



पशुधनं निवृत्तं सर्वलोकोपकारकम्।

पशुधन प्रहरी

PASHUDHAN PRAHAREE

पशु स्वास्थ्य एवं पशुधन
विकास हेतु समर्पित पत्रिका



संपादकीय



Dr. Rajesh Kumar Singh

कृषि प्रधान भारत विश्व के किसी भी राष्ट्र की तुलना में सबसे अधिक पशुधन की संख्या होने के साथ-साथ दुग्ध उत्पादन में भी प्रथम स्थान पर है। मत्स्यपालन, पशुपालन और डेयरी मंत्रालय, भारत सरकार के अनुसार 2020-21 के वित्तीय वर्ष में भारत की कुल सकल मूल्य वर्धन (जीवीए) में पशुधन की 4.9 प्रतिशत और कुल कृषि और संबद्ध क्षेत्र का लगभग 30.13 प्रतिशत की हिस्सेदारी रही। आधुनिकता के इस दौर में जहां एक ओर एंटीबायोटिक्स और कृषि रसायनों के अतिप्रयोग से खाद्य श्रृंखला में उनके अवशेषी संदूषकों में बढ़ती होने से शारीरिक व्याधियां बढ़ रही हैं, जिनके प्रति आम जनमानस की चेतना भी बढ़ रही है। इसके साथ ही बढ़ती जन आबादी की आहार आपूर्ति के लिए भी उत्पादन क्षेत्रों पर दबाव बढ़ रहा है।

जैविक या प्राकृतिक कृषि पद्धति में किसी भी प्रकार के कृत्रिम रसायनों का उपयोग नहीं किया जाता है। इसमें केवल जैविक रसायनों या प्राकृतिक रूप में उपलब्ध पादप आधारित औषधियों का ही उपयोग किया जाता है, जिनका मानवीय या पशु स्वास्थ्य पर कोई दुष्प्रभाव नहीं होता है और बहुत से किसान एवं पशुपालक जैविक कृषि उत्पादन के साथ-साथ जैविक पशुपालन भी अपना रहे हैं। इसके साथ ही पशुपालन में बहुत सी व्याधियों के उपचार के लिए स्थानीय स्तर पर उपलब्ध औषधीय पादपों का उपयोग किया जा सकता है।

बात रही बढ़ती आबादी की खाद्य आपूर्ति की तो आज बहुत सी तकनीकें पशु चिकित्सा एवं पशुपालन में आ चुकी हैं जिनका उपयोग पशुधन का उत्पादन बढ़ाने में किया जा रहा है और पशुधन की उचित देखभाल के माध्यम से किसान पशुपालन व्यवसाय को साध्य कर सकते हैं। आवश्यकता है तो केवल सही ज्ञानोपार्जन और उसे क्रियान्वित करने की, और इसके लिए हमारे संस्थान और वैज्ञानिक किसानों और पशुपालकों के साथ कंधे-से-कंधा मिला कर इस ओर अग्रसर भी हैं। पशुधन प्रहरी का यह अंक इस दिशा में सहायक है।

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द्वारा प्रकाशित एवं झारखण्ड प्रिंटिंग प्रेस, जमशेदपुर, झारखण्ड से मुद्रित ।

नोट : जमशेदपुर से पशुधन प्रहरी का प्रकाशन पूर्णता अव्यवसायिक तथा अवैतनिक है। पशुधन प्रहरी के प्रकाशित सामग्री से सम्पादक/प्रकाशक की सहमति अनिवार्य नहीं है। कुछ फोटो अन्य सामग्री साभार, पशुधन प्रहरी के सभी मामलों का न्याय क्षेत्र जमशेदपुर (झारखण्ड) होगा।

पशुधन प्रहरी में प्रकाशित लेख में व्यक्त किये गए विचार लेखक के हैं, यह पत्रिका उसका अनुमोदन नहीं करती – सम्पादक

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जैविक पशु पालन वर्तमान समय की मांग

