a model for controlling LPAI H9N2 and safeguarding both animal and public health.

All seminars received positive response from the poultry farmers. In all the seminars queries from the participants were discussed in details.

Mr Sandeep Saini RSM gave vote of thanks at Jind & Karnal. Dr. Kailash Mithia TM gave vote of thanks at Panipat . Mr Sahil (ASM) , Mr. Manoj Kadyan(ASM) & Mr. Sukhvinder Banwala (KCE) had well organized the seminar at Jind , Panipat & Karnal respectively .

JIND

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Cargill Mycotoxin Survey

Cargill Mycotoxin Survey (India)

Survey Period : January'25 – May'25

Mycotoxins are secondary metabolites produced by fungi such as *Aspergillus, Fusarium,* and *Penicillium*—pose a persistent and evolving threat to feed and food safety globally. In India, the warm, humid climate, combined with faulty agricultural and storage practices, creates a conducive environment for mycotoxin contamination, especially in key feed ingredients Like maize, rice by products, corn by products and groundnut meal. Mycotoxins are an invisible but serious threat to animal productivity and profitability. Through its rolling survey initiative, Cargill empowers feed manufacturers, integrators, and farmers with actionable intelligence to proactively mitigate risk. In a changing climate and evolving agricultural landscape, such continuous monitoring is not just an option—but a necessity—for ensuring feed safety and livestock well-being in India.

Key highlights of Mycotoxin Survey

- Total 6304 analysis has been conducted out of which 99% were contaminated withmycotoxins & 83% were contaminated above threshold risk.
- India comes in severe high risk zone, where 75% - 100% analysed samples were above performance risk level for mycotoxin contamination.
- Aflatoxin is most prevalent mycotoxin followed by T 2, DON (Vomitoxin), Zearalenone, and Fumonisin, which all can reduce performance and increase disease incidence in poultry farm operations. They exert their effects through alteration in nutrient content, absorption, and meta bolism, changes in the endocrine function; and suppression of the immune system.
- Certain ingredients consistently exhibit higher susceptibility to specific mycotoxins. Highly contaminated ingredients are: De oiled Rice Bran (DORB), Dried Distillers Grain Soluble (DDGS) specifically corn DDGS and Pea Nut Meal. These ingredients should be used judiciously with precautions. Regular mycotoxin analysis should be conducted to know contamination levels.
- Moderately contaminated ingredients are: Corn, Soyabean Meal (SBM) and Broken Rice. Corn is major constitute of poultry feed & being used more than 50%, Therefore, low level of contamination in corn could be highly harmful for bird.
- A major concern identified through the survey is the frequent co-occurrence of multiple mycotoxins in single samples. For example, combinations of aflatoxin, fumonisin, and DON are increasingly common in raw materials. This synergistic toxicity exacerbates the risk to animal health, often leading to immunosuppression, reduced feed intake, poor performance, and reproductive issues. Multiple mycotoxin co occurence was 97% in given time period.

Total Analyses	6,304

Total Contaminated Analyses Above Detection Limit	6,234

Percent Analyses Above Cargill Performance Risk Threshold

Percent Contaminated Analyses Above Detection Limit

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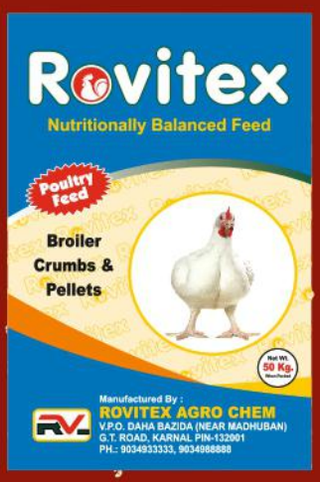
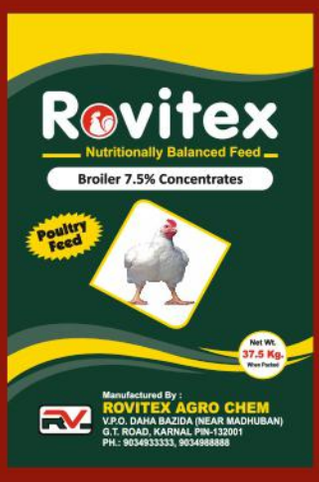
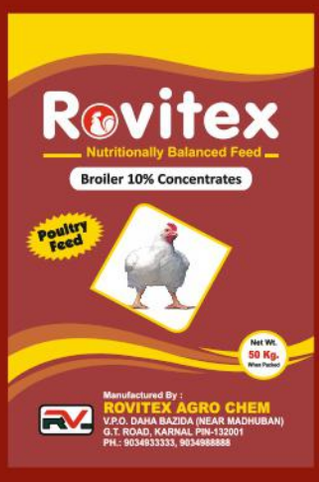
- ❖ Broiler 7.5% Concentrates
- ❖ Broiler 5.5% Concentrates
- ❖ Broiler 3.5% Concentrates
- ❖ Broiler 2.5% Concentrates
- ❖ Broiler 1.5% Concentrates

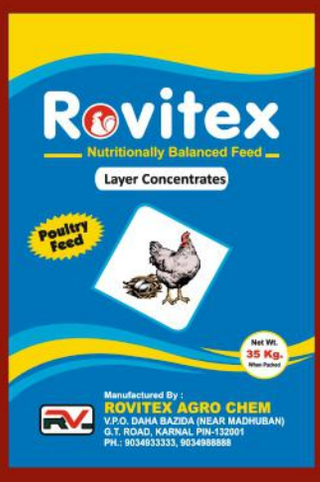
Layer Concentrates:
- ❖ Layer 5% Concentrates
- ❖ Layer 10% Concentrates
- ❖ Layer 25% Concentrates
- ❖ Layer 35% Concentrates

Broiler Crumbs/Pellets:
- ❖ Broiler Pre-Starter Crumbs
- ❖ Broiler Starter Crumbs
- ❖ Broiler Finisher Pellets









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H.O.: R.A-548, SADAR BAZAR, GANDHI CHOWK, KARNAL 132001 (HARYANA)
WORKS: V.P.O. DAHA BAZIDA (NEAR MADHUBAN), G.T. ROAD, KARNAL 132001 (HARYANA)
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E-mail: rovitexagrochem2016@gmail.com, lamba122117@gmail.com

Dealers enquiries solicited from unrepresented areas

Mycotoxin Contamination Pattern

Mycotoxin	Total Analyses	% Contaminated Above Detection Limit	% Contaminated Analyses Above Perf. Risk Threshold	% Analyses Contaminated Within Cargill Performance Risk Thresholds-Same period last year
Aflatoxin	6,173	99%	83%	83%
Fumonisin	32	90%	17%	59%
T2 Toxin	35	100%	100%	63%
Vomitoxin	32	100%	45%	93%
Zearalenone	32	97%	72%	86%
Total	6,304	99%	83%	82%

Percent Above Performance Risk ● 0-24% ● 25-49% ● 55-74% ● 75-100%

Mycotoxin Contamination Pattern: Corn

Mycotoxin	Total Analyses	% Contaminated Above Detection Limit	% above Performance Risk	Avg. Contamination (ppb)	Max. Contamination (ppb)	Std Deviation (ppb)
Aflatoxin	354	93%	71%	18	157	19
Fumonisin	5	100%	75%	828	1,447	396
T2 Toxin	5	100%	100%	76	92	18
Vomitoxin	5	100%	50%	167	239	72
Zearalenone	5	100%	25%	36	69	19

Mycotoxin Contamination Pattern: Soya Bean Meal

Mycotoxin	Total Analyses	% Contaminated Above Detection Limit	% Above Performance Risk	Avg. Contamination (ppb)	Max. Contamination (ppb)	Std Deviation (ppb)
Aflatoxin	66	65%	37%	26	107	25
Fumonisin	10	89%	0%	153	378	122
T2 Toxin	13	100%	100%	55	111	24
Vomitoxin	10	100%	44%	318	825	315
Zearalenone	10	100%	67%	65	184	49

Mycotoxin Contamination Pattern: De Oiled Rice Bran & Rice By Product

Mycotoxin	Total Analyses	% Contaminated Above Detection Limit	% above Performance Risk	Avg. Contamination (ppb)	Max. Contamination (ppb)	Std Deviation (ppb)
Aflatoxin	5,153	100%	86%	29	280	25
Fumonisin	10	89%	22%	544	1,826	597
T2 Toxin	10	100%	100%	76	198	58
Vomitoxin	10	100%	67%	248	482	121
Zearalenone	10	100%	100%	201	556	157

Mycotoxin Contamination Pattern: Peanut Meal

Mycotoxin	Total Analyses	% Contaminated Above Detection Limit	% Above Performance Risk	Avg. Contamination (ppb)	Max. Contamination (ppb)	Std Deviation (ppb)
Aflatoxin	27	100%	100%	83	236	48
Fumonisin	5	100%	0%	156	328	101
T2 Toxin	5	100%	100%	144	172	47
Vomitoxin	5	100%	20%	148	236	61
Zearalenone	5	100%	80%	52	70	13

Mycotoxin Contamination Pattern: Corn DDGS

Mycotoxin	Total Analyses	% Contaminated Above Detection Limit	% Above Performance Risk	Avg. Contamination (ppb)	Max. Contamination (ppb)	Std Deviation (ppb)
Aflatoxin	185	100%	93%	126	443	107

Mycotoxin Contamination Pattern: Corn Gluten Feed

Mycotoxin	Total Analyses	% Contaminated Above Detection Limit	% Above Performance Risk	Avg. Contamination (ppb)	Max. Contamination (ppb)	Std Deviation (ppb)
Aflatoxin	122	94%	64%	26	151	28

Percent Above Performance Risk ● 0-24% ● 25-49% ● 55-74% ● 75-100%

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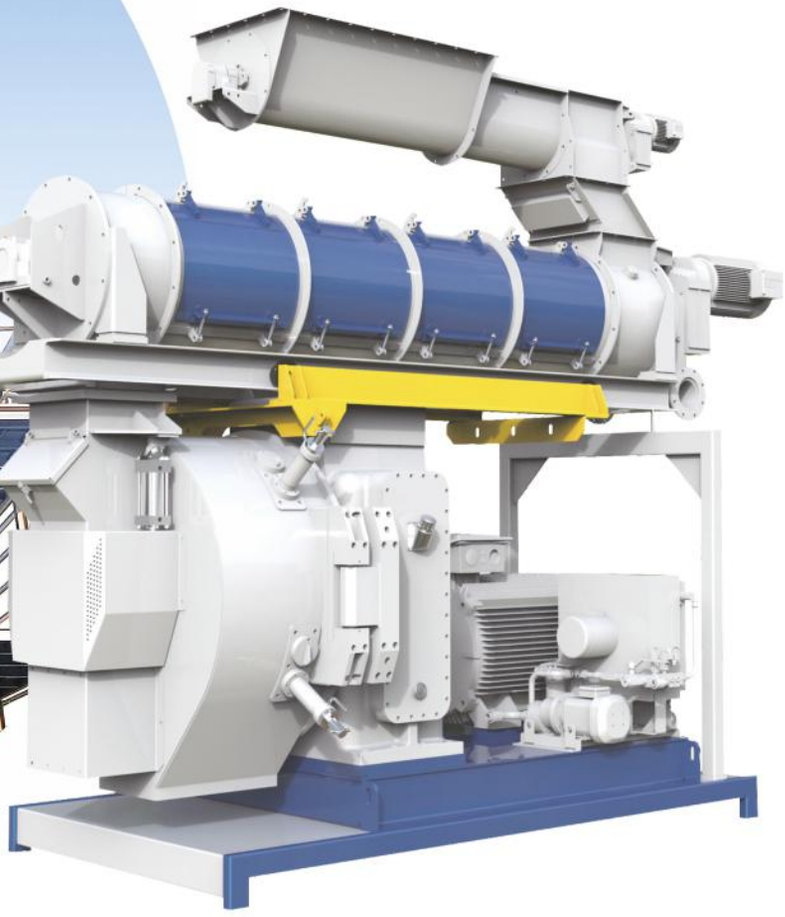

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Mycotoxin Contamination Pattern Statewise

Punjab

N° Samples	3,097	Contaminated	3,097
% above Performance Risk	87%	% Contaminated	100%

Maharashtra

N° Samples	789	Contaminated	785
% above Performance Risk	60%	% Contaminated	99%

Haryana

N° Samples	444	Contaminated	444
% above Performance Risk	98%	% Contaminated	100%

Karnataka

N° Samples	105	Contaminated	102
% above Performance Risk	74%	% Contaminated	97%

Andhra Pradesh

N° Samples	15	Contaminated	15
% above Performance Risk	40%	% Contaminated	100%

Rajasthan

N° Samples	19	Contaminated	19
% above Performance Risk	74%	% Contaminated	100%

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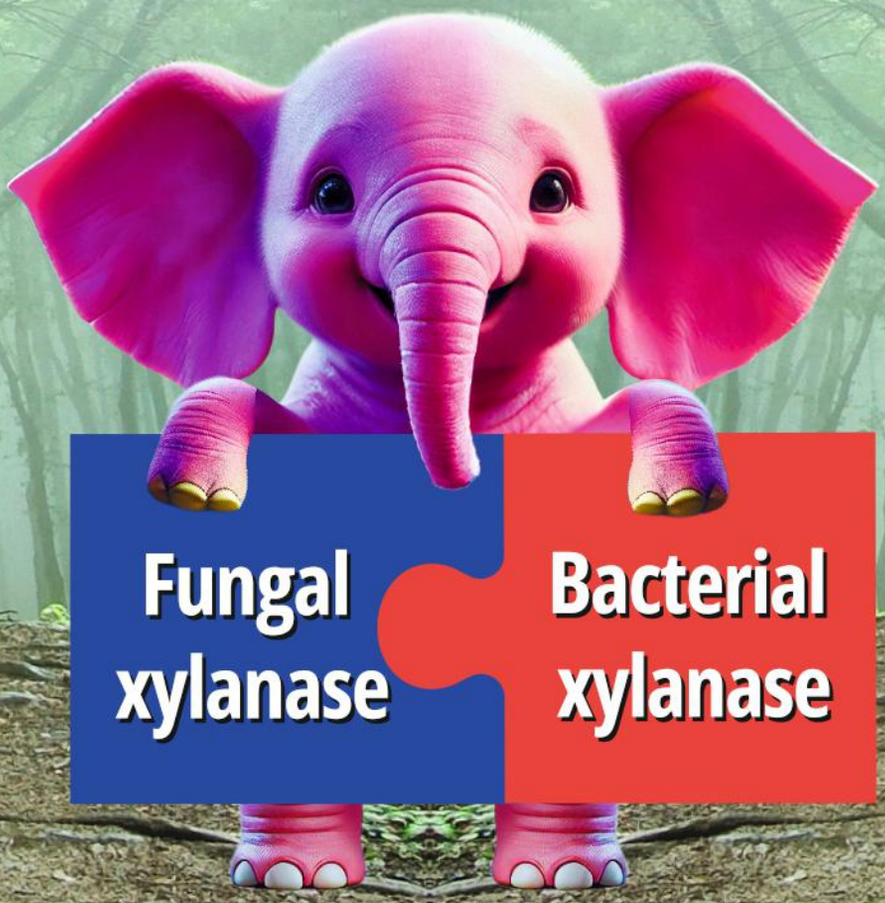

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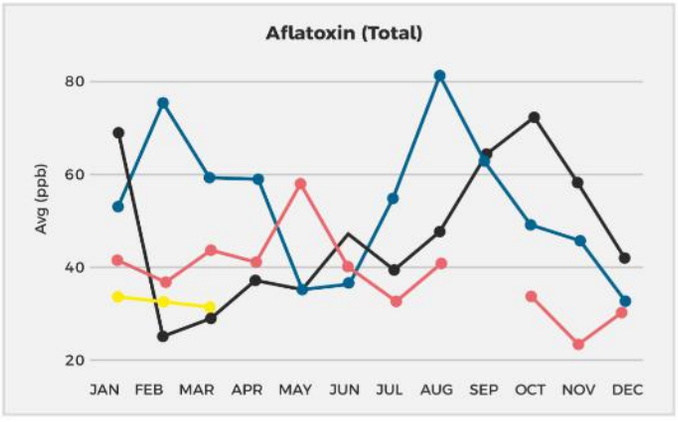
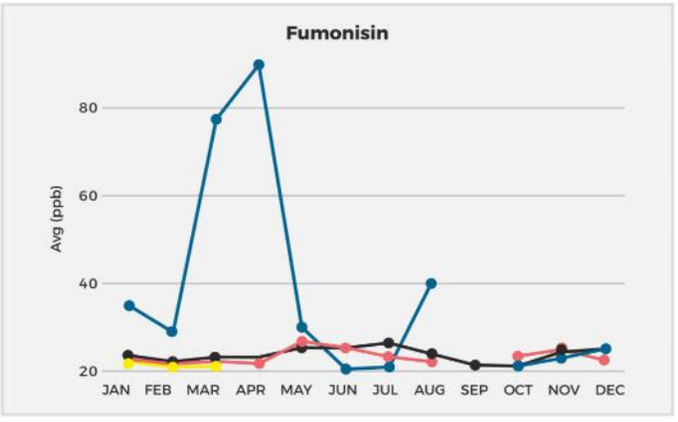
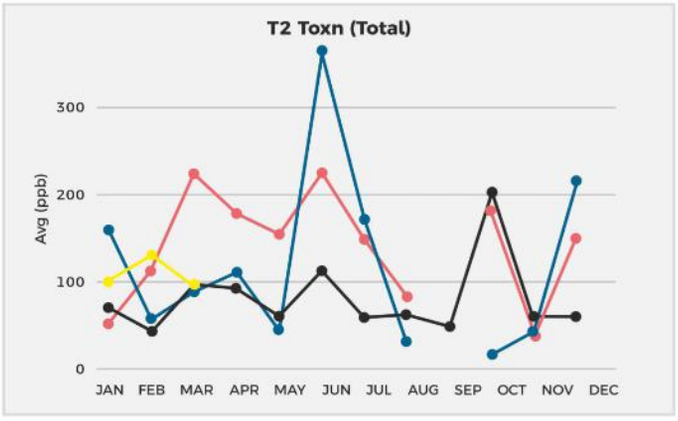
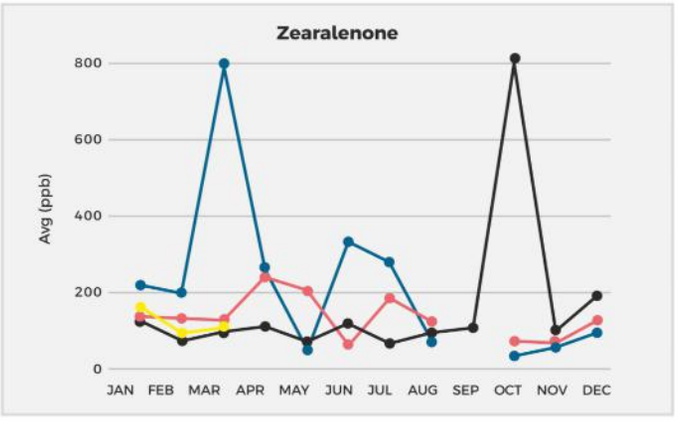
Category	KPI	Haryana	Karnataka	Maharashtra	Punjab	Rajasthan	Andhra Pradesh
General	N° Samples	444	105	789	3.097	19	15
	Average (ppb)	38	25	20	33	318	33
	Maximum (ppb)	400	145	443	384	1,447	222
	Standard Deviation	53	25	33	33	414	55
Contaminated	N° Positive	444	102	785	3,097	19	12
	% Contaminated	100%	97%	99%	100%	100%	80%
	Average Contamination in ppb	38	26	20	33	318	42
Above Performance Risk	N° Above Performance Risk	433	78	472	2.702	14	8
	% above Performance Risk	98%	74%	60%	87%	74%	53%

Mycotoxin Prevalence Pattern (Yearwise)









Legend ●2022 ●2023 ●2024 ●2025

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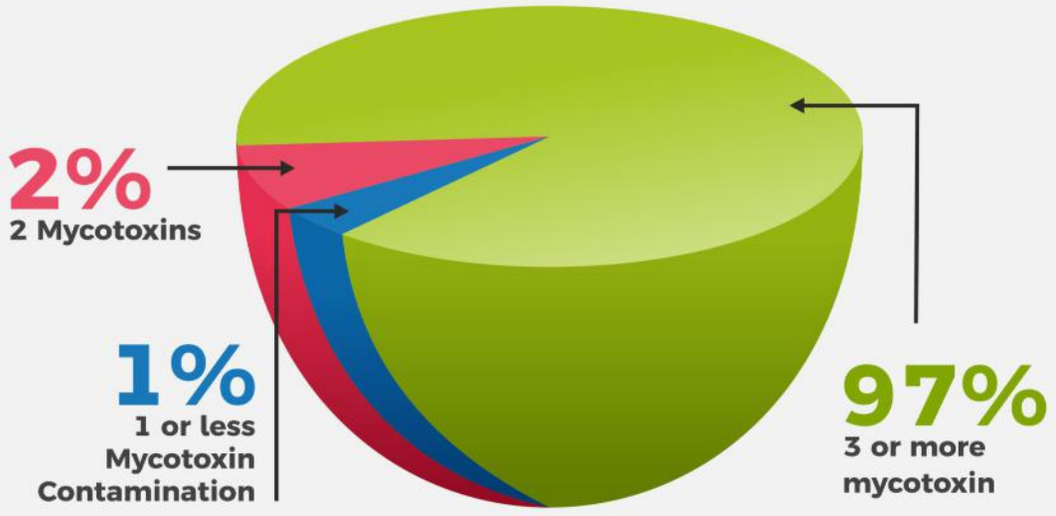
Multiple Mycotoxin Contamination



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(Differential Diagnosis is Critical for Mycotoxicosis)

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  Birds eat normally but show stunted growth and low weight gain.
- **Reduced Egg Production & Quality**
  Lower egg count, thin shells, or discolored yolks
- **Increased Mortality or Sudden Death**
  Especially in young birds without prior signs of disease
- **Immunosuppression**
  Increased susceptibility to secondary infections eg. *E. Coli* infection
- **Diarrhea or Wet Droppings**
  Often persistent, unrelated to other dietary changes
- **Lesions in Organs (on necropsy)**
  Liver swelling, pale or yellowish liver, or kidney damage
- **Feather Pecking or Nervous Symptoms**
  In some cases eg. ochratoxin or fumonisin exposure; neurological signs may appear


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6. Pelleting including cooling and crumbling
7. Liquid applications
8. Extrusion process including drying and cooling
9. Finish feed load-out
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DR. CARLOS CAMPABADAL

Faculty Member, Department of Grain Science and Industry, Kansas State University

Dr. Carlos Campabadal is a faculty member at the Department of Grain Science and Industry at Kansas State University focusing his work on the International Grains Program Institute (IGP) as an extension specialist and leader focused on outreach in the areas of grain storage, quality and processing, U.S. grain grading, export systems, and feed manufacturing. He conducts applied research in stored product protection focusing on grains, oilseeds and its co-products. He is active in international development with several projects with USAID and USDA in Central America and in Africa. He was born and raised in Costa Rica, Central America.

He obtained his doctoral degree in Agricultural and Biological Engineering from Purdue University focusing on Stored Product Protection and was a part of the Post-Harvest Education and Research Center (PHERC). He obtained his master's degree in Agricultural Engineering at the University of Illinois focused on grain processing. Before, his graduate studies and after obtaining a B.S. degree in Mechanical Engineering from the University of Costa Rica, he worked in his family feed mill company for three and a half years as a process and maintenance engineer. His previous experience includes animal farm management in beef cattle and swine farms. Dr.Carlos has travelled throughout Latin America, Africa, Asia, and Europe as a technical consultant, and speaker in more than 35 countries and 50 short courses and seminars in the areas of grain storage and feed manufacturing for U.S. Grains Council, U.S. Soybean Export Council, U.S. Wheat Associates, USDA, WISHH, World Bank, and private companies. He has also presented his research at several scientific and professional conferences, and has several publications in scientific journals. He is still involved in his family feed manufacturing and farm business operations.

DR. WILMER JAVIER PACHECO

Extension Specialist and Associate Professor, Department of Poultry Science, Auburn University

Dr. Wilmer Pacheco was born in Honduras where he obtained a BS in Food Science in 2005. Shortly after graduation, Dr. Pacheco began a feed mill manager training program with Murphy Brown, LLC in Laurinburg, North Carolina where he was responsible for overseeing the production of approximately 10,000 tons of pellet feed per week. In June 2009, Dr. Pacheco was awarded a fellowship in the Department of Poultry at North Carolina State University, where he earned his Master's in Poultry Science and his Ph.D. in Physiology and Nutrition. Currently, Dr. Pacheco is an Associate Professor and Extension Specialist at Auburn University in the State of Alabama. His research activities are focused on understanding the interrelationships between feed processing and nutrition on broiler performance. Additionally, Dr. Pacheco conducts research on nutrition strategies to reduce production costs, improve broiler performance, and nutrient digestibility. Dr. Pacheco is lead or supporting author of 32 research articles and 88 news articles primarily in Feedstuffs magazine, which is the leading source of news for animal agriculture in the United States with 12,500 accredited subscribers. Dr. Pacheco has been invited to give more than 165 presentations in 16 countries, has served as chair or member of 25 graduate student committees, and has mentored 21 visiting scholars from 12 countries.

YOUR WEEKLY CHECK-IN NATIONAL EXPERT

MR. MEENAKSHISUNDARAM KANAGARAJ

Consultant

Mr. Meenakshisundaram Kanagaraj is a freelancing consultant, technical trainer, and speaker on feed milling. He holds a Post Graduate Diploma in Digital Instrumentation and a Bachelor's degree in Physics. He has worked for an instrumentation company, an auto ancillary components manufacturer, and a multinational animal feed additive manufacturer. He has successfully completed a course on Lean Six Sigma Black Belt by the American Society for Quality (ASQ) and a course on Fundamentals of Feed Milling Technology conducted by the American Feed Industry Association (AFIA). As a consultant, he is involved in new feed mill projects from design to commissioning. He has helped feed milling organizations improve quality and productivity.

Biopreservation of meat and meat products

Awareness of human health when using chemical preservatives in food has increased, resulting in the use of alternative strategies for preserving food and enhancing its shelf-life. Fresh foods and minimally processed foods present a new challenge to food safety and security by inhibiting food-borne pathogens and other microbes. Processed food in the food industry are expected to be safe to consume. But, depending on the precautions taken by food handlers, foods can become microbially contaminated. It made research interest on the natural and effective preservatives. Biopreservation, is a sustainable approach to food safety and quality that uses microorganisms or their metabolites to inhibit spoilage and pathogenic bacteria, extending the shelf life of food products., (stiles et al., 1996).

As we all know that, Meat is highly desirable, nutritious and rich in protein, highly perishable. (Talukder et al., 2014). So there are some major concerns of meat preservation meat should be safe from the infectious agents, toxic chemicals and foreign objects. Food should be desirable to consumer i.e. good taste, colour and texture.(Nath et al., 2024).

Vaishnavi Jijore

TYPES

1. Lactic acid Bacteria and Bacteriocins
2. Bacteriophages
3. Fermentates
4. Natural Antimicrobials and Enzymes

Lactic acid Bacteria and Bacteriocins

Lactic acid bacteria (LAB) are a diverse group of microorganisms commonly found in a wide range of environments, including foods, the gastrointestinal and mucous membranes of humans and animals, and many other ecological niches where fermentable carbohydrates are present. In food fermentations—such as those involved in yogurt, cheese, salami, sourdough bread, and wine—LAB are the principal organisms responsible for creating desired sensory attributes, extending shelf life, and improving product safety by inhibiting spoilage and pathogenic microbes. LAB achieve bioprotection i.e. biopreservation primarily through the production of antimicrobial compounds such as lactic acid, bacteriocins (like nisin), hydrogen peroxide, and other organic acids including acetic and succinic acids. These metabolites acidify the food matrix, disrupt the membranes of competing microorganisms, and outcompete them for nutrients, collectively suppressing the growth of spoilage organisms and pathogens. This ability makes LAB the most widely used microorganisms for natural food preservation and safety enhancement. (Björkroth & Koort, 2016).

Bacteriocins are ribosomally synthesized antimicrobial peptides produced by lactic acid bacteria (LAB), exhibiting broad-spectrum antibacterial activity that makes them critical in food fermentation and preservation. These compounds enhance food safety by inhibiting pathogens like Listeria monocytogenes and spoilage organisms while improving sensory qualities in dairy products, fermented meats, and vegetables. Rapidly degraded by human digestive proteases, they pose no risk to gut microbiota balance. First identified in 1925 by André Gratia, bacteriocins such as Nisin - effective against Gram-positive bacteria including Staphylococcus aureus and Listeria monocytogenes serve as sustainable alternatives to antibiotics and synthetic preservatives, aligning with consumer demand for natural food additives. Bacteriocins are employed in dairy products, canned foods, and processed meats for extended shelf life. (Joerger et al., 2003).

Bacteriocins are antimicrobial peptides synthesized by bacteria that exhibit diverse mechanisms of action, primarily targeting the membranes of susceptible bacteria. Typically, bacteriocins function by forming pores in the bacterial cell membrane, resulting in the efflux of ions and molecules and ultimately causing cell lysis.

Class I Bacteriocins (Lantibiotics):

Lantibiotics, such as nisin, create pores in the membrane through a wedge-like mechanism. They often interact with lipid II, an essential component in peptidoglycan synthesis, thereby disrupting both cell wall formation and membrane integrity.

Class II Bacteriocins:

These bacteriocins form pores using models such as barrel stave or carpet-like mechanisms. Their activity frequently depends on binding to specific receptors on the cell membrane, such as components of the mannose phosphotransferase system in the case of pediocins. The primary receptors for bacteriocins are generally found on the bacterial cell membrane, not in the cytoplasm. For example, lipid II serves as a key receptor for lantibiotics, while other bacteriocins may target specific membrane-associated proteins.

Methods of Bacteriocin Application in Meat and Meat Products

1. Inoculation with Bacteriocin-Producing Lactic Acid Bacteria (LAB). LAB can be introduced as starter or protective cultures during the production of fermented meats. These bacteria produce bacteriocins in situ, helping to control spoilage and pathogenic microorganisms throughout fermentation and storage.
2. Addition of Purified or Semi-Purified Bacteriocins. Purified or partially purified bacteriocins can be directly added to meat products as natural preservatives. This approach is particularly useful when live LAB cultures are not effective or suitable for the specific meat matrix.
3. Use of Previously Fermented Meat with Bacteriocin-Producing Strains. Incorporating meat that has been previously fermented with bacteriocin-producing LAB can introduce both the bacteria and their antimicrobial peptides into new batches, enhancing preservation and safety.
4. Incorporation into Edible Films and Coatings. Bacteriocins can be embedded in edible cellulosic or other biopolymer-based films and coatings, which are applied to the surface of meat products. This method provides a controlled release of antimicrobial agents, extending shelf life and inhibiting surface contamination.
5. Commercial Preparations and Multi-Hurdle Strategies. Commercial products containing crude or semi-purified bacteriocins (often combined with organic acids) are used in meat processing, especially for products like salami and cured meats. These are frequently integrated with other preservation techniques such as curing, drying, and smoking to enhance overall efficacy.,(Thomas et al., 2000).

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Mr. Dhiraj Choudhry-99914-11111, Mr. Madan Choudhry - 99913-11111

Nisin is currently the only bacteriocin approved by the FAO/WHO (since 1969) for use in meat and meat products. (Devlieghere, et al., 2004). It is widely studied and applied due to its effectiveness against Gram-positive pathogens such as Listeria monocytogenes and Staphylococcus aureus. Other bacteriocins, such as pediocin, enterocin AS-48, enterocin A and B, and leucocin A., (Saeed et al., 2018), have demonstrated strong antimicrobial activity (notably against Listeria), but are not yet approved for commercial use in meat products. The effectiveness of bacteriocins can be influenced by factors such as meat matrix composition, pH, and the presence of competing microorganisms. To date, nisin, produced by Lactococcus lactis subsp. lactis, is the only bacteriocin that has achieved widespread commercial approval and use as a food preservative, registered as E234 (Nisaplin) and endorsed by regulatory agencies such as FAO/WHO. Pediocin PA-1, produced by Pediococcus acidilactici, has also been commercially produced and is available in products like ALTATM 2341, but it has not yet received broad regulatory approval for use in foods in many countries. Other bacteriocins such as subtilin, cerein, and plantaricin have been isolated and characterized from various bacteriocin-producing strains, but they have not yet reached commercial status or widespread regulatory acceptance.

The application of bacteriocin-producing cultures, such as LAB and Pediococcus acidilactici, has demonstrated effectiveness in controlling pathogens like Listeria monocytogenes in vacuum-packed beef, especially when combined with modified atmosphere packaging (MAP) using high concentrations of CO_2. Bio-preservation techniques using these bacteriocins can inhibit a range of spoilage and pathogenic microorganisms, including L. monocytogenes, E. coli O157:H7, Salmonella spp., and Pseudomonas fluorescens.

FERMENTATION

Fermentation is a metabolic process in which microorganisms like yeast and bacteria convert sugars into acids (e.g., lactic acid), gases, or alcohol. This process relies on the growth of microbes in foods, which may occur naturally or through the intentional addition of starter cultures. Lactic acid bacteria (LAB) are the primary microorganisms involved, producing organic acids and other bioactive compounds that act as natural preservatives by inhibiting spoilage organisms and pathogens.

Fermentation of meat using protective cultures

Selection Criteria for Protective Cultures: Must be Generally Recognized As Safe for human consumption. Capable of synthesizing inhibitory compounds (e.g., bacteriocins) within the meat matrix. Minimize alterations to flavor, texture, and aroma of the final product. Generate sufficient acid for preservation without over-acidification. Avoid excessive protein degradation to maintain meat texture. Prevent unwanted gas pockets or texture defects. Starter Cultures in Meat Fermentation: Starter cultures are microbial formulations (active or dormant) designed to initiate and guide fermentation by performing specific metabolic roles in the meat, such as acid production, flavor development, and pathogen inhibition. Meat products such as pepperoni, summer sausage, dry sausages, bologna, and salami are commonly fermented using starter cultures like Pediococcus cerevisiae (for pepperoni, summer sausage, dry sausages, and bologna), Lactobacillus plantarum (for pepperoni and summer sausage), and Micrococcus spp. (for salami) to ensure controlled fermentation, flavor development, and microbial safety. (Hammes et al., 1990). The general process for preparing fermented meat products involves preparing the meat emulsion, stuffing it into casings, adding starter cultures, fermenting through lactic acid production, followed by cooking or drying to obtain the final fermented meat product.

Effect of Culture on Meat and Meat Products: Fermented Sausages: Lactic acid bacteria (LAB) play a crucial role in fermented sausages by fermenting added sugars and producing organic acids, which lower the pH. This acidification inhibits the growth of spoilage and pathogenic bacteria, making the product safer and extending its shelf-life. LAB also contribute to flavor and texture development in these products.

Raw Ham and Ready-to-Eat Meats: Adding psychrotrophic LAB to these products, even in the presence of oxygen, helps suppress harmful bacteria like Listeria monocytogenes, especially under vacuum packaging. This biopreservation effect enhances the safety of ready-to-eat meats during refrigerated storage.

Semi-Processed Raw Meat: Specific LAB strains can improve the shelf-life and freshness of products like bacon and sausages by producing antimicrobial substances (such as organic acids and bacteriocins). These inhibit spoilage and pathogenic microorganisms, helping maintain product quality during storage.

Salted Semi-Processed Raw Meat: Starter cultures like Pediococcus species ferment sugars to produce acids in salted meats. This acidification prevents the growth of dangerous bacteria such as Clostridium botulinum, thereby extending shelf-life and ensuring product safety.,(Lucke et al., 1998).

Bacteriophage

Bacteriophages are viruses that specifically infect and replicate within bacteria by hijacking the bacterial biosynthetic machinery. They are harmless to humans, animals, and plants, targeting only their specific bacterial hosts. Application of Bacteriophage in Meat and Meat Products: Bacteriophages have been approved for use in the meat industry as a natural and highly specific antimicrobial intervention. The FDA has permitted the safe application of a lytic bacteriophage preparation as an anti-listerial agent in ready-to-eat (RTE) meat and poultry products. This preparation is typically sprayed directly onto the surface of meat products at a concentration of 0.1 ppm, with a dosage of 1 milliliter per 500 cm^2 of surface area before packaging. The bacteriophages remain inactive unless they encounter their specific target, such as Listeria monocytogenes, at which point they infect and destroy the bacteria, thereby enhancing food safety without affecting other organisms or the sensory qualities of the food., (Kathy walker et al., 2006).

Endolysin: What are Endolysins?

Endolysins, also known as lysins, are hydrolytic enzymes produced by bacteriophages (phages). During the final stage of the phage lytic cycle, these enzymes cleave the peptidoglycan layer of the bacterial cell wall, causing cell lysis and releasing new phage particles. When applied externally, especially to Gram-positive bacteria, endolysins can degrade the bacterial cell wall, making them effective antibacterial agents., (Jhamb and Spardha et al., 2014). Application of Endolysin: Endolysins have a broad killing spectrum because they cleave specific linkages in the peptidoglycan of bacterial membranes.

They are highly potent, exhibiting antimicrobial activity at nanogram levels. This makes them promising alternatives to traditional antibiotics, especially against drug-resistant bacteria. However, the production cost of endolysins is high, mainly due to the use of genetically modified organisms in their manufacture.

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Plant-derived antimicrobials: Essential oils and extracts from herbs and spices are widely used in meat products to control spoilage and pathogenic bacteria, reduce oxidative deterioration, and extend shelf life. For example, clove and cinnamon essential oils are noted for their effectiveness in reducing bacterial load and oxidative rancidity in meat. Animal-derived antimicrobials: Lysozyme and lactoferrin are incorporated into food systems to target specific bacteria, enhancing safety and shelf life. Chitosan is used as a coating or additive to inhibit microbial growth. Microbial-derived antimicrobials: Bacteriocins are used in fermented meat products and as preservatives to inhibit pathogens like Listeria monocytogenes. Organic acids and their salts are added to increase acidity and prevent microbial growth. Benefits of Natural Antimicrobials and Enzymes - Extend shelf life of meat and meat products, reduce transmission of foodborne pathogens, minimize the need for synthetic chemical preservatives, effectively control resistant organisms, such as L. monocytogenes.,(rameez et.al., 2023).

Conclusion

The use of natural or controlled microbiota, along with antimicrobial compounds, plays a vital role in extending the shelf life and enhancing the food safety of meat and meat products. These biological preservation methods, when combined with other preservation strategies, can be effectively integrated into hurdle technology to provide a multi-layered approach against spoilage and pathogenic microorganisms. This integrated preservation approach not only improves product quality and safety but also reduces reliance on synthetic chemicals, meeting consumer demand for natural and safe food products.

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Mumbai Veterinary College, Mumbai

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Daily Farm Visit Checklist: Brooding

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Daily farm visits are paramount in broiler farming, acting as the foundation for successful management and directly impacting the performance and profitability of the flock. This consistent oversight allows for early detection of issues and timely interventions, which are critical in a fast-paced production cycle like broilers. Daily farm visits are not just a routine task; they are a critical management tool that allows for proactive problem-solving, meticulous attention to detail, and ultimately, the successful and profitable rearing of broiler chickens.

This checklist is made for daily farm visits focusing on brooding, helping track key factors like biosecurity, ventilation, temperature, and drinker/feed management to keep the chicks healthy and growing well.

- covers basics like foot bath presence, curtain condition, and heat sources.
- It checks on environmental factors like temperature, humidity, and ventilation.
- It also looks at the status and cleanliness of feeders and drinkers

Farm Name:..... **Date:**.....

Flock Age:..... **Flock Size:**.....

1. Biosecurity
   a. Foot bath present? (Yes/No).....
      i. Disinfectant added? (Yes/No).....
      ii. Dosage of disinfectant added.....
   b. Farm premise cleanliness (satisfactory/ unsatisfactory).....
2. Curtain Management
   a. Outer curtain condition .....
   b. Inner curtain condition .....
3. Brooding
   a. Type of brooder/ heat source .....
   b. Number of heaters/ 1000 chicks .....
4. Temperature / Humidity
   a. Thermometer/Hygrometer placement (height above litter).....
   b. Thermometer / Hygrometer reading .....
5. Ventilation
   a. Adequate ventilation present (Yes/No).....
   b. Fans installation (Yes/No) .....
   c. Summer – Fans running (Yes/No).....
   d. Ventilation management (satisfactory/ unsatisfactory) .....
6. Space provided to chicks (sq. feet/ chick) .....
7. Drinker
   a. Is water present in drinkers? (Yes/No).....
   b. Is the drinker's height satisfactory? (Yes/No).....
   c. Is the drinker cleaning satisfactory? (Yes/No).....
   d. Number of chicks per drinker.....
   e. Is the water sanitizer added? (Yes/No).....
   f. Dosage of water sanitizer.....
   g. Water pH.....
8. Feeder
   a. Is the feed present in the feeder? (Yes/No).....
   b. Is the feeder height satisfactory? (Yes/No).....
   c. Is the feeder cleaning satisfactory? (Yes/No).....
   d. Number of chicks per feeder.....

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EQUIPMENT MANUFACTURING UNITS:

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Roorkee (Haridwar), Uttrakhand 247661

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BREEDING AND BROILER FARMING:

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e. Feed storage

i. Whether the feed bags are stored at some height above the ground? (Yes/No)…..

ii. Is there a minimum six inches gap between the wall and the feed bags? (Yes/No)…..

9. Vaccination

a. Did the water sanitizer stop 24 hours before the day of vaccination? (Yes/No)…..

b. Did the water sanitizer stop 24 hours after the day of vaccination? (Yes/No)…..

10. Litter

a. Is the litter wet, moist or caked? (Yes/No)…..

b. Whether litter raking has been done? (Yes/No)…..

11. Dead bird disposal

a. Are the dead birds kept away from live birds (no contact)? (Yes/No)…..

b. Are the dead birds disposed of in a covered dead bird disposal pit on the farm? (Yes/No)…..

12. Other animals on the farm

a. Is there any other species of animals present on the farm? (Yes/No)…..

b. If yes, then which species of animals?……

13. Disinfection in presence of birds

a. Interval between disinfection in presence of birds? ……

b. Disinfectant being used? ……

14. Weak birds isolation

a. Whether the weak and sick birds were isolated well from healthy birds? (Yes/No)…..

b. Whether a sufficient number of feeders and drinkers at adequate height were made available to weak and sick birds? (Yes/No) …..

15. Abnormality observed in chicks & farm observations……

……

……

16. Post-Mortem examination observations ……

……

Mortality		Feed received	
Balance birds		Feed given	
Weekly body weight		Balance feed	

1. Brooding Temperature:

Age (Week)	Brooding House Temperature	Litter Temperature
1	90°F	90°F
2	85°F	85°F
3	80°F	80°F
4	75°F	75°F

2. Bulb of the thermometer should be 2 inches above the litter (at the level of the chicks)

3. Number of brooders:

a. Gas brooder: follow the manufacturer's recommendation on a particular type of gas brooder

b. Coal brooder: one brooder (tin box) for 350-400 chicks

- Always do round brooding

4. Space:

Age (week)	Space (sq. feet/ chick)
1	0.25-0.3
2	0.5

5. Drinkers: one chick drinker for 50 chicks

6. Feeders:

a. One chick feeder for every 50 chicks

b. One chick tray feeder for every 80 chicks

7. For foot bath: Use phenol-based disinfectants at recommended dosage like Kem V 260® (from Kemin) @4ml/L water.

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- Assists in optimizing lipid and carbohydrate metabolism and improves energy utilization.

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Mixing Ratio:

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

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Effect of Zinc Source and its Interaction with Graded Levels of Phytase on Broiler Performance and Carcass Traits

Summary

The effect of zinc (Zn) source and Zn level were evaluated against varying doses of phytase on broiler performance and carcass traits to 42 days of age. A total of 1680 male day-old Cobb 500 broilers (49 g at placement) were allotted to one of 84 pens and split into 21 treatments in nested factorial design with 3 basal diets devoid of any Zn supplementation fed either 0, 500 or 1500 FTU/kg of phytase. The remainder of treatments comprised 3 Zn levels (50, 100 and 150 ppm), 3 phytase doses (0, 500 and 1500 FTU/kg), and 2 Zn sources (Zn-sulphate, 35% Zn; and Zn-glycinate, 26% Zn), which were used as nesting factor for the statistical analysis. Based on performance and carcass traits, the requirement for Zn-sulphate in this evaluation was between 50-100 ppm when fed at least 500 FTU/kg of phytase. Based on the same criteria (performance and carcass traits), the requirement for Zn-glycinate fell closer to 50 ppm when fed a minimum of 500 FTU/kg of phytase. Overall, phytase effect was not influenced by Zn source, and the magnitude of response of broilers to phytase was superior to that to Zn supplementation, with optimal performance and carcass traits observed at 1500 FTU/kg of phytase when supplemented to the diets ($P < 0.05$). Interestingly, diets containing 1500 FTU/kg of phytase without supplemental Zn showed better performance when compared to a standard dose of phytase (500 FTU/kg) and 150 ppm regardless of Zn source.

G.A. Gomes[1], I.N. Kaneko[2], M. Ramalho Lima[3] and F.G. Perazzo Costa[4]

I. INTRODUCTION

Zinc (Zn) is an essential trace element with several roles in animal metabolism involving numerous metalloenzyme systems (Gaither and Eide, 2001). Most recently, attention has been brought to Zn utilization in Europe, after its ban at high dose levels. The concern was around higher Zn accumulations in soil and water bodies. Phytate present in the vegetable ingredients can be complex with divalent cations (including Zn) and render these unavailable to monogastric animals. Xu et al. (1992) showed that lower esters of phytate (IP4 and IP3, specifically), can still reduce Zn availability. In this context, the objective of this study was to evaluate the interactions of Zn level (ppm) and form (inorganic sulphate or organic glycinate) when fed with varying doses of phytase (FTU/kg), especially at higher phytase doses which degrade IP6 beyond the lower esters, on broiler performance and carcass traits to 42 days of age.

II. MATERIALS AND METHODS

The experimental protocol was approved by the Federal University of Paraiba Animal Ethics Committee. A total of 1680 male day-old Cobb 500 broilers (49 g at placement) were allotted to one of 84 pens and split into 21 treatments comprising of 3 Zn levels (50, 100 and 150 ppm), 2 Zn sources (Zn-sulphate, 35% Zn; and Zn-glycinate, 26% Zn), and 3 phytase doses (0, 500 and 1500 FTU/kg, Quantum Blue, AB Vista, Marlborough, UK). This study was a nested factorial design with 3 extra treatments devoid of any Zn supplementation fed either 0, 500 or 1500 FTU/kg of phytase. All other trace minerals were supplemented as recommended by the breed guidelines. All diets were offered as mash, corn and soybean-meal based, and fed *ad libitum* in three phases, from 1-10 d (starter), 11-25 d (grower) and 26-42 d (finisher). Basal diets were formulated taking into consideration the available phosphorus (avP) and calcium (Ca) contribution of 500 FTU/kg of phytase (0.15 and 0.165, respectively) and avP levels were formulated 10-15% higher than breed guidelines to avoid a severe P deficiency in treatments devoid of phytase. Body weight (BW) and feed intake were measured and feed conversion ratio corrected for mortality (mFCR) was calculated. At 42 d of age 5 birds per pen were sacrificed for determination of carcass weight and breast weight, with carcass yield being expressed as percentage of live weight (LW) and breast yield expressed as percentage of carcass weight (CW). Data was analyzed as a nested factorial design (JMP Pro 16.2) with Zn source used as the nesting factor {((Phytase, FTU/kg [0, 500, 1500] x Zn, ppm [50, 100, 150]) x Zn Source [Zn-sulphate, Zn-glycinate]) + No Zn added (0, 500 and 1500 FTU/kg phytase)}. Two-way nested ANOVA was first performed, and whenever an interaction was significant ($P \leq 0.05$), means were then separated using Student's t-test. Additionally, orthogonal polynomial contrasts (linear and logarithmical for both phytase and Zn, and quadratic for Zn levels) analysis was performed to determine the response behavior for phytase and Zn supplementation.

III. RESULTS AND DISCUSSION

No interaction for BW was observed at either 25 or 42 d of age ($P > 0.10$, Table 1). Phytase improved the BW of birds in a linear and logarithmical fashion, irrespective of Zn source ($P < 0.01$, Table 1). Although ANOVA showed significant differences for Zn levels at both 25 and 42 d, the source of Zn did not. For Zn-sulfate, BW was improved to 25 d in both a quadratic ($P < 0.05$) or linear ($P < 0.10$) fashion, while Zn-glycinate improved the BW of broilers at 25 and 42 d in a linear and logarithmical fashion ($P < 0.01$, Table 1). Zn-glycinate improved the BW of birds compared to that of Zn-sulphate fed birds and birds not supplemented with Zn at either age ($P < 0.01$).

Table 1 – Body weight (g/bird) of broiler chickens fed diets with graded levels of zinc sulphate or zinc glycinate (0 to 150 ppm) and graded levels of phytase (0, 500 or 1500 FTU/kg) from 0-25 or 0-42 days of age

Zn Source	Zn, ppm	Phytase, FTU/kg			Phytase, FTU/kg		
		0	500	1500	0	500	1500
		25 days			42 days		
None	0	1247	1294	1378	2955	3004	3082
	50	1254	1301	1338	2890	2991	3139
Sulphate	100	1249	1305	1360	2881	3026	3171
	150	1273	1310	1361	2893	3028	3144
	50	1266	1311	1383	2945	3001	3164
Glycinate	100	1265	1321	1388	2930	3005	3148
	150	1273	1326	1390	2954	3026	3168
SEM			7.0			10.9	
		P-Values					
Phytase FTU/kg [Zn Source]		< 0.01 (N: L*, LN*; S: L*, LN*; G: L*, LN*)			< 0.01 (N: L*, LN*; S: L*, LN*; G: L*, LN*)		
Zn ppm [Zn Source]		0.01 (S: L‡, Q†; G: L*, LN*)			0.02 (G: L*, LN*)		
Phytase FTU/kg * Zn PPM [Zn Source]		0.56			0.32		
Zn Source		< 0.01 (G > S = N)			< 0.01 (G > S = N)		

Orthogonal Polynomial Contrasts for every zinc source on the trial: None: N; Sulphate: S; Glycinate: G; Linear (L), logarithmic (LN) and quadratic (Q) significance of Orthogonal Polynomial Contrasts . $P \leq 0.01$; † $P \leq 0.05$; ‡ $P \leq 0.10$*

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From 0-25 d of age, an interaction based on Zn source for mFCR was observed (P < 0.05, Table 2). In essence, the mFCR was improved when diets were supplemented with Zn-sulphate in the absence of phytase only, while Zn-glycinate improved mFCR independently of phytase supplementation. Phytase, from 0-25 d, improved mFCR irrespective of Zn source (P < 0.01).

From 0-42 d, no significant interaction was observed for phytase (P > 0.10, Table 2). A significant main effect was observed on mFCR due to phytase dose (P < 0.01, Table 2). No effect was observed for Zn level on mFCR from 0-42 d(P>0.10), however, when comparing Zn sources Zn-glycinate improved the mFCR beyond that of the Zn-sulfate fed birds, while Zn-sulfate fed birds had better mFCR than those birds fed diets devoid of supplemented Zn at either age (P < 0.01, Table 2).

Table 2 – Mortality corrected feed conversion ratio (g:g) of broiler chickens fed diets with graded levels of zinc sulphate or zinc glycinate (0 to 150 ppm) and graded levels of phytase (0, 500 or 1500 FTU/kg) from 0-25 or 0-42 days of age

Zn Source	Zn, ppm	Phytase, FTU/kg			Phytase, FTU/kg		
		0	500	1500	0	500	1500
		0-25 days			0-42 days		
None	0	1.49a	1.37cd	1.24f	1.71	1.66	1.58
	50	1.45b	1.39c	1.25f	1.74	1.64	1.50
Sulphate	100	1.44b	1.34d	1.24f	1.72	1.63	1.50
	50	1.38c	1.37cd	1.24f	1.72	1.63	1.54
	50	1.42b	1.36cd	1.19g	1.72	1.60	1.50
Glycinate	100	1.44b	1.35d	1.19g	1.71	1.63	1.50
	150	1.37cd	1.30e	1.18g	1.65	1.61	1.50
SEM			0.013			0.017	
		P-Values					
Phytase FTU/kg [Zn Source]		< 0.01 (N: L*, LN*; S: L*, LN*; G: L*, LN*)			< 0.01 (N: L*, LN*; S: L*, LN*; G: L*, LN*)		
Zn PPM [Zn Source		0.01 (S: L*, LN*; G: L*, LN*)			0.34 (S: LN†, Q‡; G: L*, LN*)		
Phytase FTU/kg *Zn PPM [Zn Source]		0.02			0.56		
Zn Source		< 0.01 (G > S > N)			< 0.01 (G > S > N)		

Orthogonal Polynomial Contrasts for every zinc source on the trial: None: N; Sulphate: S; Glycinate: G; Linear (L), logarithmic (LN) and quadratic (Q) significance of Orthogonal Polynomial Contrasts . P ≤ 0.01;† P ≤ 0.05;‡ P ≤ 0.10*

No interaction was observed for carcass yield as a g/kg of LW (CY) in birds at 42 days of age (P > 0.10, Table 1). Phytase improved CY of birds in a linear and logarithmical fashion, with Zn source (P < 0.01) significantly improving CY compared to diets devoid of supplemental Zn (P < 0.10, Table 3). Zn supplementation was significant for CY (P < 0.05) with linear and logarithmic improvements for both Zn-sulphate and Zn-glycinate (P < 0.01) and quadratic for Zn-glycinate alone (P < 0.01, Table 3). An interaction was observed for breast yield, g/kg CW, (BY, P < 0.05). Phytase dose significantly improved BY in diets devoid of Zn in a linear and logarithmic fashion (P < 0.01). In the absence of phytase, Zn appeared to have a clearer response, while 1500 FTU of phytase muted Zn response from 50 ppm onwards, irrespective of Zn source (P < 0.05, Table 3).

In summary, based on performance and carcass traits, the Zn-sulphate requirement for the current trial was around 50-100 ppm in diets with at least 500 FTU/kg of phytase, while for

Zn-glycinate the requirement to obtain the best performance and carcass traits were usually attained with supplementation levels of around 50 ppm, when birds were fed at least 500FTU/kg of phytase. In general, phytase effect was not influenced by Zn source, and the magnitude of response of phytase was superior to that of Zn supplementation, with optimal performance and carcass traits observed when 1500 FTU/kg of phytase was supplemented to the diets (P < 0.05). In fact, 1500 FTU/kg of phytase in diets devoid of supplemental Zn showed better performance than that of broilers fed 500 FTU/kg with either 150 ppm of Zn-sulphate or Zn-glycinate.

Table 3 – Carcass traits of 42d-old broiler chickens fed diets with graded levels of zinc sulphate or zinc glycinate (0 to 150 ppm) and graded levels of phytase (0, 500 or 1500 FTU/kg)

Zn Source	Zn, ppm	Phytase, FTU/kg			Phytase, FTU/kg		
		0	500	1500	0	500	1500
		Carcass Yield, g/kg LW			Breast Yield, g/kg		
None	0	750	757	765	349^{f}	355^{ef}	358^{def}
	50	747	765	777	350^{f}	370^{ab}	372^{ab}
Sulphate	100	757	766	781	358^{cdef}	367^{bcd}	370^{abc}
	150	762	771	795	366^{bcde}	374^{ab}	381^{a}
	50	771	758	783	379^{a}	357^{def}	373^{ab}
Glycinate	100	771	770	791	373^{ab}	372^{ab}	372^{ab}
	150	759	779	785	372^{ab}	379^{a}	373^{ab}
SEM			5.3			4.2	
		P-Values					
Phytase FTU/kg [Zn Source]		< 0.01 (N: L‡, LN‡; S: L*, LN*; G: L*, LN*)			< 0.01 (S: L*, LN*)		
Zn PPM [Zn Source]		0.02 (S: L*, LN*; G: L*, LN*,Q*)			0.02 (S: L*, LN*; G: L*, LN*, Q*)		
Phytase FTU/kg * Zn PPM [Zn Source]		0.19			0.04		
Zn Source		< 0.01 (G > S > N)			< 0.01 (G > S > N)		

Orthogonal Polynomial Contrasts for every zinc source on the trial: None: N; Sulphate: S; Glycinate: G; Linear (L), logarithmic (LN) and quadratic (Q) significance of Orthogonal Polynomial Contrasts . P ≤ 0.01;† P ≤ 0.05;‡ P ≤ 0.10*

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Extensive Application of Artificial Intelligence (AI) & Automation Supported by the Industry to Sustain and Boost India's Poultry Industry Growth while Ensuring Efficiency in Entire Value Chains

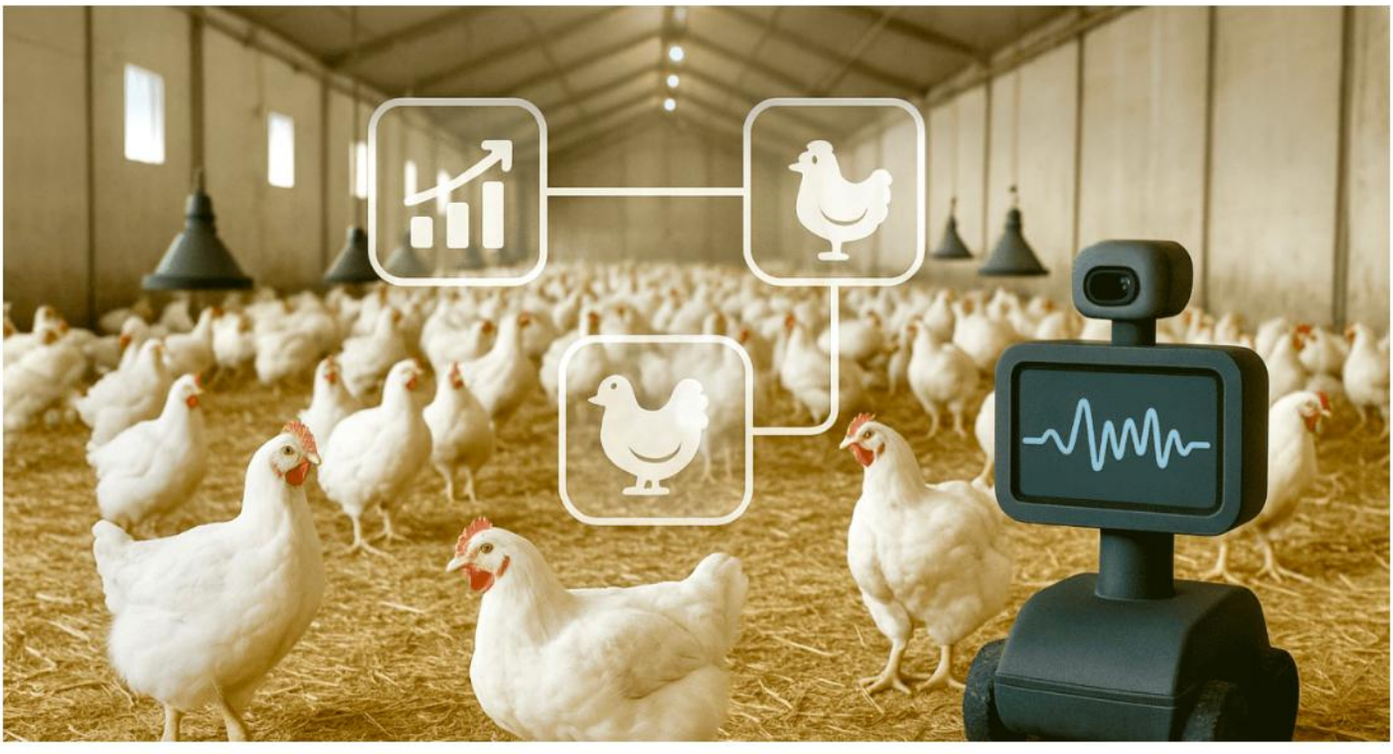
Ricky Thaper

The Indian poultry market according to industry estimates was valued at USD 30.46 Billion in 2024. Due to rising demand for protein rich food, the sector is expected to witness a growth of 7% - 8% in the next decade. The value of the poultry industry is projected to rise to USD 66.37 Billion by 2034. Despite significant growth, the sector faces critical challenges such a volatility in feed supplies and prices, lack of availability of skilled manpower, threat of spread of diseases and rising cost of production. As the demand for poultry products continues to rise, poultry farmers in India are seeking ways to optimize their operations while addressing pressing challenges such as food security, environmental impact, and biosecurity. From precision farming and genetic advancements to automation and data analytics, these cutting-edge technologies are being increasingly used in the poultry industry.