हमारे यहां सदियों से खेती और पशुपालन की साझा परंपरा रही है, जो कि लंबे समय तक प्रकृति के साथ संतुलन के दर्शन पर आधारित थी। हालांकि इससे उत्पादन कम प्राप्त होता था किन्तु स्वास्थ्य की दृष्टि से यह निरपेक्ष था। वर्तमान में पशु पालन हमारी अर्थ व्यवस्था का एक महत्वपूर्ण घटक है और ग्रामीणों की आजीविका का एक प्रमुख साधन भी है। हाल ही के वर्षों में खेती में यांत्रिकी के बढ़ते चलन और विषैले रसायनों के पशुपालन उद्योग में उपयोग से इनसे निर्मित होने वाले खाद्य पदार्थों के पोषक तत्वों के तुलनात्मक अध्ययन में पाया गया है कि जैविक पशुपालन से प्राप्त उत्पाद स्वास्थ्य की दृष्टि से अधिक उपयुक्त हैं। बीजों में अनुवांशिक परिवर्तन कर, कृत्रिम सुगंध और संश्लेषित रासायनिक रंग संरक्षक का खाद्य सामग्रियों के तौर पर बेतहाशा उपयोग हो रहा है। इन्हीं का पशुपालन और इससे जुड़े उद्योगों में होने के बहुत ही भयावह और खतरनाक परिणाम दिखाई देने लगे हैं।

आजादी के बाद शुरू-शुरू में खेतों में भारी मात्रा में रासायनिक खाद का उपयोग किया गया, जिससे उत्पादन तो बढ़ा किन्तु कालांतर में भूमि की उर्वरता में कमी आती चली गई और इसे



बढ़ाने के लिए और अधिक रसायनों और रासायनिक खाद का इस्तेमाल बढ़ता गया, परिणाम यह हुआ कि भूमि की उर्वरता लगातार कम होती चली गई। रासायनिक कीटनाशकों के बहुत ज्यादा उपयोग के कारण कई तरह के रोगों के मरीजों की संख्या में बढ़ोतरी हो रही है। खेती किसानों में अत्यधिक मात्रा में कीटनाशकों और रासायनिक उर्वरक के अंधाधुंध इस्तेमाल के दुष्परिणामस्वरूप मनुष्य और पशुओं की शारीरिक दुर्बलता और जान लेवा बीमारियों के रूप में सामने आ रहे हैं। देखने में आया है कि बहुत कम उम्र में ही मनुष्य कैंसर जैसे घातक रोग से ग्रसित हो रहे हैं। पशुओं के दूध और मांस में भी इन कीटनाशकों के अंश आने लगे हैं, जिससे पशुओं के स्वास्थ्य पर भी बहुत विपरीत प्रभाव दिखाई देने लगे हैं। इसके साथ हमारी मृदा का स्वास्थ्य भी बिगड़ता जा रहा है। इन दुष्परिणामों से बचने के लिये जैविक खेती के साथ-साथ जैविक पशु पालन की ओर अग्रसर होना समय की मांग है। रासायनिक कीटनाशक रहित उत्पाद ही हमारे स्वास्थ्य के लिए लाभकारी हैं।

जैविक पशुपालन को बढ़ावा देने के लिए बड़े पैमाने पर किसानों को प्रशिक्षण देने की व्यवस्था की जानी चाहिए ताकि कृषि के साथ जुड़ा हुआ पशुपालन घटक से कम लागत में

लेखक - डॉ. नीना त्रिपाठी
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पशुपालन एवं डेयरी विभाग
भोपाल, मध्यप्रदेश



अधिक मूल्य के जैविक पशुधन उत्पाद पैदा करने के लिए किसानों को प्रोत्साहित किया जा सके।

जैविक पशु पालन के उद्देश्य

जैविक पशु पालन एवं खाद्य सुरक्षा मनुष्य जाति और पशु जगत के लिये वर्तमान में प्रासंगिक विषय है। जैविक खाद्य की उपलब्धता मानव जाति के निरोगी स्वास्थ्य और सुखी जीवन के लिये हमारी प्राथमिकता में शामिल है।