Like most sectors of the economy, the role of Artificial Intelligence (AI) and automation are having a profound impact. In the poultry industry in India, Artificial Intelligence (AI) and automation is gradually transforming and improving efficiency, productivity, and animal welfare. Artificial Intelligence (AI) powered systems are being used for real-time monitoring of poultry houses, optimizing feed formulations, improving disease detection and streamlining logistics and supply chain management. Currently there are challenges in poultry operations in commercial layers, broilers and breeding farms. The key challenges are adverse climatic conditions, shortage and availability of skilled workers, emerging viral and bacterial diseases. Due to the age of the poultry sheds, prevalence of the diseases not eradicated while cleaning. Shortage of quality feed ingredients, use of medicines and ensuring availability of quality drinking water are also impacting the poultry industry. The quality of chicken meat is being impacted while lack of marketing facilities as well as price information is also adversely impacting the poultry sector.

The use of Artificial Intelligence (AI) based technologies to collect the data automatically and accurately in real-time helps in-depth analysis which could allow poultry farmers to immediately act upon optimizing the production. For instance, predicting or projecting body weight for a given broiler line under local conditions. Under unsupervised learning, data collected would be categorized and trends detected without specific programing using resources from the cloud, huge amounts of data could be analysed to give advance notice of a particular outcome to the farmers. Data collected by using Artificial Intelligence (AI) tools would be the greatest resourceful tool in the hands of poultry farmers to harvest the maximum benefit of what they invested.

According to a report titled "Applications of Artificial Intelligence in Poultry Industry" by Livestock Farm Complex, Veterinary College and Research Institute, Salem, Tamil Nadu, a huge amount of data can be generated in the poultry industry by providing data analysis which can play a huge role in farm management practices. Big data stored and processed in cloud spaces can be utilized remotely by Artificial Intelligence (AI) to govern the machines or robotics to regulate parameters like humidity, temperature, light, etc., in the poultry farms.



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For instance, Robots with various biosensors connected to the internet, can be programmed to collect real-time data on parameters like temperature, humidity, ammonia levels inside the farm, subsequently this information can be processed and necessary measures could be initiated. The report stated that Artificial Intelligence (AI) helps to constantly monitor farm activities round the clock in real-time which would be an impossible task for humans to perform. Currently, in a large-scale poultry farm, several farm appliances and sensors are available to control the environmental temperature, humidity, and light, but the drawback with them is that they should be either manually operated or human supervision is a must to operate with. With the power of Artificial Intelligence (AI), various sensors connected with the internet, the farm appliances can be operated from elsewhere giving accurate maintenance of the farmhouse environment at ease. Computer supervised machinery and robotics could reduce sufficiently human interaction with broiler birds, reducing the source or spread of infection. Usage of Artificial Intelligence (AI) could reduce the error rate to negligible and work round the clock which can improve the efficiency of farming leading to maximizing farmer's remuneration. Recent advancements in machine technologies have significantly revolutionized daily activities in the poultry production system. Aimed at reducing the need of labour, while ensuring round the clock monitoring, and facilitating remote reporting of growth of poultry birds, these Artificial Intelligence (AI) tools are gradually being introduced. Some of the examples of application of Artificial Intelligence (AI) and automation include the implementation of specialized robots equipped with imaging sensors and machine learning capabilities, adeptly navigates through poultry house floors, collecting eggs on the floors and monitoring factors such as temperatures, gases and light levels in the poultry units. An innovative autonomous robot utilizes artificial intelligence and sensor technology to evaluate the surrounding environment, identify equipment malfunctions, monitor the health of poultry and perform tasks such as removing deceased birds and analyzing moisture levels in the litter.

For instance, the robot stimulates bird activity, contributing to improving both feed conversion and average daily weight gain Robot also continuously scratches the litter reducing the humidity, eliminating caking and wet spots, reducing the incidence of aspergillosis, pododermatitis, foot burn and breast burn contributing to animal welfare. It can also monitor and map ammonia, temperature and humidity levels throughout the farm to keep in check. A robot by a company was designed to sanitize large poultry farms.

For disease management amongst the poultry birds, using Artificial Intelligence (AI) could be trained for detecting early heat stress in birds by using thermal imaging cameras or infra-red cameras. Likewise, diseased birds from the flock can be identified based on their movement, posture, and behaviour by image analysis collected from diseased birds and compared with the healthy ones. These tools would enhance disease control amongst the poultry birds. Confederation of Indian Industries (CII) has also stressed on strengthening integrated disease surveillance and early warning systems for reports on bird flu incidents. Computer vision-based chicken monitoring systems have been developed to study bird feeding behaviour, stress behaviour, tracking bird movement, bird distribution within the farm, real-time monitoring, early detection of sick birds, identifying lameness and activity, predicting bird live weight based on 3D computer vision.

The application of Artificial Intelligence (AI) has a range of applications in the meat processing plant and egg packing industry. These tools have potential to address some key issues in processing plants, lack of real-time processing data and the limiting speed of human interventions. The use of artificial vision offers real-time yield, monitoring of high-value chicken parts, also combined with smart automation to optimize efficiencies. For processing plants, Artificial Intelligence (AI) allows higher processing speeds and accurate packing of premium value products, translating into more profits and lesser post-harvest contamination. While still, the majority of the farms are collecting data manually and then getting the data processed in computers. By 2050, it has been estimated that a poultry farm would be able to generate 4.1 million data points through various sensors and other related devices connected through the internet of things.

Going forward Artificial Intelligence (AI) assisted farming in various stages of poultry production from farm to consumers would help the Indian poultry sector immensely. There are tools to mitigate or to enhance a specific outcome of a farm produce with increased efficiency to tap farm maximum production potential. In the last few years, many companies have already focused on Artificial Intelligence (AI) related research and prototypes in collaboration with leading universities across the globe. Further use of newer Artificial Intelligence (AI) related technologies will augment poultry production providing affordable animal protein along with ensuring sustainable farm practices. Broiler chicken industry has become India's most organised and vertically integrated agri-business. The broiler integrators have turned poultry farming from traditionally to a commercial enterprise even for the smallholders. Currently over 80% of poultry meat production comes from the organised sector. **For ensuring and sustaining the growth for the sector, Industry has to work closely with poultry farmers to ensure that Artificial Intelligence (AI) tools are used to optimum level for bringing in efficiency in the entire value chain.**

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Hosts Renowned Professor for Ground breaking Seminar on Infectious Coryza in Northern India

A three-day technical seminar series focusing on the latest advancements in the understanding and management of *Infectious Coryza* was successfully conducted from April 16 to 18, 2025, across key locations in northern India—Kaithal (Haryana), Yamuna Nagar, and Mohali (Punjab).

The sessions were led by Prof. Robert R. Bragg, a globally recognized authority from the University of the Free State, Bloemfontein, South Africa. Prof. Bragg is known for his extensive research and contributions to the study of avian diseases, especially Infectious Coryza. A key highlight of his presentation was the **VH COR4** vaccine, featuring the power of **C3**. He explained that **VH COR4** is specifically designed to target the **prevalent strain of** *Avibacterium paragallinarum* circulating in India, offering region-specific protection and improved control of the disease.

April 16 – Kaithal, Haryana

The technical session on April 16 was organized in Kaithal and focused on the latest insights into the prevention and control of Infectious Coryza. The program commenced with a welcome address by Mr. Harjit Padda, Deputy General Manager (DGM), who introduced the distinguished guest. A parallel technical talk on "Vengem" was delivered by Dr. Sambhaji Nimbalkar (AGM), followed by an engaging Q&A. The session concluded with a vote of thanks by Mr. Shashi Bhushan, (AGM).

April 17 – Yamuna Nagar

The second day of the series was hosted in Yamuna Nagar, where Prof. Bragg delivered an in-depth lecture on the **recent global updates and evolving challenges in Infectious Coryza**. His presentation covered pathogen variations, diagnostic advancements, and vaccine strategies. Once again, Mr. Harjit Padda introduced the speaker, setting the stage for an enlightening session. The event concluded with a vote of thanks by Mr. Raju Tanna(AGM), appreciating Prof. Bragg's valuable insights and the attendees' participation.

April 18 – Discussion with Lab Team

On the final day of the visit, a Lab team meeting was held at the Venkateshwara office in Mohali, where Mr. Harjit Padda welcomed and introduced the guest speaker, Prof. Bragg. The session featured an in-depth discussion between Prof. Bragg, Dr S P Singh (GM),Dr. Rakesh Gupta (GM), Dr. Rohilla (DGM),Dr.Danveer Singh(DGM), Dr.Sambhaji Nimbalkar(AGM) and the technical team, focusing on field-level challenges and strategies for effective Coryza management in Indian poultry farms. The meeting concluded with a vote of thanks by Mr. Raju Tanna (AGM), who acknowledged Prof. Bragg's valuable contributions and thanked all attendees for their active participation

This knowledge-sharing initiative reflects the ongoing commitment of the Venworld teams to bring global expertise to the doorstep of Indian poultry professionals and ensure science-backed disease control at the grassroots level.

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Dr. Sandeep Karkhanis

Managing Director
NOVELTECH FEEDS PVT LTD

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1 . Dr. Karkhanis, are you originally from Hyderabad, or did you move here from elsewhere?

"No, I'm originally from Bombay. I moved to Hyderabad because Noveltech Feeds' head office is based here, and it made sense to be closer to the core of our operations."

2. Looking back on your journey, what has been the most rewarding or fulfilling part for you?

"Looking back on my journey, I've had the privilege of working across various facets of business, starting with research and development, moving into technical roles, and eventually stepping into general management. The most rewarding part of my career has been reaching this point, where passion drives my work. The most rewarding part of my journey is where I am right now, because it's not just about managing the business—it's about passion. When you're driven by results and see the impact of your efforts, it makes all the hard work worth it. It's a faster-paced, results-oriented environment, and that energy is what keeps me excited."

3. What has been the most inspiring motivation or drive that has kept you going throughout your career?

"It's been self-motivation, driven by passion. I've always had a deep drive to push myself, and my motivation comes from within. The challenges and opportunities that come with leading a business like Noveltech Feeds keeps me focused and always looking for ways to improve, evolve, and make a positive impact."

4. In your opinion, what sets Noveltech Feeds apart from other companies in the industry?

"The organizational culture is our biggest differentiator. It permeates throughout the company, starting from the top. Moulding the organization into one cohesive entity with the right people on board, aligned with a common goal, is the key. While it may take time, ensuring alignment across all areas makes all the difference in the end."

5. As a leader in the industry, how do you view Noveltech Feeds' position and impact in the market?

"We are market leaders in the broiler commercial feed segment, and we pride ourselves on consistently providing the right quality of feed. Our focus on providing the right nutrition has been key to our success, and it's this dedication to quality that allows us to lead in the industry."

6. What is your perspective on the next generation coming into this industry?

"I believe the next generation is bringing agility and fresh perspectives to the table. Noveltech Feeds is a young organization that is committed to building on the legacy we've established, but also evolving with new ideas and innovations. It's important to embrace change and encourage the younger generation to bring in new perspectives and drive progress. They will be key to carrying the organization forward."

7. Outside of work, what are some of your personal hobbies or activities that you enjoy?

"Coming from a veterinary background, I've always had a deep interest in exploring natural habitats and wildlife. Additionally, I love to travel and explore different geographies, cultures, customs, and cuisines. It's a way for me to recharge and learn more about the world around me."

8. Is there anything else you'd like to share with us about your journey or vision for the future?

"This is a great industry to work in, with a lot of potential. There are many innovations waiting to be introduced, and diversification opens a huge scope for growth in the industry. I'm looking forward to the future and the exciting opportunities it holds for both our company and the industry as a whole."

Host by:
Dr. Ramesh Sikka
Founder Member
Anand Sikka Veterinarians Foundation (India)
+91 98909-63144 sikkaramesh44@gmail.com

Broiler Breeders Association North

Elects New President and Issues New Market Guidelines

Mr. Mohit Malik
President

In a crucial in-house meeting held on July 02, 2025, the Broiler Breeders Association North elected Mr. Mohit Malik as the new President of the association. Alongside the election, the association also passed a significant resolution to regulate market practices during the ongoing poultry industry crisis.

As per the newly issued guideline, no integration company, farmer, or poultry grower will market broiler birds above 2,200 grams in weight. The association has clearly stated that farmers must start selling broilers from 1,800 grams and strictly limit the upper weight to 2,200 grams.

All participating integration companies and poultry growers present in the meeting have assured their full cooperation and agreed to comply with the decision. The Association has also warned that any company or grower violating this regulation by marketing birds above 2,200 grams will be subject to penalties imposed by the Association.

This decision will be effective from July 12, 2025, and the Association has requested all stakeholders to clear their over-sized stock before this date.

The Association has made a heartfelt appeal to all members to strictly follow the new rule in the interest of stabilizing the poultry industry, which is currently facing challenging times.

"It is only through mutual cooperation and discipline that we can overcome the crisis in the poultry sector," said a senior member of the Association.

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A tough egg to crack

What probiotics can do for egg producers

By Pauline Rovers-Paap, Principal Relations Manager, Orffa Additives B.V., The Netherlands

Large volumes of saleable eggs at the highest quality are key for egg producers. Intestinal health and optimal nutrient and mineral absorption in the digestive tract are essential for egg production, shell quality and food safety of eggs. Probiotics are known to have a beneficial effect on the intestinal microbial composition, as probiotics support the persistence of beneficial commensal microbes which assist in the digestion of feed and help to protect the host from pathogenic colonization.

In 2016, the probiotic with the commercial name Calsporin® received a new European feed additive registration for the application in laying hens. Since then, numerous new studies have been carried out that further demonstrate the beneficial effect of the dietary probiotic in layers and breeders. Calsporin® contains viable spores of *Bacillus subtilis* C-3102 at 1.0 x 10^{10} CFU/g product. This article provides an update of scientific research available on the effect of probiotic *Bacillus subtilis* C-3102 in laying hens.

Support performance of hens, young and old

Optimal feeding supports young hens in early peak production and will enable egg producers to better maintain production performance in the final stage of laying. In young hens, between 19 to 42 weeks of age, the addition of 3 x 10^8 CFU *B. subtilis* C-3102 per kg feed (30 g Calsporin® per MT feed), resulted in a faster increase of egg weight, higher egg mass and better utilization of the feed (figure 1). Even with hens during peak performance, similar feed intake and higher performance did not negatively influence live hen weight in the probiotic group. Reflecting an improved feed efficiency, instead of mobilization of body reserves for the egg production. In another study, following hens for a period of one year (from 19 to 70 weeks of age), the inclusion of 3 x 10^8 CFU *B. subtilis* C-3102 per kg feed improved laying rate, egg weight, egg mass, and feed conversion over the whole period. The beneficial support of laying performance by the addition of Calsporin® proven in the registration and practical field trials, is also reaffirmed in recent published scientific articles. In various studies, the addition of *B. subtilis* C-3102 improved egg production, egg weight, egg mass and feed conversion ratio. In a study with increasing amounts of the probiotic per treatment, addition of *B. subtilis* in the diet linearly increased egg weight. Even though the fact that the probiotic is already effective at a low dosage of 30 ppm (3 x 10^8 CFU/ kg feed), higher concentrations can improve animal performance even more.

Freshness and colour of the egg

Haugh unit and yolk index are important indicators to evaluate the freshness of eggs. Although a trend for a higher Haugh unit was found in one trial, this could not be confirmed by another study, in which a significant positive effect on yolk index (calculated by dividing yolk height by yolk width) was found by the addition of *B. subtilis* C-3102. Interestingly, yolk colour was linearly and quadratically increased with increasing levels of the *B. subtilis* strain (figure 2). Enriched yolk colour might be related to a better absorption of carotenoids, primarily xanthophylls, and deposition into the developing ova by the laying hen. Changes in colour were seen before in a practical field trial with brown laying hens, where the addition of the probiotic resulted in a higher percentage of more dark coloured eggshells.

Robust eggshells

Eggshell formation is a classical and rapid biomineralization process. In a span of less than 20 hours, about 2 grams of calcium deposits as calcium carbonate in the eggshell gland. As already mentioned, hens receiving *B. subtilis* C-3102 in their diet have a higher egg weight compared to hens receiving the same diet without the probiotic. In practice, an increase in egg size is often negatively correlated with shell quality. With probiotic, however, in all cases larger eggs did not result in thinner eggshells or compromise the eggshell strength. In contrast, even thicker eggshells and less cracked eggs were noticed when egg size was increased.

Calcium absorption declines in older laying hens and can partly explain the reduced eggshell quality during the late production phase. Dietary probiotics can help to maintain eggshell quality and supplementation enables the egg producers to prolong the laying period. In aged laying hens, the addition of *B. subtilis* C-3102 resulted in higher shell weight, increase of the eggshell thickness and as a result improved eggshell strength. The eggshell breaking potential reduced from 3-4% in the control group to less than 1% in the Calsporin® treated group.

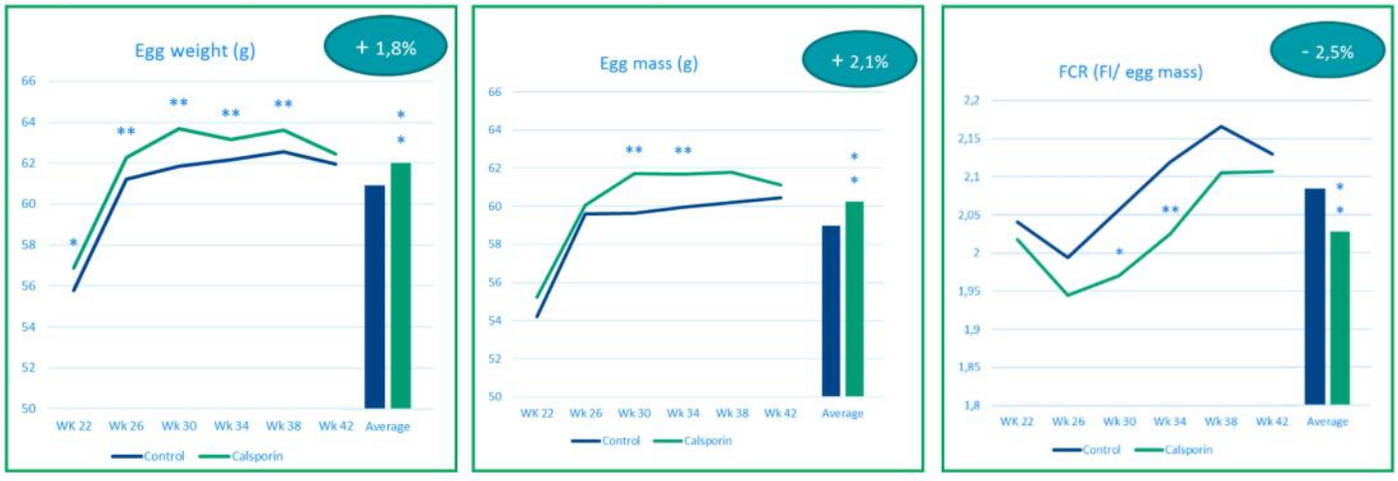

Figure 1 a-c: Bacillus subtilis C-3102 positively influenced laying hen performance in early stages of the production period (1).

** Trend for significant difference (P < 0.10), ** Significant difference (P < 0.05).*

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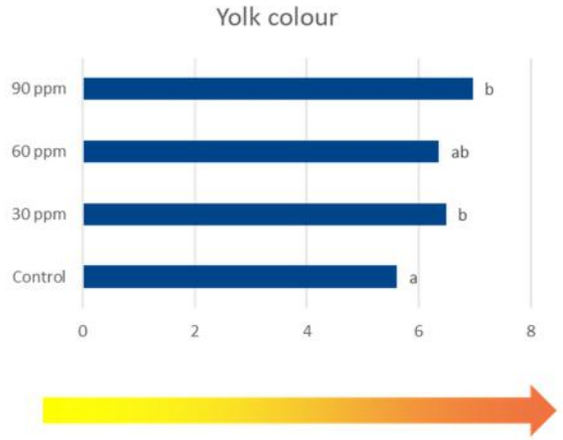

Figure 2: Bacillus subtilis C-3102 linearly and quadratically increased yolk colour. a, b: Bars with different superscript are significant different between treatments (P < 0.05).

Support nutrient and calcium absorption

Improved performance and eggshell quality can be explained by better feed utilization by the hens, as it was shown that the apparent digestibility of protein, fiber and ash was significantly higher in 70-weeks old birds receiving *B. subtilis* C-3102. Recently, a new trial confirmed the improved apparent digestibility of calcium in 79-weeks old laying hens. Increased absorptive area (higher villi and villi-crypt ratio) and transcellular transport by CALB1 (major component of transcellular Ca transport in duodenum and upper jejunum) could explain the higher calcium absorption by the use of Calsporin®. Composition of the microbiota could also have an influence on the solubility and absorption of calcium. By the stimulation of the lactic acid production of commensal lactobacilli, probiotics can decrease the luminal pH, beneficial for the dissolution and uptake of calcium. Higher calcium absorption in laying hens was also confirmed by higher calcium levels in the serum and increased calcium in the eggshell content, without affecting calcium levels stored in the tibia (figure 3).

***Bacillus subtilis* to fight pathogens**

Layer health and the food safety of eggs are related to intestinal health and the composition of the microbiota. Probiotics support the presence of beneficial gut bacteria and can suppress the development of opportunistic pathogens. Local bacteria in the digestive tract compete with pathogenic species for epithelial binding sites and nutrients, positively support the host intestinal immune response and are able to produce metabolites to control the growth of opportunistic pathogens. In young pullets, a combination of Calsporin® and yeast cell walls increased the microbial diversity of the immature microbiota and simultaneously reduced the *Salmonella* Enteritidis infection. *Salmonella* Enteritidis (SE) is one of the most reported serotypes causing foodborne illness in humans, where laying hens can serve as a SE reservoir and eggs are at a high risk of contamination. In aged laying hens after molting, *Bacillus subtilis* C-3102 elevated the amount of beneficial microbes (e.g. *Lactobacillus*) and decreased *Clostridium perfringens*, another opportunistic pathogen. Supporting the immune status of the laying hens is another strategy to fight against various infections. In laying breeders, both serum IgM and serum antibody levels against avian influenza after vaccination linearly increased by increasing levels of *B. subtilis* in the diet.

Microbiota and inflammatory responses

Opportunistic pathogens can also trigger energy demanding immunological pathways in the gut. Harmful microbes are recognized by receptors on immune cells and can trigger pro-inflammatory responses. Addition of *B. subtilis* C-3102 to the diet of laying hens modulated the TLR4/MyD88/NF-kB signaling pathway, resulting in a reduced release of the pro-inflammatory cytokines IL-1β and TNF-α. Especially *Escherichia coli* and *Salmonella* exhibit structural characteristics that can be recognized by toll-like receptors (TLRs), particularly TLR4, and activate a cascade of inflammatory signals. Lower numbers of *E.coli, Salmonella* and *Clostridium* were confirmed in the small intestine and can explain that the suppression of pro-inflammatory cytokines might be attributed to an improved microbiota. Antioxidant status of the hens was evaluated by total antioxidant capacity, catalase, total superoxide dismutase, glutathione peroxidase malondialdehyde in the intestinal mucosa, plasma, spleen and liver. Both the intestinal and overall antioxidant status of the laying hens improved by the supplementation of Calsporin®. Energy savings related to an improved anti-inflammatory and antioxidant status can also contribute to the ameliorated egg production and feed efficiency in laying hens.

Probiotic as a nutritional solution

Bacillus subtilis C-3102 has proven to be an effective feed solution to support laying hen performance, egg quality and food safety of the eggs. The low inclusion level makes the probiotic cost attractive, and the heat-resistance of the probiotic spores enables survival of the probiotic also in pelleted layer feed.

References available upon request

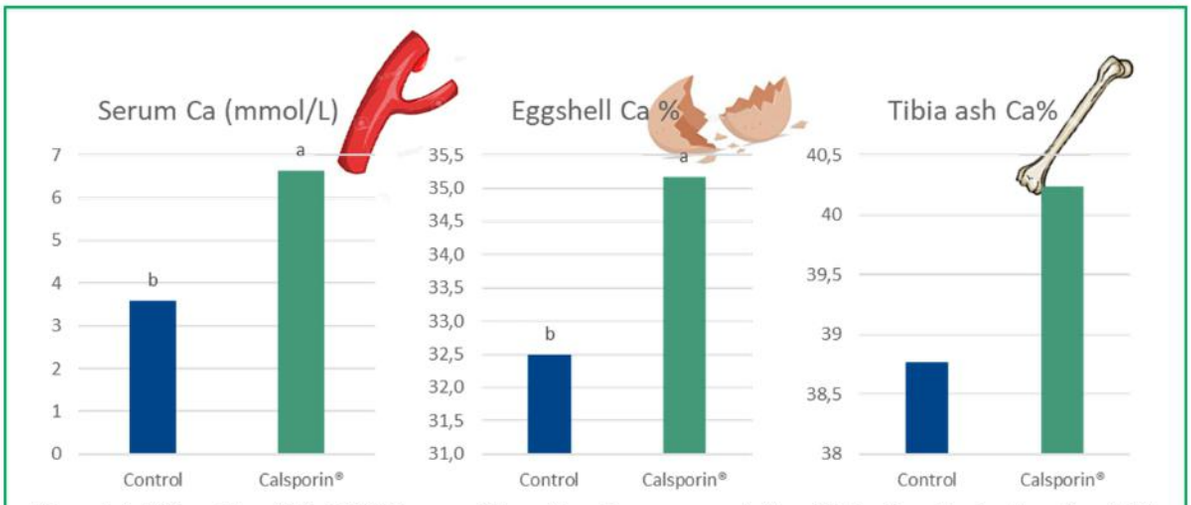

Figure 3: Addition of B. subtilis C-3102 increased the calcium in serum, eggshell, and tibia of aged laying hens (week 79). a, b: Bars with different superscript are significant different between treatments (P < 0.05).


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How can we manage Escherichia coli complications in poultry production?

E. coli is a germ whose presence is inevitable in poultry intestine. It remains benign if the balance between the animal host and its environment is stable, otherwise it can be potentially dangerous. An infection is enough to turn this germ into a mortal disease; the consequences can sometimes be extremely serious in any kind of poultry; turkey, laying hens, chickens. Below are a few simple guidelines and tips which can be implemented on poultry farms in order to manage and, even better, to anticipate imbalances that lead to colibacillosis.

Lower production, reduced feed and water consumption, diarrhea, dehydration, weight loss, mortality! What is happening in our poultry yards? These manifestations might be due to a 'colibacillosis disease'. Colibacillosis is probably the most frequent and most devastating bacterial infections in avian pathology, leading to high economic losses.

A normal presence of colibacillosis in poultry

Escherichia coli is a commensal bacterium of the digestive tract of poultry. It is a Gram-negative bacterium which is provided with pili. However, only a few serotypes are pathogenic, including "Avian Pathogenic Escherichia Coli" (APEC). Some very specific serotypes are associated with the colibacillosis syndrome in poultry. Colibacillosis results from the transfer of germs of coli bacillus type, from the lower intestinal system to the other digestive or respiratory organs of the animals. These germs end up fixing themselves and develop quickly at the level of these organs. **E. coli is housed in the digestive tract of poultry (turkey, chicken, laying hens, chickens) at a rate of 100 000 to 1 million per gram of feces in a balanced flora.**

The colonization of one day-old chick's intestine by colibacillosis must occur rapidly so that the intestinal flora can achieve the right balance. However, some serotypes of E. coli are known to be pathogenic in poultry... But systematic analysis performed on chickens reveal that these same serotypes (or group of microorganisms) often find themselves in totally healthy broiler flocks. However, an E. coli which is known to be non-pathogenic can be found in bird flocks with high mortality rate! It means that the problem is not only due to the E. coli type but also to the animal defenses.

What are the colibacillosis triggers in poultry flocks?

Colibacillosis can affect any type of poultry, turkey, laying hens, chickens. This disease may occur as a result of a temporary decline in immunity. It may be caused either by a virus or poor environmental conditions. One important pathway of the pathogen is the respiratory tract. This comes from the animal having inhaled dust particles contaminated with E. coli. Such particles can stem from the excrements of healthy animals' digestive tracts. How can this happen? The bacteria multiplies in the upper respiratory tract. The bacteria ends up colonizing the respiratory tracts because of their adhering properties. Then, they manage to reach the blood part and as a result, they proceed to colonize the deeper organs (liver, intestines ...).

However, colibacillary infections do not always lead to diseases. To prevent disease a relative balance must be struck between a regular and favorable E. coli contained in the intestine, and a E. coli contained in the organs or in the overall network of blood circulation. Many

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factors can actually break this balance. Among these are environmental stresses (cold, heat, ventilation, dust ...), farming mistakes (feed breakdown, vaccine stress, etc.) and viral transfers.

The two main causes that can lead to these negative situations are:

- A heavy-loaded hepatic condition,
- A weak respiratory status.

Depending on the dominant factor, the first element that must be sought is what triggered the stress. Depending on the nature of the problem, the diagnosis can be complemented by a respiratory solution (ventilation, air flows, ammonia or dust), or a liver-oriented type of solution (type of food, age of the animals, etc...).

How can we avoid imbalance situations which are likely to trigger colibacillosis?

The main objective is to avoid physiological imbalance. First, the factors leading to any form of physiological troubles must be examined. These include the frequency of situations where the initial state of imbalance leads to a more serious condition, the age when the issue occurs, the spatial and material locations, and the type of necrosis chart at play.

It is necessary in many cases to use antibiotic therapy, but this option should not be systematic. Systematic use is not necessarily the right way to act because it is important to identify the bacteria's sensitivity to antibiotics to adapt treatment and avoid resistance appearance, which takes time. The objective is therefore to reduce the amount of external interventions by setting up a genuine action plan for preventive control. However, this medical biosecurity strategy is worrying: the repeated use of antibiotics in cases of undefined risk can cause a high exposure and an increased likeliness of resistant strain emergence.

Antibiotic residues require long withdrawal periods and therefore, they limit the commercialization of products (eggs, meat). As for vaccines, not only are they scarce but proof of their effectiveness in farming context is, as of now, far from being convincing. Conversely, the use of complementary and preventive plant-based solutions can avoid the waiting period inherent to antibiotic delivery and the risk of **antibiotic resistance.**

In order to minimize the risk of colibacillary manifestation in poultry houses, it is essential to rid the respiratory tract of any elements likely to irritate or to weigh on it. At the same time, we must also avoid dealing with the consequences of hepatic hyperactivity, as these can weaken the animals and make them susceptible to bacteriological attacks.

Would you like to reduce colibacillosis manifestations on your farm or to get more information on preventive measures? If so, do not hesitate to contact our experts!

Antoine Rousseau
Senior Global Poultry Expert
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BULLETIN

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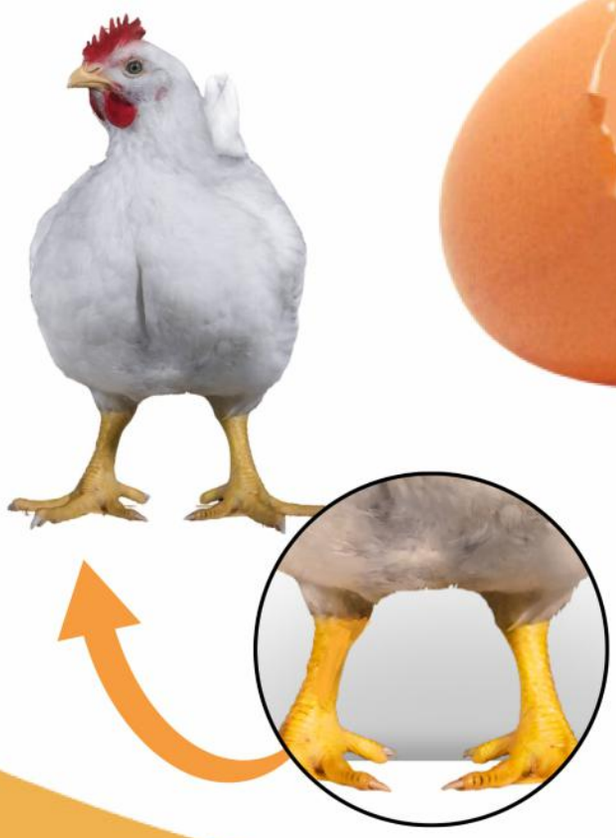

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ARTICLE

Understanding Bird Flu and Its current Global and Indian scenario

Outbreaks of Bird Flu in 2025 in different countries of the world including India once again challenge the global public health systems due to their widespread circulation and considerable mortality rates. AI, commonly referred to as bird flu, is caused by viruses belonging to the genus Influenza viruses, which are members of the Orthomyxoviridae family. The AI virus has two subtypes based on glycoproteins, namely, Neuraminidase (NA) and Hemagglutinin (HA) on its surface, which, in addition to its infectivity, are the primary factors influencing the AI virus' pathogenicity, transmission, and host adaptation. AIVs are categorized into two groups based on their pathogenicity to chickens as determined by the intravenous pathogenicity index (IVPI) test: highly pathogenic avian influenza viruses (HPAIV) and low pathogenic avian influenza viruses (LPAIV). In recent years, the transmission of HPAIV strains such as H5N1, H5N8, and H7N9 has presented substantial threats to public health. Among the various HPAIV strains, the H5N1 virus is regarded as the most pathogenic, with a high mortality rate in chickens and humans.

Although this virus primarily affects poultry, it can also infect humans, pets, livestock, and wild animals. The harmful effects of AI illness can affect both human and animal health and cause financial losses. In humans, AI is classified as a highly contagious respiratory illness that is usually self-limiting but has a significant global impact on morbidity and mortality. In poultry, severe pathogenicity can result in death, but it often has low pathogenicity, causing subclinical infections, respiratory conditions, or decreased egg production.

Poultry, particularly chickens and ducks, was the source of the AI outbreak, ultimately connected to human transmission. AI illness is difficult to control because people regularly come into contact with chickens, ducks, birds, turkeys, and other poultry in daily life, like at farms, marketplaces, and slaughter houses. Since there is currently no effective treatment for AI virus infections in commercial poultry and no widely available vaccine for human AI, treatment options for human infections are limited to supportive therapy and antiviral medication. Resistance to anti-virals is becoming a more significant issue.

Akshit Tyagi[1], Aditi Singh Nimi[2], Shivang Madhyan[3]

Etiology

The RNA virus, termed the AI virus, is a member of the Orthomyxoviridae family. This virus has a single-stranded nucleic acid composed of eight gene segments that encode approximately 11 proteins. The influenza virus envelope comprises a combination of proteins and carbohydrates. The virus uses its spikes to cling to particular receptors in host cells. There are two types of spikes, namely, those containing NA and HA, which are situated outside the virion. The four types of antigens found in influenza viruses are nucleocapsid protein (NP), HA, matrix protein (MP), and NA. Based on the types of NP and MP antigens, influenza viruses are classified as influenza A, B, and C viruses. Influenza A virus infection is highly harmful to both humans and animals, resulting in high rates of morbidity and mortality worldwide and making it a crucial component of the health sector. Because this type of virus is easily mutable and can produce new, more virulent forms through antigenic drift or shift, it can spread globally. There are nine NA and 15 HA subtypes. Epidemiological seroprevalence investigations have demonstrated that a number of influenza A virus subtypes, including H2N2 (1889), H3N8 (1900), H1N1 (1918), H2N2 (1957), H3N2 (1968), H7N7 (1977), and H5N1 (2005), are linked to pandemic outbreaks. Although influenza C virus is infrequently encountered despite its ability to infect both humans and animals, influenza B virus exclusively targets humans. Types B and C influenza viruses infrequently or never produce pandemic outbreaks.

Transmission

The avian influenza virus spreads through direct contact with infected birds, whether wild or domesticated. It can be transmitted via bird droppings, saliva, nasal secretions, and contaminated water or feed. Migratory birds often act as carriers, spreading the H5N1 virus across regions and increasing the risk of outbreaks in poultry farms. Although human-to-human transmission is rare, people can get infected through direct contact with infected birds, their droppings, or contaminated surfaces.

Pathogenesis

AI viruses can infect and kill various bird species. Their virulence divides them into two categories. First, an HPAI virus termed HPAI has been identified as a lethal virus-producing bird plague. This group was restricted to H5 and H7 rats, and the mortality rate was approximately 100%. Second, another virus known as low pathogenic AI (LPAI) causes mild respiratory sickness. There is uncertainty regarding the factors leading to the virus's transformation from LPAI to HPAI. Under certain conditions, mutations occur quickly once wild birds are introduced. In other instances, the LPAI virus was present in chickens for months before mutation. The pathogenicity of AI viruses is polygenic and heavily dependent on a group of genes that affect immune evasion mechanisms, replication efficiency, and host and tissue tropism. Furthermore, after interspecies transmission, variables specific to the host and species affect the course of infection. There are several ways in which the LPAI virus can infect flocks of chickens. The inhalation or consumption of infectious LPAI or HPAI virions triggers pathogenesis because trypsin-like enzymes in intestinal and respiratory epithelial cells cleave surface HA. This leads to multiple replication cycles in the intestines and respiratory tract, which release infectious virions. Second, HPAI viruses infiltrate the submucosa and enter the capillaries following their initial replication in the respiratory epithelium. This virus reproduces in endothelial cells and then travels through lymphatic and vascular networks to infect and multi ply in different cell types in the skin, brain, and visceral organs. Alternatively, the virus could spread throughout the body before multiplying extensively in vascular endothelial cells. This virus is present in red, white, and plasma blood cells. Macrophages appear to be involved in viral dissemination throughout the body. This pantropic replication is caused by HA proteolytic cleavage sites, which are cleaved by the ubiquitous cellular enzyme furin. Multiple organ failures lead to clinical symptoms and mortality. Third, the intestine or respiratory tract is typically the only place where LPAI viruses can replicate. Most frequently, respiratory injury results in the onset of disease or death, particularly when coupled with subsequent bacterial infection.

The LPAI virus replicates and damages renal tubules, pancreatic acinar epithelium, fallopian tubes, and other organs containing epithelial cells that occasionally have trypsin-like enzymes in several animals.


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Global Scenario

Between 2003 and February 2025, the World Health Organization has recorded 972 cases of confirmed H5N1 influenza, leading to 468 deaths [1]. The true fatality rate may be lower because some cases with mild symptoms may not have been identified as H5N1.

Tens of millions of birds have died of H5N1 influenza and hundreds of millions of birds have been slaughtered and disposed of, to limit the spread of H5N1. Countries that have reported one or more major highly pathogenic H5N1 outbreaks in birds (causing at least thousands but in some cases millions of dead birds) are South Korea, Vietnam, Japan, Thailand, Cambodia, Laos, Indonesia, China, Malaysia, Russia, Kazakhstan, Mongolia, Turkey, Romania, Croatia, Ukraine, Cyprus, Iraq, Nigeria, Egypt, India, France, Niger, Bosnia, Azerbaijan, Albania, Cameroon, Myanmar, Afghanistan, Israel, Pakistan, Jordan, Burkina Faso, Germany, Sudan, Ivory Coast, Djibouti, Hungary, United Kingdom, Kuwait, Bangladesh, Saudi Arabia, Ghana, Czech Republic, Togo, Nepal, Bhutan, the Philippines, and Chile [2].

Indian scenario

On 22 May 2024, the International Health Regulations (IHR) National Focal Point (NFP) for India reported to WHO a case of human infection with avian influenza A (H9N2) virus detected in a child resident of West Bengal state in India. This is the second human infection of avian influenza A(H9N2) notified to WHO from India, with the first in 2019.

According to data of Ministry of Fisheries, Animal Husbandry & Dairying posted on 05 APR 2025 states affected since January in India are Maharashtra, Chhattisgarh, Jharkhand, Andhra Pradesh, Madhya Pradesh, Telangana, Karnataka, Bihar. Total number of Epicenters in 2025 is 34, whereas Active Epicenters are 6 (3 States – Jharkhand (Bokaro and Pakur), Telangana (Ranga Reddy, Nalagonda and Yadadri Bhuvanagiri & Chhattisgarh (Baikunthpur, Korea).

Clinical Symptoms

The type of AI virus and host species determines the clinical manifestations, severity, and fatality rates of AI. Most AI viruses are LPAI viruses (subtypes H1–H16). An infection with the LPAI virus typically results in respiratory symptoms in birds, including sneezing, coughing, nasal and eye discharge, and swelling of the infraorbital sinuses. Sinusitis is common in ducks, quails, and domestic turkey. Respiratory tract lesions typically involve inflammation and blockage of the lungs and trachea. AI symptoms in laying and broiler hens include mucosal edema and inflammatory exudate in the oviduct lumen, decreased egg production, infertility, and egg rupture or involution. Symptoms that are rarely observed in laying hens and broilers include acute renal failure and deposition of visceral uric acid (visceral gout). Clinical symptoms or severe AI-related lesions may not be visible in acute cases before death. However, in severe cases, the lesions could be as follows: Cyanosis and edema of the head, comb, wattles, and snood (in turkey); ischemic necrosis of the comb, wattle, or hair net; edema and red discoloration of the calves and feet as a result of subcutaneous ecchymotic bleeding; petechial hemorrhages in the muscles and visceral organs; and blood staining. Greenish diarrhea is common in severely sick birds. Acute AI infection-surviving birds may develop central nervous system (CNS) involvement, which manifests as torticollis, in coordination, opisthotonos, paralysis, and drooping wings. The location and severity of microscopic lesions vary widely; examples include edema, bleeding, and necrosis in the parenchymal cells of the skin, CNS, and various visceral organs. The symptoms of AI virus infection can range from moderate to severe, especially in those infected with the H5N1 or H7N9 subtypes. These symptoms, which include sore throat, stuffy nose, fever, cough, body aches, headache, exhaustion, and conjunctivitis, are comparable to seasonal flu. Types A and B influenza viruses cause asymptomatic respiratory infections in young and healthy people, but in certain cases, especially in older patients and those with co morbidities or immunosuppressed illnesses, they can be fatal. Symptoms include cough, malaise, fever, chills, sore throat, headache, coryza, anorexia, and myalgia.

Treatment

AI, which affects poultry, has no known cure. However, secondary illnesses can be prevented using broad-spectrum antibiotics, sound husbandry practices, and a healthy diet. Treatment for AI in humans varies among individuals based on the severity of the disorder. The illness may involve a range of drugs in addition to symptomatic care, such as antivirals and antibiotics, to treat or prevent subsequent bacterial pneumonia. Certain AI viruses can be effectively treated with two classes of antiviral medications: adamantane (rimantadine and amantadine) and NA inhibitors (zanamivir, peramivir, laninamivir, and oseltamivir). However, some of these medications (laninamivir and peramivir) are not licensed in all countries.

Diagnosis

AI viruses cannot be identified based only on clinical signs and symptoms because the lesions and symptoms of this illness are diverse and may be mistaken for those of other illnesses. Therefore, serological and virological testing is required, and confirmation must be per formed at a qualified laboratory. Oropharyngeal, cloacal, and tracheal swabs from live birds can be used to detect the AI virus. Several factors, including the virus and bird species, affect the accuracy of this detection. Moreover, droppings and feathers from young birds can be used as helpful samples. All species can benefit from virus characterization through virus isolation, which involves inoculating samples into chicken embryos to identify the characteristics of red blood cell deposition. Despite being time-consuming, this method is the "gold standard" for detecting AI viruses and is mostly utilized for the diagnosis of initial clinical cases as well as the isolation of the virus for additional laboratory investigations.

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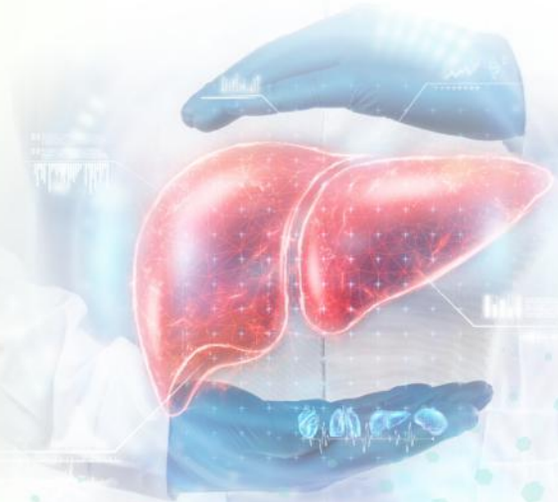

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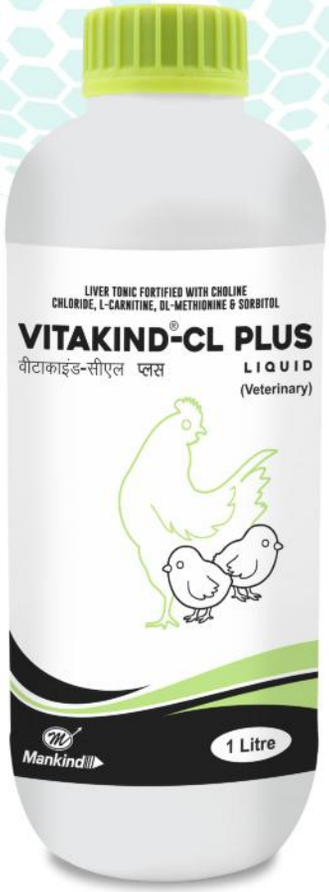

D — **DETOXIFICATION :** Removes toxins from liver

E — **ENERGIZER :** Energy generation

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The AI virus can also be diagnosed in a laboratory setting using molecular tests such as real-time polymerase chain reaction (RT-PCR) or serological tests such as the HA inhibition test, anti gen detection enzyme-linked immunosorbent assay (ELISA), agar gel immunodiffusion (AGID), and other immunoassays.

Vaccination

Vaccinating poultry against AI disease using live recombinant vaccine (Fowl pox H5) and inactivated vaccine can limit virus transmission when vaccinated birds become sick, protect birds from clinical disease, and increase resistance to infection. Therefore, by reducing the number of circulating viruses, carefully controlled poultry vaccination can reduce rates of mortality and morbidity, as well as human danger. The best public health measure to prevent influenza in people is annual influenza vaccination, which comes in two trivalent formulations: live attenuated and inactivated formulations containing AI A virus strains (H1N1 and H3N2) and AI B virus. No vaccine for AI is commercially available and has undergone experimental testing that satisfies all the necessary criteria. Most vaccinations achieve the intended outcome, which is protection against clinical illness caused by AI viruses.

Public Health Importance

AI disease outbreaks in domestic and wild birds are uncommon; however, an infection can significantly threaten public, veterinary, and medical health. Following the 1997 epidemic of AI H5N1 in people and poultry in Hong Kong and the 2003 outbreak of AI H7N7 in the Netherlands, there have been concerns that the AI virus may continue to exist in some chicken populations and, through multiple mutations or reassortment, become a pandemic virus for humans. The viruses that emerged in the 20th century were novel HA subtypes against which the human population failed to develop immunity. The reintroduction of H1N1, which over time modified and re-sequenced the AI A genes of multiple AI, human, and swine viruses, resulted in the 2009 H1N1 pandemic. The current strains of AI viruses that pose a threat to global health are many subtypes, namely H5, H7, and H9, which have repeatedly infected humans and caused occasional diseases. One health approach to mitigating the AI virus is vaccinating humans and susceptible farmed and pet animals.

Control

Once the occurrence of HPAI is confirmed through the laboratory tests; all contingency procedures for the containment and eradication of HPAI should be implemented with the following-

- Cross-sectoral notification to health and health related sectors, industry and farmers.
- Restricted access to infected premises and alert zone.
- Restrictions on movement and trade of poultry and its products.
- Depopulation procedures for infected birds.
- Strict compliance to biosafety and biosecurity protocols.
- Vaccination of at-risk human populations.

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This time Mrs. Perizaad Zorabian, Managing Director, Zorabian Chicken take us to her father, Late Mr. Khoram Zorabian journey and share a fond memory paying to tribute to her father

Mr. Khoram Zorabian

1. Was he Orginally from Mumbai ??

Yes , my father Khoram Zorabian was born and brought up in Mumbai and lost his father at the tender age of 8…He was brought up by an extremely strong and resilient mother who had to single handedly raise 7 children …His mother described him as always being bold, brave and a go getter…She also said that from a very young age he was someone who spread love everywhere he went – very close to the meaning of his real persian name Khudamorad which means Son of God.

2. Why did he choose Poultry as a profession ?

My father was a completely self made man, because he came from very humble beginings he started young with helping his family during his summer breaks at their family owned dairy farm and bakery.

Inspite studying law – Dad always enjoyed the thrills of entrepreneurship ..He started small with his own Bakery and then a restaurant in Bandra called Gondola. Since he enjoyed the hospitality business the next natural progression for him was to start a resort and he bought a piece of land in Khapoli… but as fate would have it he did not get the NOC for that resort. Someone who has never allowed any failure or set back stop him, he then decided to start a Poultry Farm because thru all his ventures with food he realized that there was a huge gap in the market for good quality chicken and he decided to start a Poultry Farm with a clear Vision that Zorabian would be a Niche Premium Producer of High Quality Chicken.

3. What kept him motivated right thru his journey ??

My fathers single obsession and passion right thru his journey was that Zorabian would be the first name that came to anyones mind when you think of High Quality Chicken…His desire to ensure that all Zorabians products were of superior quality with zero compromise was the driving force that helped him take all his decisions. For him it was never about scale, volume and number…It was about being the best so he built a company that today epitomises Quality, Intergrity and Trust.

He was also passionate about food and his dream was to optimize the culinary expertise that he had with his restaurant and catering business to start a Ready to Cook Range of Chicken Products that were unlike anything available in the market …Great on taste and Good health made out of a 100 percent wholesome meat.

4. What was the best thing he liked in his journey ????

My father was a people person, he loved meeting people and he was a man who surrounded himself with the best and the most learned in the business and he always learnt from them, never one to shy away from trying something new, he was always one step ahead of everyone.

He was one of the first who adopted environmentally controlled sheds in India and went on to build a state of art processing plant. He also had the vision to build his own distribution network so that he would deliver his chicken in branded bags (which was unheard of in his time) , void of any preservatives to his customers in temperature controlled vehicles.

In no time, In Mumbai Zorabians Institutional customers read like the whos who of quality conscious companies. With the onset of Modern Retail Trade everyone who wanted a reliable chicken producer would Only call Zorabian who by then was known in the business for Quality, Integrity and Trust.

What he loved the most about his journey at Zorabian was the wonderful people he met and interacted with, all of whom helped shape him and the company into what it stands for today.

He also loved his team and his people at Zorabian whom he truly considered his extended family…seeing them and their families progress and prosper was also something that brought him tremendous joy in his journey.

5. As compared to the other big players in the industry , how did he feel Zorabian was different ???

My father only competed with himself, his competition was to be the best when it came to a quality product , he wanted to always ensure all his customers were delighted with Zorabians Offerings. Nothing else mattered to him…So all his decisions were made with zero insecurity and compromise and as a daughter I admired that the most about him. Today Zorabian can afford to command a premium price for its products only because of his stand on Zero Compromise.

6. Please tell us about his family ???

Our mother Firoza was an exceptional woman , his childhood sweetheart and his greatest strength thru the good times and bad.

And then it was the three of us….Perizaad, Sohran and Shazaad….His son Sohrab took on the Catering and Hospitality business and was successfully running that.

His son Shazaad, came back from America in 2000 and joined him to strengthen and develop the farming and truly took his fathers vision to the next level.

Under his fathers guidance, Shazaad systematized Zorabians Back end , Zorabians Contract Farming thrived and Zorabian became a completely vertically integrated farm with its own Breeder Farms, Feedmill, Processing Plant, Ready to Cook Plant and Distribution Network.

Shazaads passion with growing chicken responsibly ensured that Zorabian Is today a Green Company…conscious about recycling waste and conserving the environment.

His daughter Perizaad joint the business in 2007 and that's when Zorabian Launched its Retail Line of Fresh Chicken Tray Packs and Ready to Food Products. With Perizaad helming Sales, Marketing and all Front end Operations and Shazaad looking at the back end and farming operations, Zorabian under dads Leadership grew from strength to strength into being Mumbais Preferred Chicken Brand for every Quality Conscious Customer both in the B2B and B2C segment.

7. What he thought about his organization being a Leading Name in the Poultry Industry ??

My father was very very proud of what his children and his team under his guidance achieved in Poultry…what he was most proud of was that Zorabian grew to be a trusted and leading name in the Premium Niche Segment of Poultry inspite of making a conscious decision to stay mid-sized. The brand today has the strength and ability to scale its operations pan india if the family so desires.

He was also extremely proud of all the giant steps Zorabian as a company has taken for initiatives like Animal Welfare, Enviroment Sustainability, Farmer and Employee Welfare..All areas that he was so passionate about.

8. What was his dream as the next generation entered his business ??

His Dream for all his children was always very simple, he wanted all three of us to be happy and take his legacy forward and scale and grow the business at the pace we wanted to. My father has seen a lot of highs and lows with the business and he never wanted to impose anything on us. His only expectation from the next generation really was to continue to be the best and to take care of his people all of whom have spent their entire life being loyal to the brand.

He wanted us to continue to positively impact the villages around us..to continue to not just Grow Great Chicken but to encourage and grow all the peoples lives we touch.

9. What was his favourite food ??

My father was a great foodie and his love for food was legendary…All His Poultry Fraternity Doctors and Friends remember him for his Akoori Breakfast and his Dhansak Lunches…He loved his Samosa, Vada Pav and Misal Pav, He loved his sausages and salami and whenever we travelled abroad his suitcases were filled with great products and his dream was that Zorabians Sausages and Salami would be world class…which I truly believe we are.

10. What were his hobbies ??

Dad loved all types of sport and loved his time watching football, tennis , cricket. He loved building and contructing things, making beautiful homes and gardening and farming were his passion. Another passion was accquiring land….He would have been a real estate tycoon if not for poultry.

11. What qualities best describe Mr Khoram Zorabian ...

My father, was a legend in every way…He was bindaas, large hearted, fearless, a dreamer, go getter, he lived a large full life that was driven by love..love for his family, love for his company and his people. His greatest legacy is not just the incredible company that hes built and handed over to us…It is his goodwill, his relationships that all three of us are most blessed with..Today as we traverse the world of Poultry…We stay humbled by all the Poultry Industry Stalwarts , people who knew him, people who worked with him…all of whom today encourage, guide and help us take our fathers legacy forward with pride and honour

Strengthening Global Trust:

Vietnam Delegation Visits PVS GROUP's Comprehensive Facilities

PVS GROUP had the honour of hosting a distinguished delegation from Vietnam for an insightful week-long visit to India. The visit was a testament to the enduring relationship built on trust, transparency, and our shared commitment to advancing animal healthcare solutions.

During their stay, our esteemed guests were warmly received at the PVS GROUP Head Office, followed by an exclusive guided tour across 10 state-of-the-art manufacturing units. These facilities span our entire product portfolio, including:

- Feed Supplements
- Veterinary Antibiotics
- Disinfectants and Farm Hygiene Products
- Probiotics and Postbiotics
- Nutraceuticals and Phytogenic Additives
- Herbal Antiviral and Immunity-Boosting Formulations

This visit offered our clients a first-hand experience into the scale, operational excellence, and stringent quality standards that define PVS GROUP's manufacturing ethos. The delegation was especially impressed by our DSIR-accredited R&D Centre, where numerous innovative and patented formulations have been developed to address species-specific challenges across poultry, cattle, sheep, goat, camel, horse, swine, and aquaculture.

The visit not only served to reinforce confidence in PVS GROUP's capabilities but also exemplified the importance of collaborative global partnerships in driving innovation and sustainability in animal healthcare.

At PVS GROUP, it is always a matter of pride to welcome international partners, showcase our robust infrastructure, and align visions for mutual growth.

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The Importance of Training in the Real World Enhancing Skills, Fostering Growth, and Driving Success

Dr. P.E. Vijay Anand
Center Lead – The Soy Excellence Center, India
U.S. Soybean Export Council

The Soy Excellence Centres focus on training the global workforce engaged in the poultry, feed milling, aquaculture, dairy, and soy food sectors. Training holds a pivotal role in the real world across various domains and industries. It serves as the cornerstone for personal and professional development, ensuring that individuals stay competent and competitive in an ever-evolving landscape. The significance of training can be observed through its manifold benefits, ranging from enhancing skills and fostering growth to driving overall success.

Goals of the Soy Excellence Center, India

The India SEC Program embodies the global vision crafted by the U.S. Soy Industry, translating this philosophy into impactful action with the help of regional experts in India and the members of the SEC's Regional Advisory Council.

With clear objectives and a strategic focus, the program aims to:

a) **Empower Future Leaders**: Cultivate a new generation of problem-solvers who will emerge and engage as good leaders in this crucial market. b) **Elevate Professional Skills**: Shape the next wave of young professionals, equipping them with the expertise to become efficient and visionary managers of tomorrow. c) **Strengthen Enterprise Capacity**: Build the operational strength of companies within the protein value chain, driving demand for high-quality raw materials and innovative technologies, which will boost the market demand for soy and feed. d) **Fuel Industry Growth**: By achieving these milestones, the program will drive sustained growth in India's protein industries, ultimately opening new doors for U.S. Soy market access in the region.

"At the SEC, we reflected deeply on the impact of effective training programs and identified eight key outcomes that can emerge from them. Each of the eight outcomes is described in detail below."

Enhancing Skills and Competencies

One of the primary advantages of training is the enhancement of skills and competencies. In an era where technology and methodologies are constantly advancing, staying updated is crucial. Training programs help individuals acquire new skills, refine existing ones, and keep pace with industry standards. This continuous learning process ensures that professionals remain relevant and effective in their roles.

By way of example, in the food industry, there is growing attention given to protein. All of us work directly or indirectly in the protein value chain. Customers' expectations, food norms, production techniques and technologies, our understanding about nutrition, equipment and its technology (transforming digital), and animal and plant genetics keep continually changing.

Boosting Employee Morale and Satisfaction

Training also plays a significant role in boosting employee morale and job satisfaction. When organizations invest in their employees' development, it sends a positive message that they value and believe in their workforce. This investment leads to increased job satisfaction, higher motivation levels, and a stronger sense of loyalty among employees.

For instance, companies that offer leadership development programs, soft skills training, and career advancement opportunities often see lower turnover rates and higher engagement levels. Employees feel more competent, confident, and prepared to tackle challenges, resulting in a more positive work environment.

Fostering Innovation and Adaptability

In today's fast-paced world, especially in the protein value chain/ food chain, innovation and adaptability are key to staying ahead of the competition. Training empowers individuals and organizations to embrace change and think creatively. It encourages a culture of continuous improvement and experimentation, where employees are not afraid to take risks and propose new ideas.

Organizations that prioritize training are better equipped to adapt to market shifts, technological disruptions, and changing customer demands. Specifically, we see a lot of digital applications being used in the protein production sector or the feed manufacturing sector. Companies that invest in digital transformation training can seamlessly transition to new business models, enhance their digital presence, and offer innovative solutions at production centres or to their clients.