1. जैविक पशुधन उत्पाद में डेयरी के उत्पाद, मांस, अंडा जैसे खाद्य पदार्थों का पर्याप्त मात्रा में और अधिक गुणवत्ता में उत्पादन करना।
2. जैविक खेती अपनाकर भूमि की उर्वरकता को बचाए रख कर भूमि की इस उर्वरकता को लम्बे समय के लिये बनाये रखना।
3. पशुपालन, कृषि व पर्यावरण के बीच जैविक प्राकृतिक चक्र बना कर संतुलन स्थापित करना और प्रकृति को प्रदूषण मुक्त करना।
4. कृषि व जैव विविधता का संरक्षण करना व

उनके बीच संतुलन स्थापित करना।

5. जैविक पशु पालन अपनाकर मानव स्वास्थ्य व अन्य प्राणियों की रक्षा करना।
6. जीन विविधता का संरक्षण और पशुओं को उनके प्राकृतिक स्वभाव में प्रकट होने देना।
7. जैविक उपटत्र व पुर्नचक्रित पदार्थों के उपयोग को बढ़ावा देना।
8. जल व मृदा संरक्षण को प्रोत्साहित करना।
9. जैविक पशु पालन को अपनाने के लिये पशु पालकों को प्रोत्साहित कर अधिक से अधिक लाभ पहुँचाना।



किसी प्रमाणित एजेंसी से करवाए ताकि इन उत्पादों में जैविक उत्पाद का टैग लगाया जा सके तथा इनका उचित दाम निर्धारित हो सके।

जैविक पशुपालन क्या नहीं करें

जैविक पशु पालन के लाभ

1. जैविक पशुपालन, वातावरण को प्रदूषण रहित बनाये रखने एवं मानव स्वास्थ्य की रक्षा करता है।
2. जैविक पशु पालन से प्राप्त उत्पाद एंटी बायोटिक्स एवं हॉर्मोन से पूर्णतः मुक्त होते हैं। अतः इनके सेवन से मुनष्य एवं अन्य प्राणियों को कई घातक बीमारियों से बचाया जा सकता है। जैसे हृदय रोग, कैंसर, मधुमेह आदि।
3. मृदा की उर्वरकता को लम्बे समय तक बनाये रखता है।
4. जैविक पशुपालन प्राकृतिक संसाधनों के उपयुक्त उपयोग को सुनिश्चित करता है ताकि कम लागत से अधिक मात्रा व उच्च गुणवत्ता वाले पशु आधारित भोज्य पदार्थों का उत्पादन हो सके।
5. जैविक पशुपालन से प्राप्त खाद्य पदार्थ का मूल्य सामान्य साद्य पदार्थों से अधिक होता है, इससे पशु पालक को अधिक आमदनी होने से उसकी आर्थिक स्थिति सुदृढ़ होगी।
6. यह पारंपरिक पशुपालन को बढ़ावा देता है ताकि किसानों को कम लागत में अधिक मूल्य वाले जैविक पशु उत्पाद प्राप्त हो सकें।

जैविक पशुपालन, क्या करें?