Ensuring Compliance and Reducing Risks

Compliance with industry regulations and standards is non-negotiable for many businesses. It is an area that is catching up fast because of health and wellness concerns. Training ensures that employees are aware of and adhere to these regulations, thereby minimizing the risk of legal issues, financial penalties, and reputational damage. We operate in the food sector – be it production, R&D, or marketing - our audience is humans and their food; therefore, food safety and all regulations governing it take centre stage.

Improving Performance and Productivity

A well-trained workforce is synonymous with improved performance and productivity. Training equips employees with the knowledge and tools they need to perform their tasks efficiently and effectively. It reduces errors, enhances quality, and streamlines processes, leading to better overall performance.

To illustrate, customer service representatives who receive training on communication skills, conflict resolution, and product knowledge are more likely to handle inquiries and complaints successfully. This improved performance translates into higher customer satisfaction and loyalty. The workforce at a feed mill, when taught about implementing a proactive maintenance protocol, can help reduce downtime that could occur due to an unforeseen production issue.

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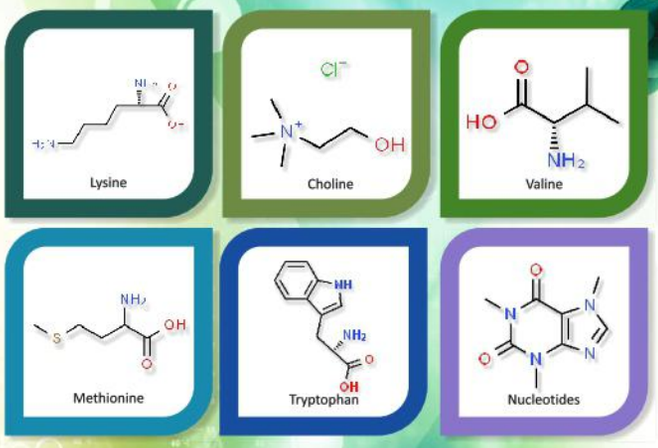

To achieve high efficiency poultry farming, a finely balanced feed formula with high bioavailability of feed nutritional fractions especially of critical ingredients including limiting amino acids, trace minerals etc., are required. To attain this balance, supplementation becomes extremely crucial to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

Training is instrumental in supporting career development and progression. It provides individuals with the skills and qualifications needed to advance in their careers. By offering training opportunities, organizations can nurture talent from within and prepare employees for higher responsibilities.

Mentorship programs, professional certifications, and specialized training courses, such as those of SEC, are some of the ways organizations can support career growth. Employees who see a clear path for progression within the company are more likely to stay committed and strive for excellence.

Contributing to Organizational Success

Ultimately, training the workforce contributes significantly to organizational success. A skilled, motivated, and adaptive workforce is a powerful asset that drives innovation, efficiency, and competitiveness. Organizations that invest in training are better positioned to achieve their strategic goals and maintain a sustainable growth trajectory.

In particular, companies with robust training programs often report higher profitability, stronger market positions, and greater resilience in the face of challenges. Training fosters a culture of learning and development, where continuous improvement is the norm and excellence is the standard.

Contributing to National Protein Security

The food sector's training programs are essential not only for the company's success but also for contributing to national protein security. As a key player in the food industry, our commitment to ensuring the safety, quality, and availability of protein sources is paramount. By training our workforce in best practices for food production, handling, and distribution, we help guarantee that our products meet stringent standards and are accessible to the wider population.

Proteins are crucial for human health, playing a vital role in growth, repair, and maintaining bodily functions. Ensuring a reliable supply of high-quality protein is a critical aspect of national food security. Our training programs cover various aspects of protein management—from sourcing sustainable and ethically produced raw materials to implementing advanced preservation techniques that extend shelf life and minimize waste.

Additionally, by investing in training, we foster innovation, which can diversify the market and offer more sustainable solutions to meet the growing demand. This proactive approach not only supports our business objectives but also aligns with global efforts to combat food insecurity and promote public health.

By prioritizing training, we empower our workforce to uphold the highest standards in food safety, quality, and innovation, thereby contributing to the overarching goal of national protein security.

Conclusion

In conclusion, training is a vital component of real-world success. It enhances skills, boosts morale, fosters innovation, ensures compliance, improves performance, supports career development, and drives organizational success. Whether at an individual level or an organizational level, the benefits of training are profound and far-reaching. As the world continues to evolve, the importance of training will only grow, making it an indispensable element of personal and professional growth.

NEWS

Workshop on Monsoon Management by TILMAH

TILMAH (Tropical Institute of Livestock Management and Health), under the leadership of Dr. Shabbir A. Khan, has initiated a poultry course at Faizabad, Ayodhya. Earlier it was conducted at Gurgaon for the last 10 years.

As part of this initiative, the institute recently conducted a one-day workshop on "Monsoon Management" for 15 field staff members of an integration company.

Mr. Shabbir Ahmad Khan

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Campus Calling 2025

Bentoli Agrinutrition Launches – A National Contest for Budding Veterinary Professionals

Bentoli Agrinutrition, a US-based multinational company committed to advancing animal health and nutrition, proudly announces the launch of the second edition of its flagship campaign, **Campus Calling - 2025**. This innovative nationwide competition is open to **4th and 5th-year** veterinary students from colleges across India and Nepal, aimed at fostering young talent and encouraging scientific writing skill in the field of poultry health.

Building on the tremendous success of its inaugural edition, 2024—which saw 217 students from 54 veterinary colleges participate—Campus Calling 2025 returns with an even broader vision and greater opportunities.

The core of the competition is a scientific article writing challenge on the topic:
"Coccidiosis Control Through Phytochemical Modulation of Immunity."

Participants will submit essays as per the provided guidelines. The top five essays will be shortlisted, and selected students will be invited to present their ideas in an online oral presentation before an expert jury. ***The top two winners will each receive an all-expenses-paid trip to attend Poultry India 2025—South Asia's premier poultry exhibition—taking place in Hyderabad on 26th to 28th November 2025. Winners will also be honored with a trophy and citation.***

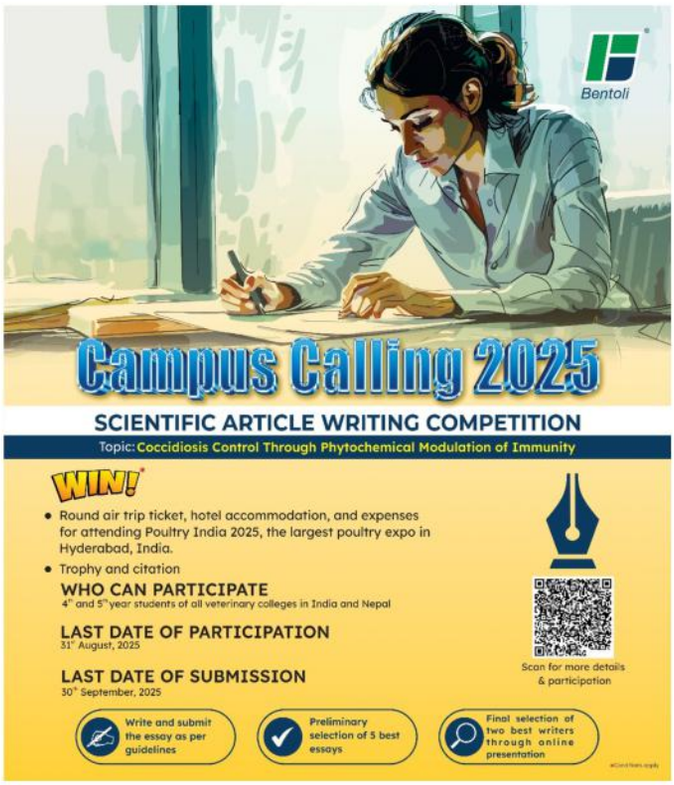
"With Campus Calling, we aim to inspire young minds to tackle real-world challenges in poultry health, while offering them valuable professional exposure," said **Dr. Jayanta Bhattacharyya, Director, Technocommercial.**

Key Dates:

- Last Date of Participation: August 31, 2025
- Last Date of Essay Submission: September 30, 2025

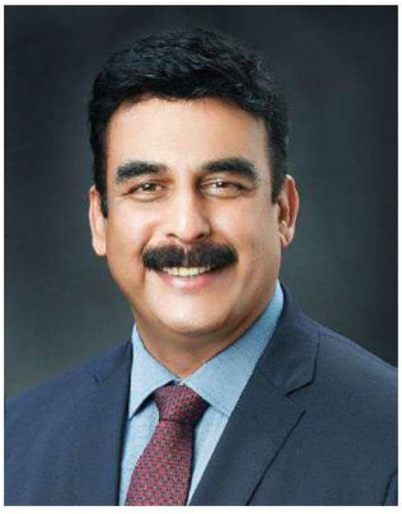
Veterinary institutions are encouraged to share the campaign details and display the official poster on campus noticeboards. A QR code linking to detailed guidelines and the registration form is provided for ease of access.

For further information or queries, please contact:
campuscalling@bentoli.com



Dr Sushanth Rai Bellipadi

Director, Raison's Nutrition, Mangaluru



Dr Sushanth Rai Bellipadi, director of Raison's Nutrition, Mangaluru, has been nominated by the Government of Karnataka to the Board of Management of the Karnataka Veterinary, Animal and Fisheries Sciences University (KVAFSU), Bidar with immediate effect for the next three years.

Dr Rai is a well-recognized figure in the veterinary and poultry sectors. He previously served two consecutive terms as President of the Karnataka Poultry Farmers & Breeders Association (KPFBA) from 2019 to 2024. He has been a member of the Research Advisory Committee of ICAR-NIANP (National Institute of Animal Nutrition and Physiology) and ICAR-DPR (Directorate of Poultry Research), Hyderabad. In 2024, he is also elected to the Board of the Veterinary Council of India (VCI) from Karnataka, further cementing his leadership credentials in the industry.

Known for his visionary leadership and collaborative approach, Dr Rai has consistently steered organizations toward impactful growth. He is admired for his ability to foster synergies, maintain composure in high-pressure environments, and transform challenges into opportunities for development. His nomination to the KVAFSU Board is seen as a significant step toward strengthening the state's veterinary and animal sciences ecosystem.

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Evonik to reduce carbon footprint

and plastic use with new paper bags for MetAMINO®

- Evonik removes plastic film layer in 25-kilogram bags for MetAMINO®
- The new packaging helps conserve resources, facilitates recycling, and reduces CO_2 emissions
- Antwerp is Evonik's first production site to switch to the new packaging, with others to follow

Essen, Germany. Evonik has introduced a more environmentally friendly 25-kilogram paper bag for MetAMINO® (DL-methionine) by eliminating the plastic film layer. This change not only benefits customers with easier disposal options but also aligns with the EU's new 'Packaging & Packaging Waste Regulation' (PPWR) aimed at enhancing recycling efforts.

The new packaging consists of two layers of paper and can be recycled as a pure paper bag (PAP 22) according to the EU recycling classification. For the Antwerp production site alone, this initiative will save 32 tons of polyethylene (PE) per year and reduces the packaging's CO_2 footprint by 20 percent. Intensive testing has confirmed that the high quality of MetAMINO® remains unchanged in the new packaging and that its shelf life of 36 months is unaffected.

"Product packaging plays an important role in our company's efforts to reduce CO_2 emissions and achieve a resource-conserving circular economy," says Dr. Dirk Hoehler, responsible for the amino acid business at Evonik Animal Nutrition. "Packaging must protect the product effectively, but it should do so in the most environmentally friendly way possible."

The packaging experts at Evonik Animal Nutrition have been working for several years on practical solutions to reduce the use of plastic in the packaging of MetAMINO® and other feed ingredients. The transition to the new bags has begun in Antwerp, with plans for the Singapore and Mobile (USA) sites to follow.

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TocoSel-N: A Synergistic Blend of Nano-Selenium and Vitamin E for Enhanced Poultry Health and Productivity

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The modern poultry industry faces continuous challenges in maintaining optimal flock health, productivity, and resilience against various stressors. Nutritional interventions play a crucial role in addressing these challenges. TocoSel-N is an innovative feed additive that combines the power of **Nano-Selenium** with **Vitamin E**, offering a synergistic approach to improve antioxidant status, immune function, and reproductive performance in poultry. This article delves into the unique characteristics and benefits of TocoSel-N.

The Science Behind TocoSel-N

TocoSel-N's efficacy stems from its dual-component formulation, each ingredient contributing distinctly and acting to provide synergistic benefits.

Nano-Selenium: Superior Absorption and Bioavailability

Selenium (Se) is an essential trace mineral vital for numerous physiological processes, including antioxidant defense, immune modulation, and thyroid hormone metabolism. While traditional inorganic and organic Selenium sources are widely used, their absorption and utilization can be limited. TocoSel-N utilizes **Nano-Selenium**, a form of Selenium engineered at the nanoscale (typically <100 nm).

Key advantages of Nano-Selenium include:

- **Superior Absorption:** The extremely small particle size of Nano-Selenium allows for increased surface area and enhanced permeability across the gut lining, leading to improved absorption compared to conventional Selenium sources. This is attributed to phenomena like passive diffusion and facilitated transport mechanisms, which are more efficient for nanoparticles.
- **Enhanced Tissue Penetration:** Once absorbed, the nano-sized particles can more readily penetrate various tissues and cells, including those of the immune system and reproductive organs, ensuring targeted delivery and higher tissue Selenium concentrations.
- **Reinforcement of Antioxidant Status:** Selenium is a critical component of **Glutathione peroxidase (GPx)**, a major antioxidant enzyme that protects cells from oxidative damage caused by free radicals. Nano-Selenium's improved bioavailability means more Selenium is available for GPx synthesis, leading to a stronger endogenous antioxidant defense system.
- **Immunity Resilience:** Selenium plays a vital role in immune cell proliferation, antibody production, and cytokine regulation. Enhanced Selenium status through Nano-Selenium supplementation can bolster the poultry's immune response, making them more resilient to disease challenges and reducing susceptibility to infections.

Vitamin E: A Potent Antioxidant and Immune Modulator

Vitamin E is known for its powerful antioxidant properties. It acts as a primary chain-breaking antioxidant in lipid membranes, protecting cell integrity from oxidative damage.

The role of Vitamin E in poultry health includes:

- **Cell Membrane Protection:** Vitamin E is strategically located within cell membranes, where it neutralizes free radicals, preventing lipid peroxidation and maintaining the structural and functional integrity of cells. This is particularly crucial for rapidly dividing cells and those under metabolic stress.
- **Immune System Support:** Beyond its antioxidant role, Vitamin E enhances various aspects of the immune response, including T-cell function, phagocytic activity of macrophages, and antibody production. It works synergistically with Selenium to optimize immune cell function.

Synergistic Benefits of TocoSel-N

The combination of Nano-Selenium and Vitamin E in TocoSel-N creates a powerful synergistic effect, where the combined action is greater than the sum of their individual effects.

- **Enhanced Antioxidant Defense:** Both Selenium (as a component of GPx) and Vitamin E work in concert to address oxidative stress. Vitamin E acts as the first line of defense in lipid membranes, while Selenium-dependent enzymes deal with hydrogen peroxide and organic hydroperoxides in the aqueous phase. This comprehensive antioxidant protection helps mitigate the damaging effects of environmental stressors, disease, and intensive production systems on poultry.
- **Optimized Immune Response:** The combined influence of Nano-Selenium and Vitamin E significantly strengthens the poultry's immune system, leading to improved resistance against pathogens and a reduced need for prophylactic antibiotics.
- **Stress Reliever:** Oxidative stress is a major component of various physiological stressors (e.g., heat stress, transport stress, disease challenge) in poultry. By enhancing the antioxidant system, TocoSel-N helps alleviate the negative impacts of stress, leading to improved welfare and performance.

Impact on Reproductive Outcomes

TocoSel-N significantly contributes to improved reproductive performance in breeding poultry.

- **Fertility:** Both Selenium and Vitamin E are crucial for reproductive health. Selenium is involved in spermatogenesis in males and ovarian function in females. Vitamin E protects germ cells from oxidative damage. The enhanced antioxidant status provided by TocoSel-N can lead to improved sperm viability and egg quality, thereby increasing fertility rates.
- **Egg Quality:** Oxidative stress can negatively impact eggshell quality and internal egg characteristics. By reducing oxidative damage, TocoSel-N contributes to stronger eggshells, reduced instances of hairline cracks, and better albumen and yolk quality.
- **Hatchability:** Healthy embryonic development is highly dependent on adequate nutrient supply and protection from oxidative stress. The superior absorption and antioxidant reinforcement provided by TocoSel-N ensure optimal conditions for embryonic development, leading to higher hatchability rates and stronger chicks.

Conclusion

TocoSel-N, with its innovative blend of Nano-Selenium and Vitamin E, represents a significant advancement in poultry nutrition. By leveraging the superior bioavailability of Nano-Selenium and the potent antioxidant properties of Vitamin E, TocoSel-N effectively enhances the antioxidant status, bolsters immune resilience, alleviates stress, and profoundly improves reproductive outcomes in poultry. This synergistic formulation provides a comprehensive solution for producers aiming to optimize flock health, productivity, and sustainability in an increasingly demanding industry. The unique characteristics of TocoSel-N make it an invaluable tool for promoting overall well-being and economic viability in poultry operations.

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Elevating Poultry Health with Hydroxy Trace Minerals

By : Dr Maloshrie Bora, Program Manager (Trace Minerals), Trouw Nutrition South Asia

Trace minerals such as zinc, copper, and manganese are fundamental to poultry health, acting as cofactors in vital biochemical pathways: skeletal development, immune defenses, antioxidative systems, enzyme functions, feathering, and reproductive performance. Yet, the typical composition of feed ingredients often falls short of modern poultry standards. That's why precision mineral nutrition—providing the right mineral at the right time and in the right form—is essential to support optimal broiler growth, eggshell integrity in layers, and fertility in breeders.

While inorganic sources like sulfates and oxides have been staples for decades, they suffer from low bioavailability and reactiveness. These soluble compounds can prematurely release minerals, which then form insoluble complexes with phytate or binding agents in the gut, diminishing absorption and even degrading vitamins or enzymes in the premix. This not only reduces feed efficiency but also increases mineral excretion, raising environmental concerns. Organic (chelate) minerals improved this situation, but often at a premium cost and with variable potency. Enter the next generation: hydroxy trace minerals. Hydroxy trace minerals, like copper, zinc, and manganese hydroxychloride, represent the latest leap in mineral nutrition. Their crystalline, covalent structure is non-hygroscopic and non-reactive in feed and the upper gut. This structure allows slow, controlled release of minerals at the ideal intestinal absorption site, significantly improving bioavailability. They resist premature dissolution, ensuring minerals are released more slowly and absorbed where it matters most.

Research across poultry sectors consistently shows that hydroxy trace minerals outperform inorganic sources. Broilers fed hydroxy copper and zinc achieved 7–8% heavier carcasses and a noticeable boost in breast meat yield. In independent trials, hydroxy-supplemented flocks maintained or improved feed conversion ratios while using lower inclusion levels than sulfate-based diets . Moreover, in antibiotic-free or necrotic enteritis challenge models, hydroxy minerals reduced pathogen load and mortality, performing on par with ionophores. Layers also benefit: eggshell quality improves, feed remains stable longer (less oxidation), and FCR gains are consistent when inorganic Cu, Zn, Mn are replaced with hydroxy versions. Breeder flocks, too, see enhanced fertility and hatchability under precision hydroxy mineral regimes. Beyond performance, hydroxy trace minerals contribute to gut integrity and immune defense. Broilers on hydroxy mineral diets exhibited reduced cecal enterobacteria and maintained tight junction integrity, translating into healthier birds and better carcass quality.

Discover IntelliBond®: Precision You Can Trust

Among hydroxy trace mineral solutions, Trouw Nutrition's IntelliBond® stands out as a premium, thoroughly validated choice. Designed to optimize delivery of copper, zinc, and manganese, IntelliBond features:

- **High bioavailability and potency :** thanks to stable, covalent crystalline bonds that release minerals at the optimal intestinal site
- **Enhanced feed stability and nutrient preservation** : safeguarding enzymes like phytase and vitamins from degradation in premixes
- **Improved bird performance and economics** : with independent studies showing better feed conversion, heavier carcasses, superior egg output, and healthier flocks under stress .
- **Environmental sustainability** : with reduced inclusion rates and lower mineral excretion promoting cleaner production.
- **Unmatched versatility across poultry species and life stages** : including broilers, layers, and breeders—even under challenging conditions like heat stress or compromised hygiene. This adaptability has been validated across multiple trials and production environments.

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Smart minerals, Smart nutrition, Smart decision

THE BENEFITS

- Increased stability
- Improved palatability
- Low solubility
- Increased bioavailability
- Improved digestibility

Minerals are an essential nutrient for production animals. It is very important to feed a stable and highly bioavailable source of trace mineral, in order to optimise health, wellbeing and performance, as well as minimising environmental impact. Our

IntelliBond, Optimin and IntelliOpt

products offer a full range of Organic and Hydroxy Trace Minerals sources.

Scan the code for latest updates

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Proven Performance Across Poultry Types

A Spanish study comparing hydroxy vs. sulfate-fed broilers at nutritional levels found that those receiving hydroxy minerals (IntelliBond C and Z) achieved 7.4% higher live weights, 7.7% heavier carcasses, and 16.1% breast meat yield, versus 15.3% in the sulfate group. Another Trouw Nutrition joint trial with the University of New England demonstrated improved bone integrity (tibia breaking strength) and breast meat zinc content in broilers fed 100 ppm IntelliBond Zn, with gut integrity maintained. In antibiotic-free commercial conditions, hydroxy copper-chloride combined with organic acids matched or exceeded the performance gains of feed antibiotics while improving egg weight, mass, and feed efficiency in layer hens. These findings highlight the ability of IntelliBonds to deliver consistent productivity gains across broilers, layers, and breeders—even under stress or antibiotic-free regimes. Trouw Nutrition India has been pioneering mineral-precision feeding. "Trouw Talks" events in Karnal and Hyderabad, unveiled IntelliBond's OptiSize® technology—highlighting uniform, stable crystals that protect premix integrity and animal performance. Trouw Nutrition's new premix plant near Hyderabad supports local production of trace minerals, vitamins, and specialized premixes—readying India for advanced feed solutions. This investment and local research infrastructure underline Trouw Nutrition's strong commitment to validating hydroxy mineral efficacy under Indian production conditions.

Why IntelliBond® Stands Out

Developed over two decades and backed by 200+ global trials, IntelliBond® hydroxy trace minerals ensure predictable delivery and dependable results through:

- Superior bioavailability due to controlled release and crystalline stability
- Enhanced feed stability, maintaining vitamins, enzymes, and reducing oxidation in premixes
- Animal performance gains, improving carcass weight, egg production, feed conversion, and profitability
- Gut health, by reducing pathogenic bacteria and preserving gut barrier integrity in broilers
- Environmental responsibility, lowering mineral excretion while supporting sustainability-focused operations

Precision Manufacturing and Traceability

Trouw Nutrition's OptiSize® technology guarantees uniform particle size and non-hygroscopic behavior. Its low reactivity protects feed integrity, while rigorous traceability—from raw material origins to lot distribution—ensures feed safety and compliance.

Modern poultry production demands precision: the right trace mineral, in the right form, at the right level. Hydroxy trace minerals—especially IntelliBond®—deliver on that promise. Scientific evidence and Trouw Nutrition's local investments prove that these superior minerals enhance productivity, welfare, and sustainability in broilers, layers, and breeders. By choosing IntelliBond®, nutritionists and producers gain a trusted, research-backed solution that fosters better performance, protects investments, and advances poultry industry goals in India and beyond.

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1 Data on file, Study Report No. B815R-US-18-A46, Zoetis Inc.

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Confederation of Indian Industry

AMR Stewardship Drive 2025

Building Partnerships for Strengthening Our Response to AMR

Date: 11 July 2025 | Venue: ICAR-NIVEDI, Yelahanka, Bengaluru

Antimicrobial Resistance (AMR) is increasingly recognized as a critical public health challenge worldwide, posing significant risks to human and animal health, food safety, trade, and economic stability. Recognizing the urgency of this growing threat, the Confederation of Indian Industry - Food and Agriculture Centre of Excellence (CII FACE) in collaboration with Indian Federation of Animal Health Companies (INFAH) as Knowledge Partner has launched the **AMR Stewardship Drive 2025** a multi-city outreach campaign aimed at fostering awareness, building capacity, and promoting antimicrobial stewardship practices across the livestock and aquaculture sectors.

The first session of this national drive was organized on **11th July 2025 in Bengaluru by CII FACE in collaboration with ICAR-National Institute of Veterinary Epidemiology and Disease Informatics (NIVEDI)**. The inaugural session marked the beginning of a sector-wide effort to combat the rising threat of AMR in animal agriculture. A total of 120 participants including veterinarians, researchers, academicians, fisheries professionals, industry members, startups and veterinary graduates participated in the event.

The event commenced with welcome remarks by **Mr. Suresh Chitturi**, Chairman, CII Committee on Animal Agriculture and Managing Director, Srinivasa Farms. He emphasized that addressing Antimicrobial Resistance (AMR) was no longer a future challenge but a present imperative. He underscored the need for collective action across the animal agriculture value chain to safeguard productivity, public health, and food safety, while sustaining farmer livelihoods.

Setting the context for the day, **Dr. Shirish Nigam**, President, Indian Federation of Animal Health Companies (INFAH) and Managing Director, EW Nutrition India, spoke about the pivotal role of the animal health industry in driving responsible antibiotic use. He highlighted the industry's commitment to stewardship, innovation, and partnerships that strengthen AMR mitigation at the grassroots level.

In his special address, **Dr. Baldev R Gulati**, Director, ICAR - National Institute of Veterinary Epidemiology and Disease Informatics (NIVEDI), reflected on the growing risks of AMR in animal production systems. He outlined NIVEDI's ongoing efforts in advancing disease surveillance, veterinary diagnostics, and One Health collaboration to counter this emerging threat.

Prof. (Dr.) P K Shukla, President, Indian Poultry Science Association and Head, Department of Poultry Science, DUVASU, Mathura, shared perspectives on the poultry sector's unique challenges and opportunities in AMR containment. He emphasized the need for enhanced veterinary practices, alternative therapies, and farmer education to promote judicious use of antimicrobials in poultry farming.

Dr. Sindura Ganapathi, Visiting PSA Fellow, Office of the Principal Scientific Adviser to the Government of India, emphasized the importance of aligning AMR containment efforts with the broader One Health agenda. He added that "AMR is not a one-pathogen, one-solution problem—it requires a multi-faceted approach involving innovation and targeted strategies. Each sector, whether poultry, dairy, or aquaculture, faces its own unique challenges and must be addressed with sector-specific solutions."

The inaugural session concluded with a **Vote of Thanks by Mr. Suresh Chitturi**, who reiterated the critical role of partnerships between government, industry, and academia in shaping a future-ready response to AMR.

A key highlight of the event was the release of the CII FACE report titled **"Industry-led AMR Stewardship in Animal Agriculture"**. This report complies learnings from extensive multi-stakeholder consultations and highlights the drivers of antimicrobial use in dairy, poultry, and aquaculture, emerging risks, gaps in current practices, and context-specific solutions for responsible antimicrobial usage. The report outlined actionable recommendations for policymakers, industry players, academia, startups, and farmer organizations, providing a roadmap to enhance stewardship, safeguard food safety, protect animal productivity, and ensure environmental sustainability.

The program featured the technical session on **Ground-Level Action Against AMR**. This technical session focused on ground-level strategies to combat AMR through four key areas including promoting ethnoveterinary medicine by showcasing herbal alternatives, encouraging responsible antibiotic use through drug classification, withdrawal periods, and record-keeping, with a strong emphasis on the role of vets and para-vets; ongoing AMR surveillance programs and testing in the Livestock Sector and preparing stakeholders for compliance with the FSSAI 2024 amendment collectively enabling practical, field-ready solutions for AMR mitigation across the livestock and aquaculture sectors.

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The afternoon session featured a high-level panel discussion on **"Tackling AMR in Animal Agriculture: Industry Perspectives and Practices."** Industry leaders shared real-world experiences and practical challenges in implementing responsible antimicrobial use. The discussion focused on innovations and good practices already adopted by progressive players, the need for an enabling environment, policy support, capacity building, and partnerships to mainstream these efforts, scaling sustainable practices while balancing productivity and profitability in the livestock sector. The session reinforced that combating AMR requires a multi-pronged approach integrating policy reforms, industry action, and farmer-level awareness.

As part of its youth engagement efforts, the event also featured a **Collage-Making Competition** for students and scholars on the theme **"Be Antibiotic Smart: The Future is in Your Hands."** This creative session encouraged participants to visually express their understanding of AMR, and the proactive steps needed to contain it.

The AMR Stewardship Drive 2025 reaffirms the importance of collaborative action across industry, government, academia, and civil society to address antimicrobial resistance a silent but growing threat to India's animal agriculture and public health. The event sets the stage for a sustained, sector-wide stewardship movement under the broader One Health vision for India.

The next session of this national drive is scheduled on 11 August 2025 at Nagpur Veterinary College, Nagpur, Maharashtra.

BULLETIN

Brush and Beyond 2025

Bentoli Agrinutrition Launches, a National Drawing Contest to Inspire Young Creative Minds

"Bentoli Agrinutrition, a global leader in animal nutrition and health, is proud to unveil 'Brush and Beyond 2025' — a national-level drawing competition for children aged 10 to 16 years from industry stakeholders' families. This vibrant initiative aims to spark creativity and imagination among young minds while fostering awareness about sustainability and the deep connection between humans and animals."

Theme: "Farm Animals and Us – Growing Together Sustainably"

Selected **top 12 artworks** will be featured in the official **Bentoli 2026 Calendar**, and winners will be awarded with **exciting prizes and certificates**.

Submission Deadline: 15th September 2025

Drawing Instructions:

- The drawing must be done on an **A4 size sheet with landscape orientation**.
- **Any medium** may be used: crayons, colored pencils, watercolors, etc.
- On the **back of the artwork**, clearly mention:
  - Child's name and age
  - Customer name and contact number
  - Age proof details
- **Only hand-drawn artwork** will be accepted. **Digital art will not be considered**.
- All entries must follow the **competition rules**. Non-compliance will result in disqualification.
- **Only original creative work** is eligible. **Copied or copyright-protected content** will be disqualified

Submission Guidelines:

Participants must submit their drawings **through their respective Bentoli sales managers**.

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New Add-on for Industry 4.0 Fund: Ska Buys Avitech

The Quadrivio Group private equity fund acquires a majority stake in Avitech S.r.l., an Italian company leading in the design and manufacture of poultry farm systems.

Quadrivio Group has acquired 60% of Avitech S.r.l. an Italian leader in the design and production of poultry farming systems through SKA, the group's company specialized in poultry plants and equipment.

SKA was bought in 2022 by Industry 4.0 Fund, the Quadrivio Group private equity vehicle investing in digital transition and technological innovation for SMEs. The fund currently has five other companies in its portfolio: *F&DE Group*, a leader in outsourced hotel catering services; *Rototech*, an Italian company that designs and produces plastic parts for the industrial, construction and farming sectors; *Texbond*, one of the main European manufacturers of nonwoven fabrics for the medical and hygiene fields; *Soft N.W.*, specialized in producing and distributing nonwovens for the construction and agriculture industries; and lastly *Twist*, a firm specialized in sales of reconditioned smartphones, tablets, notebooks, PCs and smartwatches. Industry 4.0 Fund completed its first exit operation in 2023, selling EPI, which manages the official online and brick & mortar stores for the most prominent Italian football clubs and other important international-level teams.

Avitech S.r.l. produces facilities for hen-egg farming, with both conventional installations and alternative cage-free solutions, pullet-rearing systems, and egg conveyor equipment. The company manages the whole manufacturing process, from design to development through to installation, offering a broad range of services aimed at delivering to the end customer a highly customized product complying with all animal welfare regulations.

Avitech is on track to close 2025 on a turnover of €8 million and a double-digit profit margin. This acquisition will enable SKA to offer a complete product range in the hen-egg farming sector, with the scope to further penetrate certain specific markets and expand the company's know-how in this important sector.

SKA also bought another add on in November 2023: ISA, which manufactures steel structures for farming and animal-husbandry uses.

Roberto Crapelli, Managing Partner of Quadrivio Group, stated: "Quadrivio and SKA's management have worked very hard to achieve this new buy and build operation, which will ensure an acceleration in value creation for the portfolio company, SKA. The operation fits perfectly with the SKA business model as it enables expansion of the product range offered to customers and means precious know-how can be added into the entire production chain."

Massimo Ubiali, CEO of SKA, added: *"The Avitech acquisition takes the SKA group to consolidate its leading position in the supply of poultry farming facilities and systems. The new acquisition will also enable significant expansion of the product range specific to egg farming, allowing the group to penetrate markets and reach clients that are currently inaccessible. I'm particularly pleased that people with over 20 years' experience in the technical and commercial areas will be joining the SKA team they will significantly contribute to the entire group's development. The investments made in the manufacturing process in recent years mean we will be able to internalize production of the Avitech range, achieving industrial synergies and top-level quality on the market. Today, the SKA group stands as offering the broadest range of poultry farming products, manufactured at its own plants."*

Floriano Zappettini and Mauro Bellini, respectively Chairman of the Board of Directors and CEO, are also satisfied with the operation and state: *"This operation excites and motivates us further. The common objectives will fuel and accelerate the growth of the Group and the companies involved."* Both will remain within the Management, contributing to carrying forward, thanks to their many years of experience, the industrial development objectives set.

The SKA and Industry 4.0 Fund teams were supported for the legal due diligence and in defining the contractual aspects by Fivers Studio Legale. The financial due diligence and tax due diligence were carried out by MAC-LAB, while the labour law due diligence was conducted by Geco & Associati.

The sellers were assisted by Studio Associato Piccinelli & C. of Brescia.

Quadrivio Group | Industry 4.0 Fund Quadrivio Group is active in the alternative investments world and has been operating in private equity for over 25 years. Industry 4.0 Fund invests in technological innovation and digitalization for SMEs, supporting them for international growth and adoption of 4.0 technologies. The Industry 4.0 Fund portfolio comprises five companies: F&DE Group, a leader in outsourced catering to hotels (fedegroup.it); Rototech, an Italian firm that designs and makes plastic parts for the industrial, farming machinery and construction sectors (rototech.it); Texbond, one of the main European manufacturers of nonwoven fabrics for the medical and hygiene fields (texbondspa.com); Soft N.W., expert in producing and distributing nonwovens for the construction and agriculture industries (softnw.com); SKA, specialized in manufacturing poultry farm systems (skapoultryequipment.com); and Twist, a company retailing reconditioned smartphones, tablets, notebooks, PCs and smartwatches (twiston.it).

Info: quadriviogroup.com | industry4zerofund.com

SKA SKA was founded in 1954 in Sandrigo, in the province of Vicenza, and is specialized in the manufacture of poultry farm systems as well as equipment for free-range chicken, turkey, duck and quail farming.

Info: skapoultryequipment.com

AVITECH Established in early 2021 by professionals with lengthy experience in the poultry sector, Avitech is specialized in the design and manufacture of state-of-the-art poultry systems for egg-laying hens.

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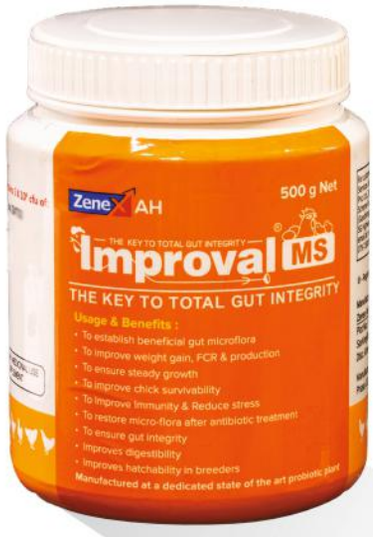

#1 FCR point represent third/last decimal point of 1000

*Majority of field trials were conducted at same farm with multiple sheds in integrations across various geographical locations and at different time of the year. Some of the integrators were generous in sharing complete production indices while others communicated the summary of the trial results. In the field trials, Improval MS was compared with antibiotic/probiotic/antibiotic + probiotic/probiotic + prebiotic control. Detailed reports availble on request.

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ARTICLE

Parasitic diseases of Poultry Diagnosis and Control

Dr. N. Rani, Dr. G. Ponnudurai and Dr. K. Dhandapani

Modern poultry practices, especially caging of laying hens and confinement rearing of broilers has significantly influenced parasitic infections. However, certain parasites are commonly encountered in poultry, which results in high economic losses due to lowered egg production and higher control costs owing to recurrent use of anti-parasitic drugs.

Endoparasites of poultry

Over the last 50 years, as a consequence of intensification of poultry farming, many helminths that were so common in backyard poultry are now seldom seen in commercial operations. Although confinement rearing on litter, largely prevents infections with helminths that utilize outdoor intermediate hosts, helminths such as Ascaridia galli that have direct life cycles or tapeworms that utilize intermediate hosts such as ants, beetles and flies continue to be a problem in modern poultry farms. Of the nematodes, Ascaridia galli is the most common parasitic roundworm of poultry. Although, death has been observed in severe infections, the primary damage is mainly due to reduced efficiency of feed utilization that leads to drop in egg production. Although plenty of drugs are available, the treatment of choice is piperazine because many of the available drugs remove only the adult parasite and not the immature form that produces the most severe damage. The caecal worm, Heterakis gallinae can be effectively treated with fenbendazole. Subulura brumpti that utilizes beetles or grasshoppers as intermediate hosts is also common because beetles are invariably seen in litter material. Another nematode that is common in deep litter houses is Capillaria spp. Control is best achieved by using Hygromycin-B and meldane.

Syngamiosis caused by Syngamus trachea affects other birds like pheasants, guinea fowl, goose, various wild birds and turkey. Diagnosis is made from the clinical manifestation, from finding eggs in feces and in nasal discharges and also from finding worms in the trachea by directly viewing inside of the trachea through the beak. The eggs are ellipsoidal, operculate at both poles, thin shelled and with segmented embryo. The worms may be seen anywhere in the trachea but usually at the posterior region. Flubendazole (Flubenol 5%) powder added to feed was highly effective in killing the gape worms.

The change from backyard or free-range management to confinement rearing in large houses has brought on marked reductions in tapeworm infections in chickens. However, tapeworms such as Railletina sp., Cotugnia digonophora and Choanotaenia infundibulum that utilize ants and beetles as intermediate hosts are fairly common in commercial farms. More than 100 species of beetles belonging to ten families act as intermediate hosts of Railletina cesticillus and small ants, which frequent poultry houses such as Tetramorium spp., Monomorium spp. and Pheidole spp., are the intermediate hosts of Railletina tetragona and R. echinobothrida. Earthworms act as intermediate hosts for Amoebotaenia sphenoides while beetles and slugs are intermediate hosts for Hymenolepis carioca and Davainea proglottina respectively.

Preventing the birds from having contact with the intermediate host is the first step to consider in tapeworm control. If Choanotaenia infundibulum appears in caged layer facility, house fly control will benefit the producer. If Railletina spp. and Cotugnia digonophora is present, ant and beetle control measures may help. Removal of old poultry manure to distant places and cleaning of pens and feed rooms as well as discarded feedbags can control beetles. Metaldehyde baits kills slugs and snails. Earthworm is considered as economically valuable invertebrate and its elimination is not advocated. Although several drugs are available for tapeworm control in birds, butynorate is the treatment of choice for six species of chicken tapeworms. Eliminating the intermediate host (beetles and houseflies) from the environment disrupts the life cycle. Chickens and turkeys can be dewormed with flubendazole at 60 ppm in the feed for 7 days.

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Ectoparasites of poultry

Although the external parasite problem has changed completely with the evolution of the poultry industry to high-density confinement production units, mites and lice infestation continue to plaque the poultry industry. Mites and lice are common external parasites of poultry. Treatment and control programs require use of insecticides on the birds and may also require application of insecticide to the facility. Insecticides for treating mites and lice can be applied to birds as a powder or dust or in a liquid spray. Some products come in either form. When applying the insecticide, part the bird's feathers so that the dust or spray reaches the skin. To treat facilities or buildings, a liquid spray or wettable powder should be used so that the insecticide can penetrate small cracks and crevices. Floors and bedding may also be treated. Since the louse population is on the host continuously,

whatever treatment is used must be applied directly or indirectly to the infested chicken. Several methods of indirect treatment have been reasonably successful. The 'dust box method' employs dust in boxes situated throughout the house on the floor to allow the hens to dust themselves. Similarly, areas of litter where hens tend to dust themselves may be treated with insecticidal dusts. Treatment of the entire litter area with sprays and dusts, provide an indirect treatment. Cages hens can only be treated directly either by sprays or dusts. Dusts include Carbaryl 5%, Coumaphos 0.5%, Malathion 4-5%. Sprays include Carbaryl 0.5%, Coumaphos 0.25%, Malathion 0.5%, Tetrachlorvinphos 0.5%, Tetrachlorvinphos-dichlorvos 0.5% and Permethrin at 0.05%. Other treatments that eliminated infestations include dimectron, parathion as a single application.

Carbaryl dusts offer one easy and low cost method for treating lice and mites on birds. A shaker can provide easy application to the birds. When applying the dust, part the bird's feathers are parted so that the dust, when sprinkled, reaches the skin. The dust should be applied to the entire body for the first time and then subsequently dusted on the vent region and under the wings, upper leg, and to the crest and beard, or wherever pests are observed.

A dusting box (24" x 36" x 4") can also be used for periodic treatment of fowl (not recommended more than once per 4 weeks). Powders can be used in the dusting box at a rate of 5 lb/100 birds for 5% dust or 2.5 lb/100 birds for 10% dust. The birds will dust themselves. Organophosphates and permethrins are also available in dust form. Toxicity can occur if these products are over used. Treat all affected birds in a flock. Other approved insecticides for eliminating lice and mites from poultry and poultry facilities include pyrethrins, pyrethroids and organophosphates. Pyrethrins and pyrethroids are very efficacious and non-toxic and come in powder, wettable powder, and liquid forms for use on birds and facilities. Usually, a 0.1% solution is used on facilities and a 0.05% spray is used on birds. Because they are chemically unrelated to the carbamate and organophosphate insecticides, pyrethrins and pyrethroids are a good choice for use in rotation pest control program. Rotating the type of insecticide used will reduce the occurrence of chemical resistance (and the resulting lack of effect) to a particular product. Also apply a general insecticide treatment to inner and outer walls, ceilings and floors with a 0.1% permethrin spray solution such as Permectrin II or other 0.1% permethrin spray diluted from an emulsifiable concentrate or wettable powder. Impregnation of polyvinyl chloride plastic with permethrin at 10% in the form of bands or strips has been shown to provide long-term efficacy when hung in cages with infested fowls. Two strips about 20.5 cm long, containing 9.6% (wt/wt), established control within 77 days. Closantel, was found to be very effective against feather mites in poultry. For control of chicken mite, treatment should be directed at the premises rather than the host.

Insecticide Recommendations for Poultry Infested with Lice and Mites

Insecticide	Application Method	Rate	Restrictions & Comments
Carbaryl (Sevin)	Dust	5% AI, 1 lb/ 100 birds	Dust must reach skin.. Treatment interval, 4 weeks.
	Dust Box	5% AI 2.5 lbs/50 birds	
Malathion	Spray	0.5% AI, 57% EC 1 fl oz/bird	
	Dust (in ltr.)	4% AI, 1 lb/500 sq ft	
Malathion	Dust Box	4% AI, 1 lb/30 birds	
	Tail Dip	0.25% AI, 57% EC Wet vent and surrounding areas	
Permethrin (Ectiban)	Spray	0.05% AI, 5.7% EC 1 gal/100 birds	
Stirofos (Rabon)	Spray	0.5% AI, 24% EC 1 gal/100 birds	Treatment interval 13 days.

In deep litter system of rearing, insecticidal control recommendations as treatments applied to the litter include carbaryl (5% dust), coumaphos (5% dust), malathion 4-5%; tetrachlorvinphos 0.5% spray. Control of mites on hens in cages may be accomplished by sprays or dusts applied directly to the hens. These materials include carbaryl as a spray or dust; coumaphos as a spray or dust; malathion as a spray or dust; and tetrachlorvinphos-dichlorvos as a spray.

The No Mite Strip is a popular deterrent/treatment for mites only, used by small flock owners. The blue plastic strips are placed near food/water sources and roosting sites so that the birds come in periodic contact with them. The strips reportedly last up to 2 years. Another popular product used by exhibitors to poultry shows to deter mites is Blue Ribbon. Blue Ribbon contains eucalyptus, balsam, organium, and rosemary oils with camphor in a canola extract base. Apply one drop under each wing and around the vent to deter mites/lice. In early days for control of scaly leg mite, various oils from crude petroleum to kerosene were used. With the advent of gamma BHC, a 0.1% emulsion applied for 30 seconds killed the mites. In India, a proprietary herbal mixture in coconut oil (Ectopar) applied to the legs for 3 to 4 days, eliminated scaly leg. Discomfort is relieved by dipping the legs in medicinal grade mineral oil or linseed oil, or by thoroughly coating them with warm Vaseline.

Insecticides Recommended as Residual Facility Sprays for Poultry Insect Control

Insecticide	Application Method	Rate	Restrictions & Comments
Carbaryl (Sevin)	Spray	0.5% AI, 50% or 80% WP	Surface treatment
Malathion	Spray	1.0% AI, 57% EC	
Stirophos (Rabon)	Spray	0.5% AI, 24% EC	Do not contaminate feed or water.

Disinfestations of egg flats and cases have recently received attention. Methyl bromide and sulfur dioxide killed all the mites infesting flats and cases in a closed van. Vans can be closed and treated after loading at the egg plant, let overnight or kept closed

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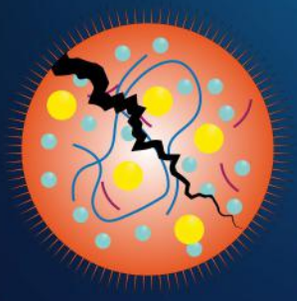

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during transit, and sprayed at destination or in transit.

Individual birds can be effectively treated for lice using liquid soap and water. Fill a tub large enough to immerse the bird's body and neck with warm water and add liquid soap (not detergent) to make a good lather. Work the soapy water over the bird with your hands to make sure the bird is wet and repeats the treatment in two weeks to kill newly hatched eggs. The soapy water method has also been used successfully in commercial layer flocks.

Fleas and bugs: Two fleas, namely Ceratophyllus gallinae, the hen flea and Echidnophaga gallinacea are common in poultry. Ceratophyllus gallinae adults and larvae can be found in the nest box material with smaller numbers in the litter under these boxes. The stick tight flea Echidnophaga gallinacea, attaches itself to the skin of its poultry host. The skin around the eyes, wattles, combs, the anus and other bare spots are most commonly attached. Ulceration, swelling, and wart like elevations may be of such severity that blindness occurs and death results.

Flea control is accomplished most successfully where the material harbouring the eggs, larvae, and pupae can be removed and destroyed. When this is not practical, treatment of these sites with insecticides will remove the source of re-infestation. Titchener (1983) found that 0.25% permethrin spray gave good control of adult and larvae hen flea, Ceratophyllus gallinae, in infested nest boxes and litter. True bugs feeding on poultry are relatively unimportant. Cimex lectularius, the bed bug is prevalent in our country but this species is more of a nuisance than a pest of economic importance. Improved poultry housing where the hens lay eggs on the bare wire bottom of cages has largely eliminated bed bugs as a problem. Spraying the house with 0.25% phosalone at 100 to 200 ml/m2 gave good control. Permethrin was also found to be effective.

Diatomaceous Earth (DE) consists of the sedimentary deposits formed from the skeletal remains of a class of algae (Bacdlariophyceae) that occur in both salt and fresh water and in soil.

These remains form diatomite, almost pure silica that is ground into an abrasive dust. When the tiny, razor-sharp particles touch an insect, they cause many tiny abrasions, resulting in loss of body water and death by dehydration. Diatomaceous earth is liberally spread in the poultry pen and nest boxes. When an insect ventures into diatomaceous earth, it looses ten percent of the body fluid and dies of dehydration.

Manure breeding flies

The housefly, Musca domestica, is a true nuisance in and around poultry farms. Big commercial farms have now gone in for caged system of rearing owing to its inherent advantages. Although caged system of rearing has its own merits, the accumulation of droppings on the floor serves as a very good substrate for fly breeding and fly production becomes astronomical. Problems associated with flies in a poultry farm include; increased cost off deworming as flies transmit helminths especially tapeworms; increased incidence of fowl cholera and fowl typhoid, reduced life of cages due to high level of ammonia; liquefaction of mature due to movement of fly larvae in the manure and flies are a nuisance to the nearby human population. Moreover, heavy fly populations in caged layer operations may also add to operational costs by making it necessary to wash the eggs to remove flyspecks. Although this can be avoided by regular removal, the method is cumbersome and laborious.

Insecticides should be considered supplemental to sanitation and management measures must be directed to prevent fly breeding. Fly resistance to insecticides has developed at differing levels in various poultry house locations, depending somewhat on prior exposure. The use of a variety of different classes or families of insecticides can minimize the development of resistance. The use of insecticides viz., organophosphate, carbamate, pyrethroid, and other classes of insecticides may be rotated for effective control of flies. Periodical application of insecticides besides, being expensive and laborious also results in the development of insecticide resistance in the fly population.

Residual Sprays

Residual sprays are the most effective and economical method for controlling potentially heavy populations of adult flies of any species present. These sprays should be applied at the beginning of fly season (during summer showers). Application of residual sprays after manure removal will reduce fly buildup that usually follows the removal of manure. A second application should be made five to six weeks later (two sprays are required.) The insecticide may be applied to surfaces, on which flies rest, such as poultry house framework, the ceiling, walls, trusses, wires supporting cages, electric light cords and other areas marked by fly specking. The poultry houses around openings and on shrubs and other plants where flies rest should also be sprayed. Apply coarse, low-pressure sprays to the point of runoff at pressures of 80 to 100 pounds per square inch, using a power sprayer. Depending on the insecticide used and the type of surface sprayed, treated areas may remain toxic for 2 to 15 weeks. Insecticide contamination of feed, water and eggs should be avoided. Water and feed troughs also should be sprayed. Any of these residual sprays are recommended:

1. Cyfluthrin : Use 19 grams of 20% WP per 9 litres of water. Apply 9 litres of diluted mixture per 1,000 square feet as a coarse wet spray. Birds have to be removed from the building before spraying.
2. Dichlorvos : Use 1.1 litre of 40.2% EC per 112.5 litres of water. Apply 1.1 litre of diluted mixture per 1,000 square feet as a coarse, wet spray. Birds do not have to be removed from the building before spraying.


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3. Dimethoate (Cygon, Residual Fly Spray): Use 4.5 litres of dimethoate (Residual Fly Spray 2 EC per 112.5 litres of water. Apply 4.5 litre of diluted mixture per 500 to 1,000 square feet of surface as a coarse wet spray. Birds must be removed before spraying. Do not contaminate feed or water.
4. Malathion: Use 75 ml of 57% EC per 4.5 litres of water. Apply 5-9 litres of diluted mixture per 1,000 square feet as a coarse, wet spray. Birds do not have to be removed from the building before spraying.
5. Permethrin : Use 200 ml of 25% WP per 23-45 litres of water. Apply 4.5 litres of finished spray per 750 square feet as a coarse, wet spray.
6. Tetrachlorvinphos & dichlorvos (Ravap): Use 4.5 litres of 28.7% EC per 112 litres of water. Apply 4.5 litres of diluted mixture per 500 to 1,000 square feet as a coarse, wet spray. Birds do not have to be removed from the building before spraying.
7. Tetrachlorvinphos (Rabon): Use 1.8 to 3.6 kgs of 50% WP per 112 litres of water. Apply 5-9 litres of diluted mixture per 1,000 square feet as a coarse, wet spray. Birds do not have to be removed from the building before spraying.

It is often not practical to treat large poultry houses with residual sprays. Portable, lightweight, mechanical fogging machines are convenient, efficient and labor-saving in caged bird operations to quickly reduce adult fly populations, providing quick fly knockdown with poor residual action. Gasoline powered side pack Ultra-Low Volume (ULV) aerosol generator spraying, utilizing micron particle size spray droplets, is a very effective contact application with little or no residual effect. Space applications should fill the room with fog or mist. For indoor space application to kill flies, windows, doors and other ventilators may be shut off. Natural pyrethrins, used inside for adult fly control through a ULV machine, are easy to use at 1% pyrethrins + 5% piperonyl butoxide. The ratio of 1:5 pyrethrin to piperonyl butoxide is the most effective for fly control. When using this equipment, adjusted to deliver aerosol droplets (30 microns or less), apply 30 ml of Pyrethrins 1% per 1,000 cubic feet of space. Leave room closed for at least one hour. Do not remain in treated areas and ventilate before re-entry. Treatments are especially useful in closed egg rooms or other work areas where there is little or no air movement. Use pyrethrum oil-base space sprays (0.06% to 0.1% pyrethrins) plus piperonyl butoxide as a mist or fog in the air throughout the poultry house at the rate of 15 ml per 1,000 cubic feet on an "as needed" basis for best fly control.

Baits are a supplement to residual and aerosol sprays. Place baits outside of cages in the high-rise house. These selective adulticides suppress low fly populations, maintaining them at a low level. Never apply baits where they could accidentally be eaten by the birds or mixed into the feed. Dry sugar baits of methomyl are effective. Methomyl should be rotated with other baits to avoid development of resistence. Methomyl is a carbamate insecticide whereas other baits such as dichlorvos, trichlorfon and tetrachlorvinphos, (Rabon), mixed with sugar are organophosphate insecticides.

Apply when mixed as soon as possible and do not store for later use. Ready-to-use dichlorvos (Vapona) 20% resin strips can be used at the rate of one strip per 1,000 cubic feet of enclosed area. Strips will need to be replaced as they lose their effectiveness, which is about every three months. Methomyl fly belts can be attached to surfaces out of reach of food-producing animals. The belt may be cut to any desired length and attached to surfaces such as walls and ceilings. Follow label directions. Both resin strips and fly belts may become dusty and dirty when in use for long periods of time.

Feed Additive: Development of insecticide resistance in the fly population not only renders the chemical ineffective leading to economic loss, needless use of chemical also results in environmental contamination. This interest has resulted in studies on hormonal disruption of insect growth. Insect growth regulators (IGRs) such as the chitin synthesis inhibitor, have been shown to be highly effective. Cyromazine (Larvadex) has been found to be very effective when applied as a pour on for upto 8 weeks or upto 13 weeks. Cyromazine has been said to affect moulting and pupation following ingestion by first stage larvae and control manure breeding flies in and around caged or slatted flooring layer chicken operations and breeder chicken operations. The 1% Larvadex Premix is blended into the feed at the rate of 0.45 kg per ton of feed. Larvadex will provide a high degree of fly control and a feeding program must be followed to prevent potential fly resistance. Never feed continuously throughout the year. Prevalence of adult flies in and near the poultry house should be monitored and when the population reaches a level to cause concern, insecticide should be used to reduce the breeding potential. Manure should be checked for "hot spots" in the pits for maggot activity and if maggots are active, Cyromazine can be used in the ration. Cyromazine can be used continuously for four to six weeks (minimum of four weeks) and this is usually enough to break the fly population life cycle.

Undisturbed poultry manure accumulations normally support large populations of parasites ands predators of fly larvae. These parasite/predator populations consist of predaceous beetles, mites, soldier flies and parasitic wasps. Proper manure management is the key to successful fly control. Keeping the manure dry is of critical importance if manure is allowed to accumulate. Proper drainage around poultry houses, maintenance of leak proof water systems, providing good air circulation around the poultry house by vegetation control around the house, and use of fans if necessary, are means of aiding dryness. In poultry houses where weekly manure removal is not practical, natural enemies of the fly may contribute, to a degree, some fly control. The build up of natural enemies is much slower than that of the flies. Populations high enough to substantially benefit fly control will develop only if the manure is not disturbed for relatively long periods of time. Thus to encourage parasites ands predators, complete manure removal should take place only during the non fly season efforts should be made to aid the biological control system by leaving some of the old manure to supply a source of natural enemies to invade the new droppings. Chemicals should be applied sparingly and carefully to the resting site of the fly adults. Larvicides should be used only for the treatment of spots of high larval density rather than as a blanket application to the entire manure pit. This will reduce the damage to introduce or naturally occurring parasites ands predators and will slow the development of insecticide resistance and insecticide treatment of manure should be totally discontinued as it kills the beneficiaries as well.

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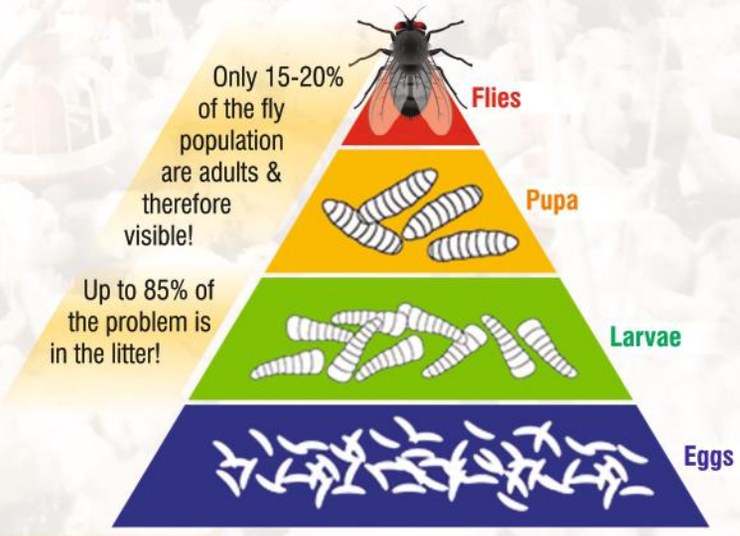

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ARTICLE

Diseases of Rainy Seasons and Their Prevention in Poultry

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

Rainy seasons can pose significant challenges to poultry health, as the wet and humid conditions can create an environment conducive to various diseases. Poultry production during the rainy season presents unique challenges but can be managed effectively with careful planning and management. By considering these factors and implementing appropriate management practices, poultry farmers can successfully navigate the challenges of the rainy season, ensuring the health and productivity of their flocks.

Points to be considered for poultry farming during rainy season

Poultry farming during the rainy season requires special attention to prevent disease outbreaks and ensure the well-being of the flock.

Housing and Shelter

1. **Weatherproof Structures:**
- Ensure poultry houses are well-constructed to keep out rain and moisture.
- Use materials that are durable and resistant to water damage.

2. **Ventilation:**
- Maintain good airflow to reduce humidity and prevent respiratory issues.
- Use fans and vents to keep the air moving and reduce dampness.

3. **Drainage:**
- Implement effective drainage systems around the poultry house to prevent waterlogging.
- Elevate coops and use slatted or raised flooring to keep birds off wet ground.

Litter Management

1. **Dry Bedding:**
- Use absorbent materials like straw, wood shavings, or rice hulls.
- Change or refresh bedding regularly to keep it dry and clean.

2. **Litter Depth:**
- Maintain an appropriate litter depth to manage moisture and reduce pathogen load.

Feed and Water Management

1. **Feed Storage:**
- Store feed in dry, cool places to prevent Mold growth.
- Use feed bins with lids to protect feed from moisture.

2. **Water Supply:**
- Ensure clean, fresh water is available at all times.
- Regularly clean and disinfect water containers to prevent contamination.

Health and Disease Management

1. **Biosecurity:**
- Implement strict biosecurity measures to prevent disease introduction and spread.
- Use footbaths, disinfectant mats, and restrict access to the poultry area.

2. **Vaccination:**
- Follow recommended vaccination schedules to protect against common diseases.
- Ensure all birds are vaccinated appropriately and on time.

3. **Health Monitoring:**
- Regularly check birds for signs of illness and take prompt action if any issues are detected.
- Isolate sick birds to prevent disease spread.

4. **Parasite Control:**
- Regularly treat birds for internal and external parasites.
- Monitor for signs of infestation and take preventive measures.

Nutritional Management

1. **Balanced Diet:**
- Provide a balanced diet that meets the nutritional needs of the birds.
- Consider adding vitamin and mineral supplements, especially vitamin C and E, to boost the immune system.

2. **Feed Quality:**
- Ensure feed is of high quality and not contaminated with Mold or toxins.
- Avoid using damp or mouldy feed.

Environmental Management

1. **Temperature Control:**
- Use heaters or brooders to maintain optimal temperature, especially for young chicks.
- Ensure proper insulation to keep the interior temperature stable.

2. **Light Management:**
- Ensure adequate lighting, especially if natural light is limited due to overcast skies.
- Use artificial lights to maintain consistent light exposure.

Record Keeping

1. **Monitor and Record:**
- Keep detailed records of feed intake, health checks, vaccination schedules, and any disease outbreaks.
- Use records to track performance and make informed management decisions.

Pest Control

1. **Rodent Control:**
- Implement measures to control rodents, which can spread diseases and contaminate feed.
- Use traps, baits, and rodent-proof feed storage.

2. **Insect Control:**
- Control insect populations, such as flies and mosquitoes, which can transmit diseases.
- Use insecticides, traps, and maintain cleanliness to reduce breeding grounds.

Emergency Preparedness

1. **Flood Management:**
- Have a plan in place for potential flooding, including evacuation routes and alternative housing options.
- Keep emergency supplies, such as feed and water, in easily accessible locations.

2. **Disaster Plan:**
- Develop a disaster plan to respond to extreme weather events.
- Train staff on emergency procedures and response actions.

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Predisposing factors for various disease of poultry in rainy season

Predisposing factors for various diseases in poultry during the rainy season are influenced by environmental, management, and biological aspects. These factors create conditions that are conducive to the proliferation and transmission of pathogens. Some important key predisposing factors for various poultry diseases during the rainy season are:

1. **High Humidity and Moisture**
- **Description:** The rainy season brings increased humidity and moisture in the environment.
- **Impact:** High moisture levels can promote the growth of Mold, bacteria, and parasites.
- **Diseases:** Coccidiosis, Aspergillosis, Fowl Cholera.

2. **Poor Ventilation**
- **Description:** Enclosed or poorly ventilated coops can trap moisture and ammonia from droppings.
- **Impact:** Leads to respiratory issues and the spread of airborne pathogens.
- **Diseases:** Infectious Coryza, Aspergillosis, Newcastle Disease.

3. **Accumulation of Wet Litter**
- **Description:** Wet and dirty litter due to rainwater ingress or poor drainage.
- **Impact:** Provides a propagation ground for bacteria and parasites.
- **Diseases:** Coccidiosis, Aspergillosis, Fowl Cholera.

4. **Standing Water**
- **Description:** Puddles and standing water around the poultry house.
- **Impact:** Attracts insects like mosquitoes and flies, which can transmit diseases.
- **Diseases:** Fowl Pox.

5. **Temperature Fluctuations**
- **Description:** Rainy seasons often come with fluctuations in temperature.
- **Impact:** Stress on birds, weakening their immune system.
- **Diseases:** Newcastle Disease, Infectious Coryza.

6. **Overcrowding**
- **Description:** Higher stocking densities due to farmers consolidating birds into fewer dry areas.
- **Impact:** Increases stress and the spread of infectious agents.
- **Diseases:** Coccidiosis, Fowl Cholera, Infectious Coryza.

7. **Poor Sanitation Practices**
- **Description:** Infrequent cleaning and disinfection of poultry houses.
- **Impact:** Build-up of pathogens in the environment.
- **Diseases:** Fowl Cholera, Infectious Coryza, Coccidiosis.

8. **Presence of Wild Birds and Rodents**
- **Description:** Wild birds and rodents seeking shelter from the rain.
- **Impact:** Can introduce and spread diseases.
- **Diseases:** Newcastle Disease, Fowl Cholera.

9. **Contaminated Feed and Water**
- **Description:** Wet feed and contaminated water sources.
- **Impact:** Growth of Mold and bacteria in feed and water.
- **Diseases:** Aspergillosis, Coccidiosis, Fowl Cholera.

10. **Missed Vaccination**
- **Description:** Inadequate or missed vaccinations.
- **Impact:** Increased susceptibility to infectious diseases.
- **Diseases:** Newcastle Disease, Fowl Pox.

11. **Suboptimal Nutritional Status**
- **Description:** Nutritional deficiencies due to changes in feed quality or availability.
- **Impact:** Weakens the immune system of the birds.
- **Diseases:** Various infectious diseases.

12. **Poor Drainage Systems**
- **Description:** Inadequate drainage leading to water accumulation around the coop.
- **Impact:** Creates a damp environment that is conducive to pathogen growth.
- **Diseases:** Coccidiosis, Aspergillosis.

Health hazards to poultry during rainy season

During the rainy season, poultry are exposed to several health hazards that can impact their well-being, productivity, and survival.

1. **Respiratory Diseases**
- **Cause:** Increased humidity, poor ventilation, and ammonia buildup from wet litter.
- **Examples:** Infectious Coryza, Aspergillosis, Newcastle Disease.
- **Symptoms:** Sneezing, coughing, nasal discharge, difficulty breathing.

2. **Parasitic Infections**
- **Cause:** Wet and dirty conditions favour the growth of parasites.
- **Examples:** Coccidiosis, Roundworms, Mites.
- **Symptoms:** Diarrhoea, lethargy, weight loss, poor growth, feather loss.

3. **Bacterial Infections**
- **Cause:** Damp conditions and contamination from water and feed.
- **Examples:** Fowl Cholera, E. coli infections, Salmonellosis.
- **Symptoms:** Swelling of the wattles, comb, and face, diarrhoea, joint pain, sudden death.

4. **Fungal Infections**
- **Cause:** Mold growth in damp feed and bedding.
- **Examples:** Aspergillosis.
- **Symptoms:** Respiratory distress, lethargy, loss of appetite.

5. **Viral Diseases**
- **Cause:** Spread through contaminated water, feed, and contact with wild birds.
- **Examples:** Newcastle Disease, Avian Influenza, Fowl Pox.
- **Symptoms:** Respiratory issues, nervous signs, reduced egg production, lesions.

6. **Nutritional Deficiencies**
- **Cause:** Poor feed quality due to Mold or dampness, reduced feed intake due to stress or illness.
- **Examples:** Deficiency of vitamins and minerals.
- **Symptoms:** Poor growth, feather abnormalities, weak immune system.

7. **Heat Stress**
- **Cause:** High humidity and temperature fluctuations.
- **Symptoms:** Panting, reduced feed intake, decreased egg production, lethargy.

8. **Mycotoxicosis**
- **Cause:** Consumption of mouldy feed contaminated with mycotoxins.
- **Symptoms:** Poor growth, immunosuppression, liver damage, reduced egg production.

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9. **Foot Problems**
- **Cause:** Prolonged contact with wet, dirty litter.
- **Examples:** Bumblefoot, footpad dermatitis.
- **Symptoms:** Swelling, lameness, lesions on the feet.

10. **Pest Infestations**
- **Cause:** Increased presence of insects and rodents seeking shelter from the rain.
- **Examples:** Lice, mites, rodent infestations.
- **Symptoms:** Feather loss, itching, skin irritation, contamination of feed and water.

Prevention and Management Strategies

To mitigate these health hazards, poultry farmers should implement the following strategies:

1. **Maintain Dry Housing:** Ensure proper drainage and use absorbent bedding to keep the coop dry.
2. **Ventilation:** Improve ventilation to reduce humidity and ammonia buildup.
3. **Sanitation:** Regularly clean and disinfect the coop, feeders, and waterers.
4. **Feed and Water Quality:** Store feed in a dry place and provide clean water. Avoid using mouldy feed.
5. **Biosecurity:** Implement strict biosecurity measures to prevent the introduction and spread of diseases.
6. **Vaccination:** Follow recommended vaccination schedules to protect against viral and bacterial diseases.
7. **Parasite Control:** Regularly treat birds for parasites and monitor for signs of infestation.
8. **Nutritional Support:** Provide a balanced diet and consider adding supplements to boost the immune system.
9. **Monitor Health:** Regularly check birds for signs of illness and take prompt action if any issues are detected.
10. **Pest Control:** Implement measures to control rodents and insects around the poultry house.

By taking these preventive measures, farmers can reduce the impact of health hazards on their poultry during the rainy season and maintain a healthy and productive flock.

Common Diseases of Poultry During Rainy Season

1. **Coccidiosis**
- **Cause:** Protozoa of the genus Eimeria.
- **Symptoms:** Bloody diarrhoea, lethargy, loss of appetite, ruffled feathers, and poor growth.
- **Prevention:**
  - Maintain dry and clean-living conditions.
  - Regularly clean and disinfect the coop.
  - Use coccidiostats in feed or water as a preventive measure.
  - Ensure proper drainage to avoid waterlogging.

2. **Newcastle Disease**
- **Cause:** Avian paramyxovirus.
- **Symptoms:** Respiratory distress, coughing, sneezing, greenish diarrhoea, reduced egg production, nervous signs such as tremors and twisted necks.
- **Prevention:**
  - Vaccination.
  - Strict biosecurity measures to prevent virus introduction.
  - Avoiding contact with wild birds and other infected poultry.
  - Quarantine new birds before introducing them to the flock.

3. **Fowl Cholera**
- **Cause:** Bacteria Pasteurella multocida.
- **Symptoms:** Swelling of the wattles, comb, and face, fever, joint pain, diarrhoea, sudden death.
- **Prevention:**
  - Vaccination.
  - Good sanitation practices.
  - Rodent control to prevent the spread of bacteria.
  - Isolate sick birds to prevent the spread.

4. **Infectious Coryza**
- **Cause:** Bacteria Avibacterium paragallinarum.
- **Symptoms:** Nasal discharge, swelling of the face and wattles, sneezing, conjunctivitis, reduced egg production.
- **Prevention:**
  - Good biosecurity and hygiene practices.
  - Vaccination in endemic areas.
  - Quarantine new birds.

5. **Aspergillosis**
- **Cause:** Fungus Aspergillus fumigatus.
- **Symptoms:** Respiratory distress, gasping, lethargy, loss of appetite.
- **Prevention:**
  - Keep litter dry and clean.
  - Ensure proper ventilation in the coop.
  - Avoid using mouldy feed or bedding.

6. **Fowl Pox**
- **Cause:** Avian poxvirus.
- **Symptoms:** Wart-like lesions on the comb, wattles, and feet; diphtheritic lesions in the mouth and throat.
- **Prevention:**
  - Vaccination.
  - Control mosquito populations, as they can spread the virus.
  - Maintain good coop hygiene.

General Prevention Measures
- **Coop Maintenance:** Regularly clean and disinfect the poultry house to minimize the presence of pathogens.
- **Ventilation:** Ensure proper ventilation to reduce humidity and prevent respiratory diseases.
- **Feed and Water:** Provide clean and dry feed and water. Avoid using mouldy or contaminated feed.
- **Drainage:** Ensure proper drainage around the poultry house to avoid waterlogging and standing water.
- **Biosecurity:** Implement strict biosecurity measures to prevent the introduction and spread of diseases. This includes restricting access to the poultry area, using footbaths, and disinfecting equipment and vehicles.
- **Vaccination:** Follow a regular vaccination schedule to protect against common diseases.
- **Rodent Control:** Implement measures to control rodents, which can spread diseases.
- **Quarantine:** Isolate new or sick birds to prevent the spread of disease to the healthy flock.

By following these preventive measures, poultry farmers can minimize the risk of disease outbreaks during the rainy season and maintain the health and productivity of their flocks.

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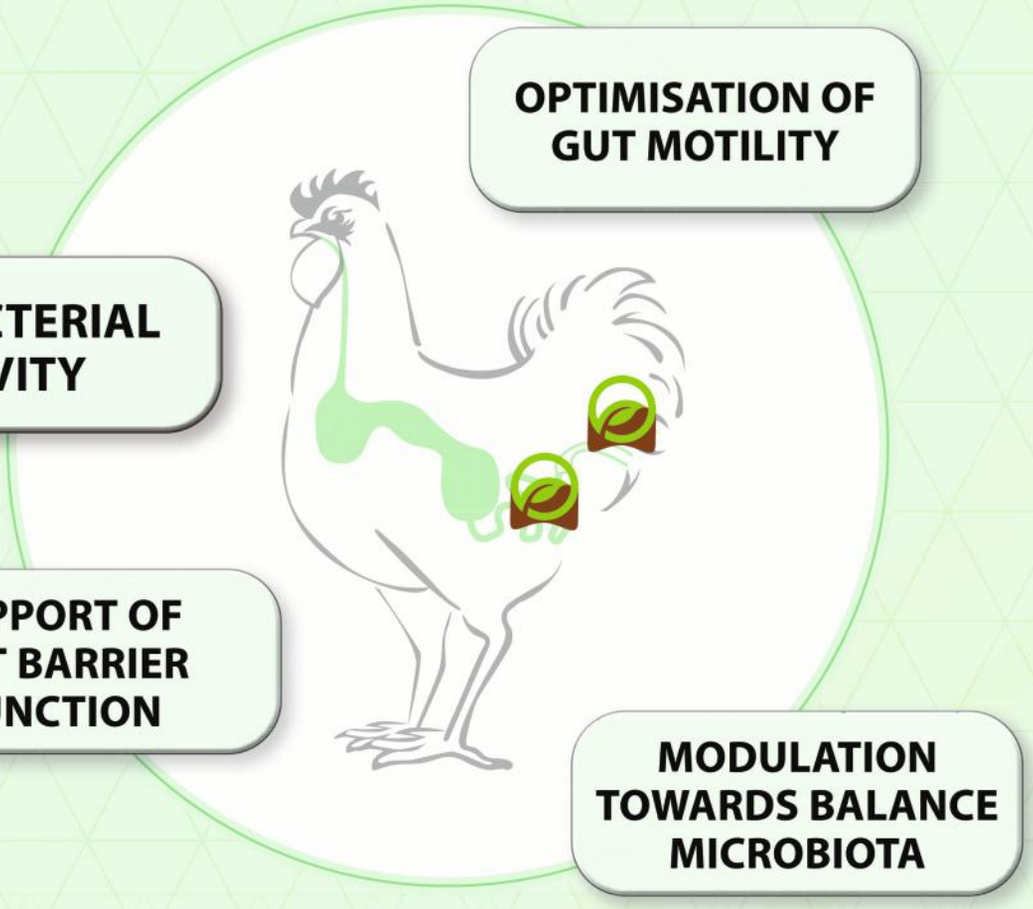

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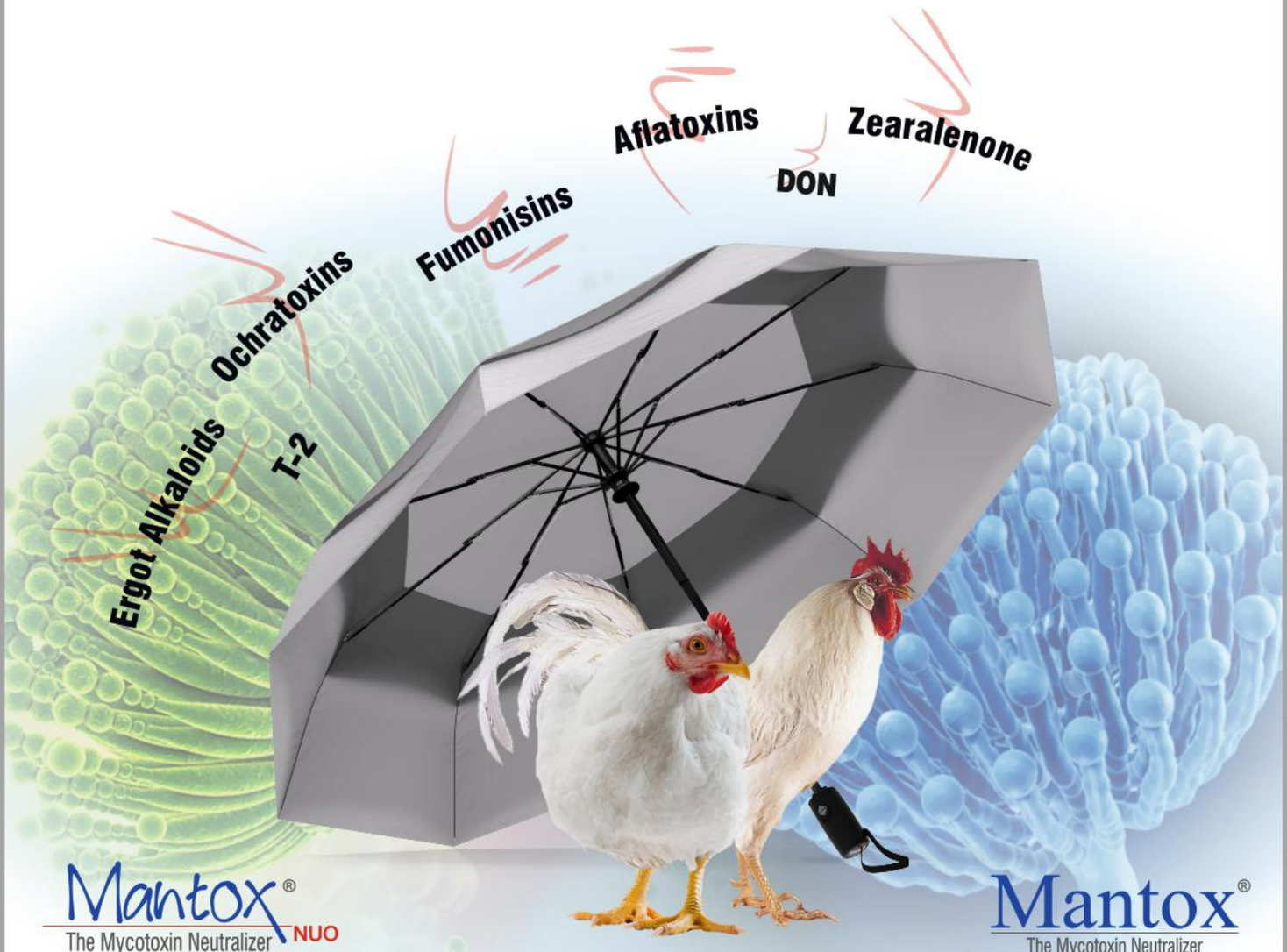

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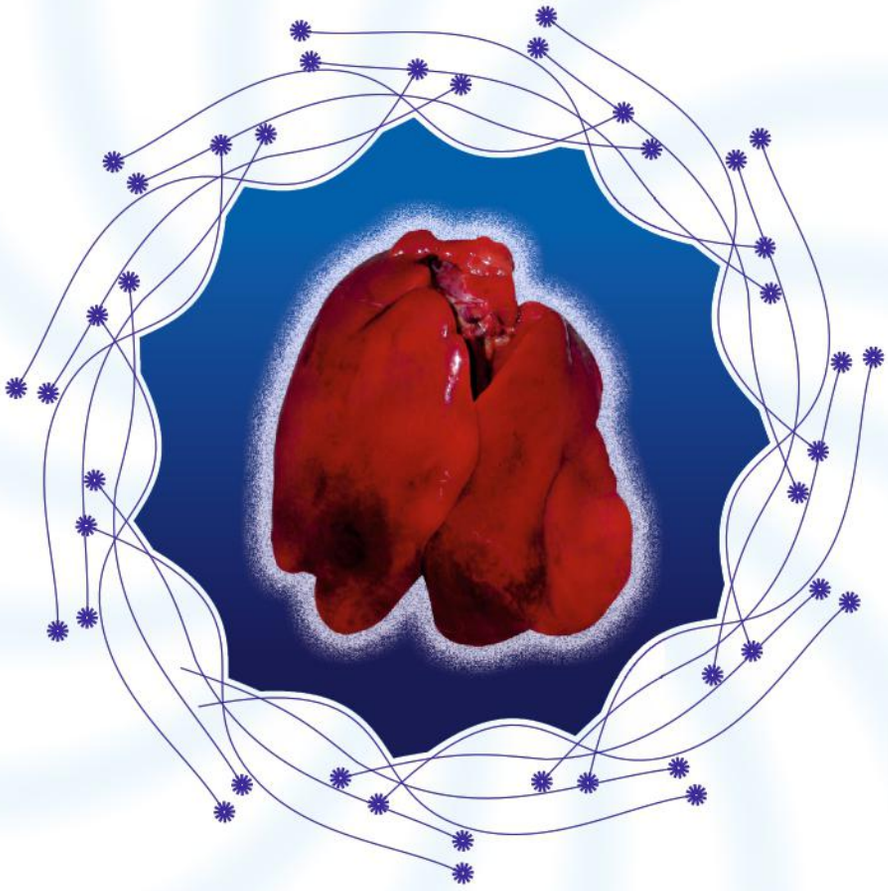

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ARTICLE

Nutritional Disorders in Poultry and the Role of Nutrition in Disease Prevention

Ram Singh Bibyan, Harneet kour, Jannat Saini, Priyanka Patir, Prajakta Sangale, Shweta, Neha Sahu,

Nutrition is the science of nourishing the body. Nutrients are substances that nourish living creatures. These are water, carbohydrates, proteins, fats, minerals and vitamins, present in different feedstuffs in variable quantity. All the nutrients are essential for growth, reproduction, egg production and good health of the birds and are supplied through diet. However, when these nutrients are deficient in diet they not only limit the growth and production, but also cause certain deficiency diseases or conditions depending upon the degree of deficiency as well as duration of deficiency. The characteristic features of these diseases are that most or many of the birds in a flock will show similar type of symptoms which may be either mild or well developed, because all the birds get the same feed stuff. Nutritional diseases generally produce retardation of growth or other symptoms which are characteristics in some cases. Mortality is not sudden and serious in most of the deficiencies and growing birds are mostly affected due to their specific requirements for body growth. Another factor which should attract our attention regarding nutritional deficiencies is fall in hatchability and some embryonic pathological changes due to deficiency in the layer stock.

Nutrient deficiency diseases/conditions/disorders

(A) Water: Water is an essential constituent of animal body and its content is about 70% at hatch, 60 to 68% at 6 weeks of age and as low as 52-57% when adult. Water plays a significant role in animal body. Deficiency of water leads to dehydration, accumulation of uric acid (gout), depressed feed intake and growth, haemoconcentration, lower blood volume, increased heart and respiration rate, and death. The requirement of water for poultry birds is calculated mainly on the basis of feed intake. The ideal ratio of water to feed intake is 1.50- 2.50: 1. The water intake for growing birds is about 2-2.5 times of feed intake during summer and 1.5 to 2 times of feed intake during winter. The layers consume generally 1.8-2.2 times in winter and 2.6-3.5 times in summer. When room temperature exceeds 35°C, the water intake may be even 4.5 times to that of feed intake.

(B) Protein and amino acids: Proteins consist of many amino acids of which some are essential for the birds. Deficiency of some of the amino acids may lead to symptoms like feather pecking, cannibalism, ruffled feathers (due to arginine deficiency), perosis or slipping of gastrocnemius tendon (due to deficiency of sulphur containing amino acids like methionine and choline. etc.) Layer chicks require 21 per cent and broilers 22.5 per cent crude protein. More than one type of protein sources in the feed mixture may help in the prevention of such conditions. Most prominent symptoms are seen as a result of deficiency of lysine, methionine and choline amino acids in particular, which in addition to producing symptoms mentioned above cause retardation of growth and egg production. Methionine also acts as a precursor for vitamin B12 and choline synthesis. Choline also helps in metabolism of fat and its deficiency may help fatty liver syndrome. The protein sources are classified into animal and vegetable protein supplements depending upon origin. The animal protein sources include fishmeal, meat meal, meat-cum-bone meal, blood meal, etc. The oil cakes and meals like soybean meal; groundnut cake, rapeseed meal, sunflower seed meal, maize gluten meal, sesame/til meal, etc. are some of the common vegetable sources of protein.

(C) Fats and Essential fatty acids: Deficiency of fats or oils in the diet decreases feed intake and may lead to deficiency of fat soluble vitamins and essential fatty acids. Essential fatty acids are not synthesized in the body and thus are dietary essential i. e. must be supplied through diet. The essential fatty acids are linoleic and arachidonic acids in poultry. Deficiency symptoms include retarded growth, loss of feather, scaly skin, diarrhorea in young chicken and reduced egg size, reduced egg production and marked decrease in hatchability in layers/breeders. Generally the requirement of linoleic acid is 1% of diet, and to meet its requirement diet should contain 3% oil (feed/supplementary). The oils are preferred over fats because the former contains more of unsaturated fatty acids. The different vegetable oils that can be used in poultry feeds are soybean oil, maize oil, til oil, palm oil, coconut oil. Animal fats like lard or tallow can be used alone or with oils for their improved utilization.

(D) Vitamins: Birds require almost all the vitamins through feed products. The requirement of only vitamin C is debatable. Vitamin deficiency, particularly which of B-complex group, generally occurs in a combined manner. Sometimes, in spite of the presence of proper amount of vitamins in the feed they may get destroyed due to improper storage and may result in deficiency diseases. Such vitamins are vitamin A, D and E which easily get destroyed by the oxidation process. Pantothenic acid and thiamine also undergo early destruction.

(i) Vitamin A: Deficiency of this vitamin is encountered quite commonly. Nowadays, many concentrated products of vitamin A are available in India. It is also called as infection resisting vitamin, because proper development of the epithelium, bursa of Fabricius and immunity is dependent on vitamin A which plays a vital role in the disease prevention. It is essential to add 1200 IU of vitamin A per 400 g of feed for chicks and 2000 IU of vitamin A per 400 g of feed for layers and breeders.

Symptoms: The symptoms of vitamin A deficiency develop several weeks after feeding deficient diet. Symptoms are not pathognomonic but may include weakness, imbalance, retardation in body growth, ruffled feathers, loss of yellow colour of the shanks and abnormally large combs and testes. Highly deficient chicks become prone to conjunctivitis, chronic respiratory disease (CRD), coccidiosis and other infections. In new born chicks, symptoms develop after 4 to 7 weeks of age. If breeder flock is deficient in vitamin A then embryonic deaths occur more frequently and table eggs may show blood spots.

Lesions: Mucosal surface of the oesophagus shows most characteristic changes. Swollen glands may take the form of vesicles or pustules, 1.5 to 2 mm in size. Ulcers may form in the mouth which gets covered with cheesy exudates, resembling lesions of fowl pox. Cheesy exudates may also be encountered on the palate and in the nostrils. In well-developed cases, dry flakes are found in the respiratory tract which may give suspicion of ILT. In young chicks bursa may also show cheesy exudates. It may also lead to deposits of urates in kidneys and other organs.

Ducks exhibit symptoms of imbalance, lameness and even paralysis. This happens because of the improper ossification of vertebral osteoid leading to pressure on the nerves. Uric acid gets deposited in the kidneys, liver and other visceral organs.

Mortality rate is dependent on the extent of vitamin A deficiency and secondary infections. It has been recorded up to the extent of 8 per cent.

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Diagnosis: Tissue alternations in the oesophagus and respiratory tract are highly diagnostic for moderate deficiency of this vitamin. Twisting of the head to one side and improper development of main blood vessels is commonly seen in embryos, deficient in vitamin A.

Requirement: For treatment 12,500 IU of vitamin A and 1/5th of this quantity of vitamin D should be mixed in every kg of the feed. High temperature, dampness, excess of manganese and calcium in the feed have destructive effect on the vitamin. Fish liver oils, green pasture, dried leaf meal, yellow maize, maize gluten meal and vitamin A supplements. One milligram of b- carotene is equivalent to 1667 IU of vitamin A. Vitamin A is commercially available as premix alone (vitamin A acetate)or with other vitamins (B2, D3 and K).The requirements are: Starting chicks 4000 IU/kg, broiler 6000 IU/kg, laying hens 8000 IU/kg and breeding hens 12000IU/kg diet. Storage of compounded feeds for longer period increases the possibility of vitamin A deficiency.

(ii) Vitamin D: Vitamin D is also called "antirachitic factor". Cholecalciferol (D3) is the most potent than D2. The birds exposed to sunlight generally do not exhibit signs of vitamin D deficiency. However, under intensive production system deficiency may occur. The symptoms include:

Chicks: Retarded growth, rickets (reduced bone mineral deposition): characterized by severe weakness of legs, soft and brittle bones, soft, rubbery and pliable claws, bowed/bending of legs, spread out toes and swollen hocks ; poor feathering ; blacking of feathers and rubbery beak. Heads of ribs and epiphyses get enlarged.

Layers: Drop in egg production, soft and thin shell egg formation, reduced hatchability; eggs without shell and fragile bones, sternal recumbancy due to osteomalacia (bone mineral loss) are usual features.

Turkeys and ducks: Symptoms are similar to those of chicks Beak can often be fedded back on itself in ducks.

Fish liver oil, exposure to sunlight/ ultraviolet light and vitamin D3 supplements. Seeds and their byproducts are practically devoid of this vitamin. The requirements are 200 -600IU per kg diet of broiler and starting chicks, and 400- 1200 IU per kg diet of laying hens.

(iii) Vitamin E: Since vitamin E has got antioxidant properties, it helps in the preservation of other vitamins like vitamin A, D and fatty acids, etc. This vitamin has got complimentary relations with selenium and cysteine. It has got preventive effect against the degenerative changes of muscles and exudative diathesis. Deficiency of vitamin E and the other two factors may lead to the following conditions.

(a) Avian Encephalomalacia: This disease is most commonly seen in 2 to 6 weeks old birds. The author has also seen this disease in broilers, pheasants and peafowls.

Symptoms: Due to the characteristic symptoms, the disease in chickens is also called as 'crazy chick disease', because the diseased chick appears to push its head beneath its breast. Finally chicks show paralysis. Similarly symptoms may also develop due to vitamin A deficiency, but under that condition lesions are not seen in cerebellum. Diseased birds die within a few days. Mature birds do not show any symptoms except drop in egg production. Male birds may show degenerative changes in the germinal epithelium of the testes.

In the chicks, haemorrhages are seen in the cerebellum and medulla oblongata. It may also show areas of necrosis and oedema, with haemorrhages at the periphery. Lesions sometimes may affect 3/4th of the cerebellum or sometimes they may even be microscopic.

Prevention and treatment: For prevention, vitamin E should be given at the rate of 55 IU/kg of feed, whereas for the treatment 300 IU of vitamin E/kg of feed is essential. Cotton seed cake, soybean oil, etc. are good source of vitamin E.

(b) Exudative Diathesis: Under this condition, oedema is encountered in the subcutaneous tissue, which later turns green due to lysis of blood. Oedema is commonly seen in the ventral aspect of the body and pericardium. Birds develop moderate anaemia and haemorrhages in the breast, thigh, intestine and gizzard. These lesions may also be seen in association with muscular degeneration. The disease occurs in almost the same age group of birds as described under avian encephalomalacia or it may also be seen in slightly older birds.

For the treatment, adequate amount of vitamin E should also be supplemented with 1.2 mg selenium/4 litres of water. Synthetic antioxidants like methylene blue, added to the diet, can also prevent the disease.

(c) Muscular Dystrophy: This disease develops in chickens due to deficiency of vitamin E and sulphur containing amino acids like methionine. In ducks, only vitamin E deficiency will lead to muscular dystrophy. The disease is commonly seen at 4 weeks of age in ducks, chickens and turkeys. White, necrotic areas of muscles are seen in the breast muscles but in the ducks and sometimes in other species too, necrotic areas along with oedema may also be seen. In turkeys lesions in gizzard develop due to combined effect of vitamin E and selenium deficiency.

(iv) Vitamin K: Normally Vitamin K is not deficient in mash. It is abundantly present in the green vegetables and grass. Although microbes present in the intestine of birds do synthesize some amount of vitamin K but it is not sufficient to complete the dietary requirement. Probably some of the fungal toxins and sulpha drugs may have inhibitory effect on vitamin K synthesis. Deficiency of vitamin K is considered to be one of the etiological factors of haemorrhagic syndrome in poultry. Addition of vitamin K at the rate of 25 mg/kg of feed is sufficient to prevent the disease but its quantity should be increased if the birds are undergoing treatment with sulpha drugs. Chicks: Hoemorrhages on the breast, legs, wings and abdominal cavities, a bluish-netted appearance to the skin and death due to bleeding are seen in boarder line deficiency. Severely deficient birds may bleed to death. Adult birds: They do not show haemorrhagic symptoms. But inadequate vitamin K in breeder diet may cause late incubation period and embryonic mortality.

Green forages or leafy materials (spinach, cauliflower, cabbage), soybeans, wheat bran, liver meal, fishmeal, egg yolk are the good sources of vitamin K. The commercial source is Vitamin K3 IP or menadione. The requirement is 0.5mg per kg of diet for all categories of birds.

(v) Thiamin (vitamin B1): This vitamin is required for energy utilization and prevention of star-gazing or polyneuritis condition. Thiamin deficiency is associated with accumulation of pyruvate and lactate in blood, reduced synthesis of fatty acid and energy metabolism. In chicken and turkey, deficiency occurs after 9 to 12 days when the day-old chicks or poults are kept on deficient diet.

Chicks: Polyneuritis or stargazing (pulling of head towards back) is the syndrome. The symptoms are loss of appetite, emaciation, general weakness, convulsion, digestive impairment, and paralysis of wings. The head is pulled towards its back because of paralysis of extensor muscle in neck. Similarly, paralysis of extensor muscles of leg causes the bird to sit on hocks. This condition is termed as stargazing or polyneuritis. Yeast, wheat germ, rice polish, whole grain & their byproducts, lucerne meal, liver meal and synthetic vitamin B1 (aneurin hydrochloride or thiamin hydrochloride).

Requirements: Broiler 2mg/kg diet, starting chicks and laying hens 6 mg/kg diet. Amprolium also decreases intestinal absorption of vitamin B1.

(vi) Riboflavin (vitamin B2): Riboflavin helps in the synthesis of many oxidizing enzymes. Symptoms: This vitamin is essential for normal metabolism in body. Its deficiency affects nerves, embryos, body growth etc. Important symptoms include inward curling of the toes and sitting on the hocks. The disease is also called as "curled toe paralysis". At about 10 days of age diarrhoea develops. The birds also show drooping of wings and head and dermatitis of eyelids, feet and mouth. There is slight decline in egg production in layers.

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The sciatic nerve of the diseased chick or affected embryo becomes 3 to 4 times thick, oedemtous and soft due to myelin degeneration and Schwann cell proliferation.

Prevention and Cure: For prevention, riboflavin should be given at the rate of 2 gm/ton of feed. For treatment, the amount of riboflavin in the feed should be increased by 5-10 times the normal. Up to 6 weeks of age, chicks must get twice the normal amount of riboflavin in the diet.

Turkey and ducks: In poults deficiency causes reduced growth rate, perosis, poor feather development, severe dermatitis of feet and shanks marked by oedematous swelling, grow poorly. In ducks in addition to these symptoms, increased mortality is also seen.

Liver meal, yeast, rice bran, molasses, fishmeal, lucerne, milk products and synthetic B2. Yeast is the richest natural source (125ug/ g). Leaves and leafy forages are also good sources. The requirement is 5 mg per kg diet.

(vii) Niacin: This vitamin is synthesized form amino acid tryptophan in the diet with the help of vitamin B6. This vitamin is an essential component of nicotinamide-adeninedinucleotide (NAD), diphospho-pyridinenucleotide (DPN) and nicotinamideadenine-dinucleotide-phosphate (NADP) which are essential for the metabolism of carbohydreates, lipids and proteins.

Symptoms: Symptoms of niacin deficiency are shown by growing chicks, turkeys and ducks. The hock joints becomes enlarged and the legs bend outwards, as seen in cased of perosis. But in this disease the gastrocnemius tendon retains its original position. In addition, symptoms like diarrhoea, stomatitis, oesophagitis and improper development of feathers have also been recorded. As in vitamin B1 deficiency, the egg production and hatchability also declines. Prevention and Cure: For prevention, wheat bran, yeast, rice-polish, fish meal, etc. should be given in the feed which are good sources of niacin. Rice polish, molasses, wheat bran, groundnut cake, lucerne meal and synthetic vitamin (Niacinamide IP, Niacin IP) are the sources of niacin. The requirements are: Broiler 40mg/kg, starting chicks 30mg/kg, and laying hens- 20mg/kg diet. (viii) Vitamin B6 (pyridoxine): Metabolities of vitamin B6 such as pyridoxal or pyridoxamine phosphate are more active than pyridoxine. In nature, pryridoxine and its metabolites occur together. This vitamin helps in the metabolism of amino acids.

Symptoms: Deficiency of vitamin B6 results in stunted growth, staggering, incoordination in the movement and encephalomalacia. Some of the birds may show jerking movements or convulsions of legs and wings, resulting in rolling onto back with legs upward. The birds may run aimlessly with flapping of wings and death. Mature birds show loss of appetite, drop in egg production and hatchability.

Vitamin B6 is distributed among the plants & animal foods of the diet. Yeast, cereal grains and their byproducts, liver meal, synthetic vitamin (vitamin B6) are the best sources of this vitamin. Generally the food supply is sufficient to meet physiological requirement of pyridoxine. The requirement is 3 mg per kg diet for all categories of chicken. Linseed has inhibitory effect on pyridoxine.

(ix) Pantothenic acid: This vitamin is also called as bird antidermatitis vitamin. The deficiency of this vitamin is not common as compared to others. This vitamin is essential for the synthesis of coenzyme A which is required for the metabolism of carbohydrates, proteins and lipids. Symptoms: Most prominent symptoms consist of formation scabs at the commisures of the mouth, sometimes eyelids and toes. Deficient birds may also show stunted growth and ruffled feathers. Another important change consists of noduar hyper-plasia or cracks in the skin of foot pad, at the joints of the claws. Later the skin and these sites may develop cracks at some places. During postmortem, spleen shows sypoplasia. Liver is small and yellowish. Yellow, pus-like material may be found in the mouth and proventriculus. There is increase embryo mortality by about second week of incubation. The embryos show subcutaneous oedema and haemorrhages. The natural sources of this vitamin are yeast, liver meal, groundnut meal, green gram, lucerne meal, milk products, fermentation residues, cereal seeds and byproducts and cane molasses. Synthetic source is calcium or sodium salt of the d- isomer (active form). The calcium salt (calcium pantothenate)is the most common commercial form as it is relatively less hygroscopic. The requirements are: Starting chicks 10mg/kg, laying hens 15mg/kg and broiler 12 mg/kg. The requirements of turkey are almost double that of chicks and they are at risk even at normal diet. (x) Biotin: The condition "egg white injury" is due to biotin deficiency. A toxic mucoprotein is present in egg white called avidin. Avidin combines with biotin to form an insoluble complex that is not absorbed from intestinal tract and renders biotin unavailable. Deficiency of biotin is unlikely under normal dietary conditions. Artificially created deficiency symptoms are:

It is known that egg contains a protein which has got inhibitory effect on the biotin, if raw egg is consumed by human beings. The raw egg component combines with biotin in the intestine and interferes in the absorption of biotin.

Symptoms: Deficiency of biotin is rare because of its presence in the diet in sufficient amount, naturally. Like pantothenic acid deficiency, it also produces dermatitis, perosis etc. Deficiency in layers caused embryonic death either in the first week or during last 2-3 days of incubation. Dead embryos show parrot beak, distorted limbs and big web between 3rd and 4th phalanges.

The natural sources are Yeast, groundnut cake, green leaves, molasses, sunflower meal, liver meal. Wheat and corn products are poor sources. It is available as vitamin H or biotin (2%).

Requirements: Broiler and starting chicks 0.10 mg/kg and laying hen 0.15 mg/kg diet.

(xi) Vitamin B12: It is also called animal protein factor. It is required for growth (thus called chick growth factor) and to prevent anaemia (antipernicious anemia factor). The deficiency symptoms are:

Chicks: Retarded growth, poor feathering, increased mortality rate.

Layers: Reduced egg production.If laying birds are deficient, hatchability may drop to zero in about 6 weeks, mortality in embryo(peak at 16-18 day) with malposition, myoatrophy and chondrodystrophy, embryos are oedematous, haemorrhagic with an irregular shaped heart.

The sources are fishmeal, meat meal, liver meal, cow dung and synthetic vit. B12. The origin of the vitamin in nature is probably the result of microbial synthesis. Plants feeds are devoid of this vitamin.

Requirements: 0.015mg per kg diet.

(xii) Vitamin C: It is chemically known as L- ascorbic acid. Deficiency of vitamin C usually does not occur in chicken. However, its supplementation (@ 100 mg/kg) is beneficial to increase the livability of birds under heat stress. The sources are fresh fruits specially citrus & leafy vegetables.

(E) Essential Minerals

(i) Calcium (Ca): It is the major element, present in largest quantity in the body and has both structural and biochemical functions. The deficiency symptoms are:

Chicks: The deficiency symptoms are similar to that of vitamin D. Stunted or no growth, unwilling to walk, lameness, rickets (enlarged hocks, beaded ribs, deformed sternum and spine, rubbery beak and leg bones).

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Layers: Frequent squatting posture, reduced egg production, thin shelled eggs, eggs without shell, decreased hatchability due to poor egg shell quality and more egg weight loss, fragile bone, leg weakness of caged layers. Deficiency of calcium leads to deformation of egg shell, thin shell egg, egg without shell. Cage layer fatigue condition is a disease of layers (hens and turkeys) reared in cages characterized by soft, weak and fragile bone. The leg bones become so weak that legs do not support the weight of the birds. The condition is associated with feeding of low calcium and high phosphorus diet. The laying birds reared on floor do not suffer from this condition.

The different sources of calcium supplements are limestone (34% calcium), oyster shell (34% calcium), marble grits or powder (34% calcium), bone meal (steamed or sterilized 24% calcium), bone ash (36% calcium), di-calcium phosphate (22-28% calcium) and rock phosphate (33% calcium).The requirements of calcium in diets are broiler starter 1.0%; broiler finisher 0.9%; egg type starter and grower 1%; layer 2.75-3.5% depending upon egg production and size of eggs. A free access to shell grit/ marble chips should be made available during peak production of eggs besides the dietary supply.

The requirement of calcium is met partly by coarsely ground calcium carbonate (2-3 kg/100 kg feed) and remaining through oyster shell grit/ marble grit.

(ii) Phosphorus (P): It is component of bone and many organic molecules. The deficiency symptoms are:

Chicks: Loss of appetite, weakness, growth failure, rickets as in calcium or Vitamin D deficiency.

Layers: Loss of appetite, reduced egg production and shell strength, cannibalism or feather pricking.

The cereals and their byproducts are good sources of P but availability of P is less from those ingredients (average 30% is available). Bone meal (steamed 12% phosphorus), bone ash (17% P), di-calcium phosphate (19% P), rock phosphate (18% P), sodium acid phosphate (22% P), etc. are the supplementary sources. The requirement of available P ranges from 0.45 to 0.30% in broilers and growing egg type chicks depending upon age and 0.30 to 0.35% in layer diets. The requirement of available P for turkey birds ranges from 0.60% at early age to 0.25% at market age, and 0.35% during laying. The requirement of total phosphorus is 0.6 to 0.7%.

(iii) Manganese (Mn): It is an important mineral for reproduction and is involved in several enzyme systems. The deficiency symptoms are:

Chicks: Perosis (swollen and flattened hock joints, slipped tendons), shortening and twisting or bending leg bones. Perosis may also result due to choline, folic acid, biotin, niacin and zinc deficiency.

Layers: Reduced egg production, egg shell strength and hatchability, thin shelled or shell-less eggs, nutritional chondrodystrophy in embryonic chicks (shortened and oedema thickness legs), shortened wings, parrot beak, retarded growth and oedema. Embryos of manganese deficient birds show heavy mortality during the last phase i.e. after 18 days and peak in 20-21 days of incubation.

Grains are usually deficient in manganese. Borderline deficiency in feeds exists. Lucerne meal, grain byproducts and manganese salt (sulphate, 25% Mn, and oxide, 60% Mn) are some sources of manganese. The requirement is 30-50 mg per kg diets.

(iv) Zinc (Zn): Zinc is required for growth, feathering, egg production and hatchability. It is associated with many enzymes as an essential component or activator. Zn is not stored sufficiently in the body for longer period. The deficiency symptoms are:

Chicks: Loss of appetite, retarded growth, poor feathering, shortening and thinning of bones, enlarged and rigid joints, enlargement of hock joint, scaling of skin and the limbs become thickened due to scales hence the disease is also called scaly limb disease.

Layers: Decreased egg production and hatchability. Embryonic mortality peaks around mid incubation with defective embryo (missing or underdeveloped toes and eyes, deformed skeletal formation), caused by zinc dependent metabolic processes involved in the development of skeletal mesoderm. Hatched chicks are weak and cannot stand, eat or drink.

Feedstuffs are mostly deficient in zinc, thus its supplementation is required. Zinc oxide (73% Zn), Zinc carbonate or Zinc sulphate (36% Zn) are the supplementary sources of zinc.

Requirements: 40-60 mg per kg diet.

(v) Copper (Cu): Deficiency of copper has been reported in chicks. Too much molybdenum or iron may also decrease its availability. Dietary supplementation of Cu is thus required. The deficiency symptoms are:

Chicks: Bone disorder, lameness, anaemia, depigmentation of feather, abnormal feather growth. Deficiency in egg causes defects in blood and circulatory system and embryonic mortality is increased during second and third days.

Distillery by-products, fishmeal, liver meal, oil cakes and dried whey are the natural feed sources, while supplementary sources are copper sulphate (25% Cu), cupric carbonate (53% Cu) or cupric oxide (75% Cu).

Requirements: 8-10 mg per kg diet.

(vi) Sodium chloride/common salt: It is important for deficiency as well as toxicity. It is a limiting mineral in feedstuffs of plant origin. The deficiency symptoms are Decreased growth and feed intake, high mortality and nervous symptoms in chicks and decreased egg production, poor growth and cannibalism in layers. Common salt is the cheap source of sodium and chloride. The requirement of salt or sodium chloride is 0.30% of diet.

Toxicity: Too much salt in feed or water causes salt toxicity or salt injury characterized by reduced growth, excess water intake, watery droppings, wet litter condition, oedema in abdominal cavity, enlarged kidney, pale colouration of kidney and mortality.

(vii) Selenium (Se): As component of enzyme glutathione peroxidase, it plays important role as antioxidant. It acts in cytoplasm and helps to remove free radicals. Usually Se deficiency does not occur in chickens. It is closely associated with vitamin E and one can spare the other. Deficiency causes exudative diathesis and white muscle disease or muscular dystrophy. Its excess intake causes toxicity.

(F) Public Health Significance: Poultry products are an important part of the human diet and supply highly bioavailable forms of nutrients. Levels of vitamins and minerals in meat and eggs are highly dependent on the levels in the diet. Birds fed diets that are deficient in vitamins or minerals do not supply intended levels of nutrition to human consumers. In fact, the vitamin and trace mineral qualities of poultry products are often optimized at levels that are above the requirement for the animal. Animals deficient in nutrients are often immunocompromised, resulting increased incidence of infectious diseases and, in some cases, evolution of more pathogenic disease organisms. Often animals can serve as buffers for high levels of minerals or other nutrients found in plants and other foodstuff's, thereby reducing human exposure to potentially toxic nutrients including some heavy metals. However, levels of some nutrients (e.g., selenium, iodine, copper, fluoride, and vitamin A) may accumulate in meat or eggs to levels that might adversely affect human health. Prompt diagnosis and correction of toxicities is important for safeguarding the human food supply.

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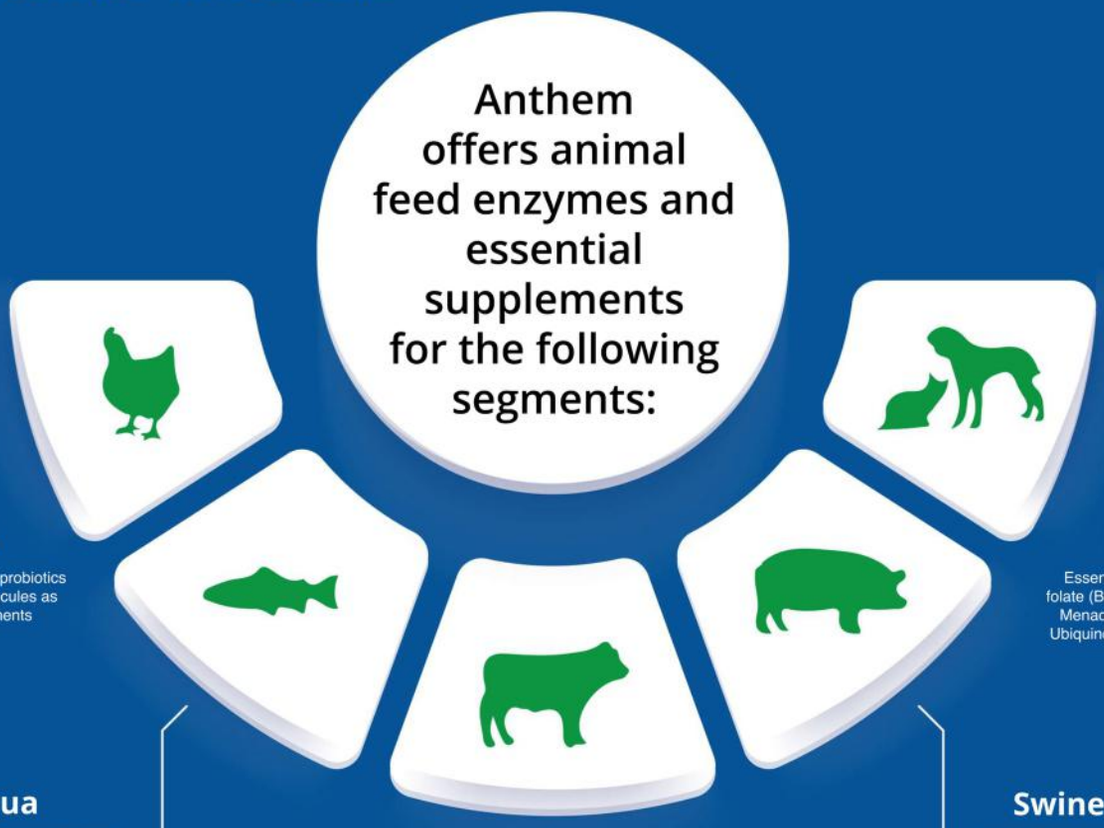

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Successful tools for a holistic approach towards gut health

Lode Nollet, Global Product Manager Poultry Enzymes, Huvepharma

Nutritional strategies to support the production of high quality, low cost and safe animal products are a must nowadays. The relationships between health, nutrition, welfare, and environment need to be considered. In poultry production, increasing feed costs are imposing pressure on the profitability of the farmer, so nutritionists seek to reduce feed costs whilst maintaining animal performance and gut health. Several strategies, with tangible tools to support this, are discussed in this article.

CONTROLLING COCCIDIOSIS

Coccidiosis, caused by protozoan parasites of the genus Eimeria, is one of the most widespread and difficult to manage poultry diseases, resulting in considerable economic losses in the broiler industry. Insufficient or inadequate control of coccidiosis will result in gut health damage and provide a pathway for other pathogens to proliferate.

For instance, suboptimal coccidiosis control combined with a high amount of undigested protein will create an ideal situation for the proliferation of Clostridia spp. Birds suffering from clinical coccidiosis will show typical signs like diarrhoea, bloody droppings, increased mortality, decreased feed intake and impaired performance.

Inadequate control of coccidiosis leads to impaired growth and feed conversion ratio, without the presence of evident clinical signs. This is subclinical coccidiosis.

Intensive methods of production of poultry favour the reproduction of Eimeria. Consequently, coccidiosis is a continuing problem requiring constant attention and, in the case of broilers, a need for continuous supplementation with anticoccidial drugs or coccidiosis vaccines, in addition to in-feed anticoccidials. Coccidiosis control combined with a good monitoring programme will be the base of any gut health management programme.

IMPROVING FEED DIGESTIBILITY

Improving digestibility of the feed can be achieved by selecting highly digestible feedstuffs. However, this will increase the feed price. The improvement of the digestibility of feed by using enzymes able to degrade Non-Starch Polysaccharides (the so-called NSPases) will not only lead to lowering the feed cost at formulation, but also exert a positive effect on the bird's gut health.

The NSPases contain xylanase or xylanase-based enzymatic complexes, and their mode of action includes the hydrolysis of soluble arabinoxylans, which minimises intestinal viscosity, preventing the overgrowth of microflora and thereby reduces gut health disorders.

Together with the efficient reduction in viscosity, NSPases will also hydrolyse insoluble arabinoxylans. This action will unlock nutrients (mainly starch and proteins) which are trapped in the cell walls of the vegetable feed ingredients (the so called 'cage effect' of insoluble fibres).

Using the correct NSPase leads to improved digestibility of starch and protein. The latter is of particular importance as high levels of undigested protein in the (last) part of the intestine is a breeding ground for protein-loving pathogens like Clostridium spp, causing necrotic enteritis.

The breakdown of arabinoxylans by NSPase also yields arabino- oligosaccharides (AXOS) which are known to be fermented by the microflora in the lower part of the intestine to butyrate, which is a major energy source for villi regeneration allowing good gut health status.

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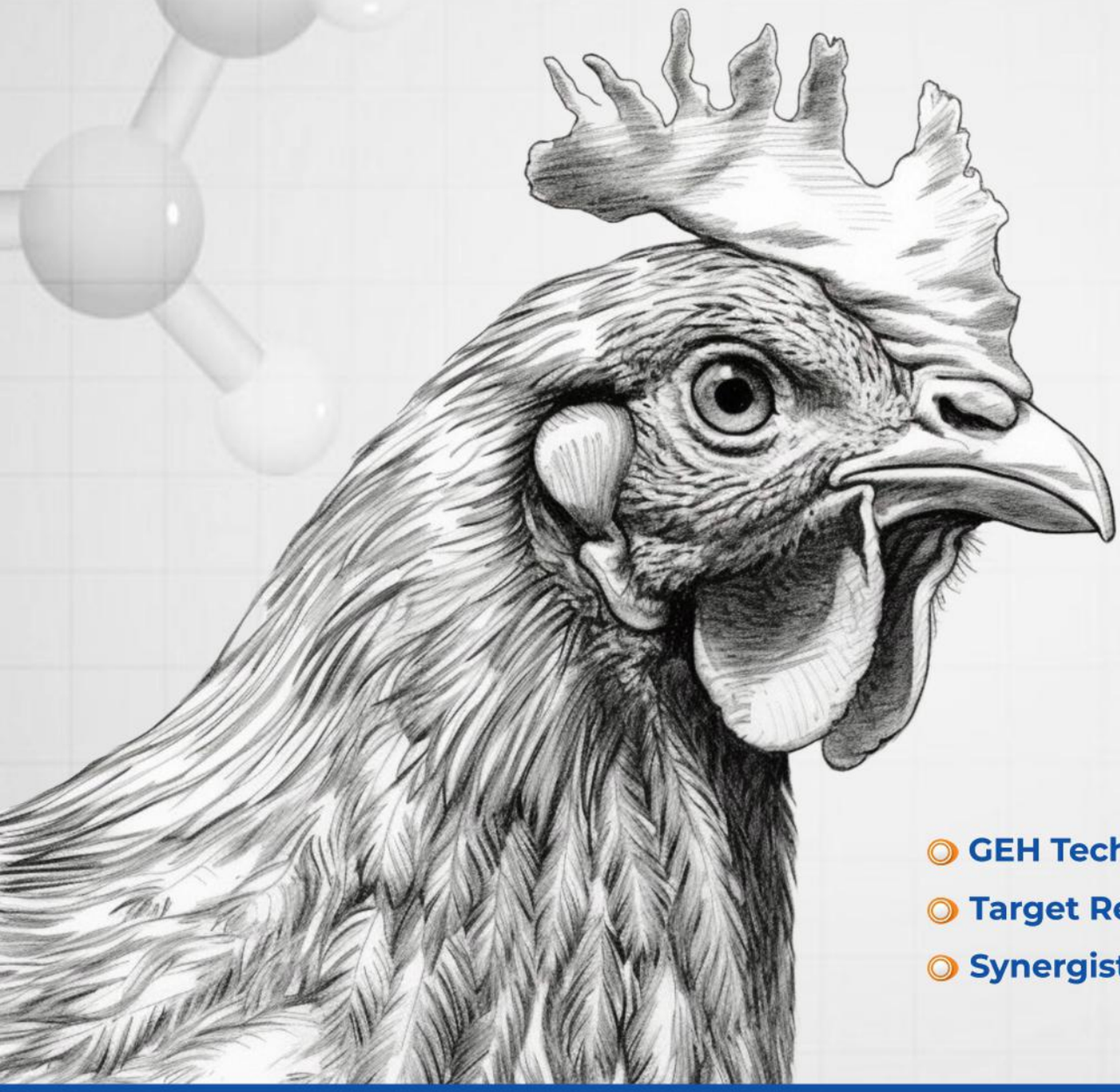

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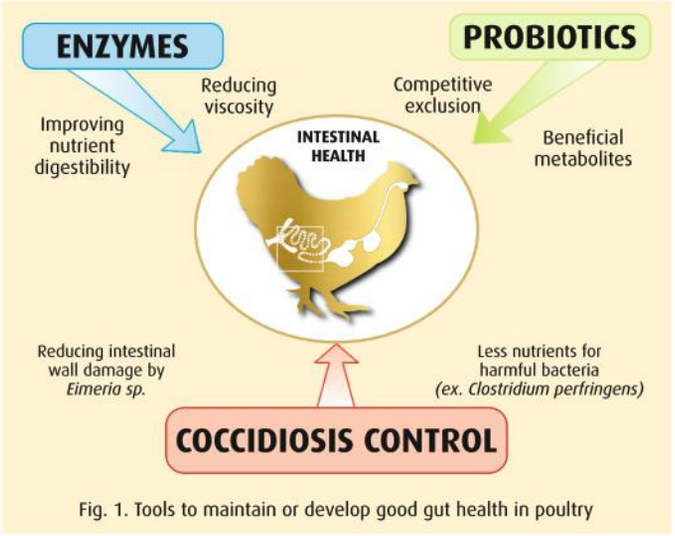

Fig. 1. Tools to maintain or develop good gut health in poultry

Phytases have been shown not only to break down phytate to release phosphorus, but by doing so, to also destroy the anti-nutritional factor phytate.

This not only leads to a reduction of endogenous protein losses, but also liberates protein and amino acids which are complexed by phytate, enhancing their digestibility.

SUPPORTING THE MICROBIOTA

The relationship between a healthy gut and the animal's microbiota is undeniable. As part of the holistic approach, the inclusion of probiotics in the nutritional programme offers a way of supporting gut health from a microbial perspective.

The mode of action of probiotics is usually multifactorial, including (but not limited to) the production of beneficial metabolites or the direct competition with unwanted bacteria. As a result, probiotics often help to balance the present microbiota and improve its robustness, supporting general gut health in the process.

Probiotics can be incorporated into the feed or drinking water, depending on the strain and formulation used. Although there are many commercial options available, the preferred product of choice should be based on a single unique strain, capable of forming spores and with a proven and researched mode of action. Such probiotics increase the ease of use, whilst ensuring product efficacy.

Good examples are B-Act®, containing viable spores of *Bacillus licheniformis*, based on *Clostridium butyricum*. Probiotics allow producers to support their animals' gut health efficiently, setting them up for a successful production period from start to finish.

CONCLUSION

Gut health management is of paramount importance to the profitability of poultry farming. The strategy behind managing optimal gut health should contain a combination of the most important control tools on the market available today: an adequate and well thought-through coccidiosis control programme, combined with an NSP enzyme and a phytase, and topped off by a well-functioning probiotic.

To know more, please contact Huvepharma technical team

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Per chick produced	382 g	334 g

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