1. पशुओं को रासायनिक खाद्य रहित पूर्णतः जैविक चारा खिलायें जिसका

उत्पादन जैविक बीजों एवं जैविक पद्धति से किया गया हो।

2. बरसात के मौसम में जल हरे चारे का उत्पादन जब अधिक हो तो उसे हे व साइलेज के रूप में संरक्षित किया जा सकता है ताकि पशुओं को वर्ष भर जैविक चारा प्राप्त हो सके। इसमें अजोला पशु आहार भी शामिल किया जा सकता है।
3. पशुओं का प्रबंधन अच्छी तरह से करें ताकि वे लगातार स्वस्थ रहें व कम से कम बीमार पड़ें।
4. पशुओं के बीमार होने की स्थिति में पारंपरिक देशी इलाज, आयुर्वेदिक व होम्योपैथिक दवाइयों से इलाज को प्राथमिकता दें।
5. फार्म का प्रमाणीकरण अधिकृत जैविक एजेंसी से करवाया जाए। जैविक पशुधन फॉर्म को सामान्य फॉर्म से पृथक रख कर पशुओं के लिए प्राकृतिक चारागाह की व्यवस्था करें और छायादार वृक्ष लगाए ताकि उनका पालन पोषण प्राकृतिक वातावरण में हो सके।
6. फॉर्म की साफ सफाई नियमित तौर पर जैविक व रासायनिक कीटनाशक रहित जैसे नीम, तुलसी इत्यादि का उपयोग कर पारंपरिक देशी विधियों से करें।
7. जमीन की उर्वरकता को बढ़ाने के लिए जैविक खाद्य जैसे कि वर्मी कंपोस्ट, केंचुआ खाद्य व फॉर्म के बचे हुए जैविक अपघटक का उपयोग करें साथ ही जैविक तरीके से प्राप्त पशु उत्पादों को अन्य पशु उत्पादन से अलग रखें तथा इनमें किसी भी प्रकार का प्रसंस्कृत संश्लेषित फीड एडिटिव और रासायनिक संरक्षक ना मिलाए।
8. पशु उत्पादों की प्रोसेसिंग भी उन्नत देशी तकनीक का उपयोग करते हुए जैविक तरीके से करें।
9. जैविक पशु उत्पादों का प्रमाणीकरण

1. चारा उत्पादन के लिए जेनेटिकली मोडिफाइड बीजों का इस्तेमाल बिलकुल न करें।
2. जमीन की उर्वरकता को बढ़ाने के लिए रासायनिक उर्वरकों का उपयोग बिलकुल न करें।
3. पशुओं का उपचार के लिए एंटीबायोटिक व एंजिमायैथिक दवाइयों का इस्तेमाल न करें।
4. जेनेटिकली मोडिफाइड वैक्सीन के प्रयोग से बचें।
5. कीटों के नियंत्रण के लिए संश्लेषित केमिकल कीटनाशकों का उपयोग न करते हुए नीम तुलसी जैसे आयुर्वेदिक एंटीबायोटिक का उपयोग सुनिश्चित करें।
6. खरपतवार को नष्ट करने के लिए संश्लेषित खरपतवार नाशक का उपयोग न करें।

जैविक पशु पालन एवं खाद्य सुरक्षा मनुष्य जाति और पशु जगत के लिये वर्तमान में प्रासंगिक विषय है। जैविक खाद्य की उपलब्धता मानव जाति के निरोगी स्वास्थ्य और सुखी जीवन के लिये हमारी प्राथमिकता में शामिल है।

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SUCCESSFUL THERAPEUTICS MANAGEMENT

OF JAUNDICE IN A CROSS BRED DOG - A Case Report



An adult 2-year old male Cross bred dog was presented to the Veterinary Clinics Haryana, with a history of anorexia, high fever, deep yellow coloured urine. Clinical examination showed pale mucus membranes with increased respiration rate, however, electrocardiogram (ECG) was found normal. The hematological findings showed severe microcytic hypochromic anaemia, neutrophilic leukocytosis, marked increase in total bilirubin values suggestive of jaundice. Blood smear examination was found negative for hemoprotozoan. The dog was treated and Supportive treatment and Reevaluation of various blood parameters after 5th, 12th & 26th days of treatment revealed marked improvement.

Keywords: Jaundice, Blood transfusion

INTRODUCTION

Jaundice is the clinical manifestation of animals when the visible mucous membrane turned into yellowish discoloration caused by hyperbilirubinemia. Hyperbilirubinemia can occur due to prehepatic (usually hemolysis), posthepatic (due to obstructive or functional cholestasis), or hepatic causes. Hyperbilirubinemia in hepatic disease is caused by decreased uptake of unconjugated. bilirubin and/or

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decreased conjugation by the hepatocytes therefore, hyperbilirubinemia is usually associated with a severely impaired hepatic function. Prehepatic jaundice is usually caused by the release of hemoglobin associated with RBC lysis. High plasma levels of unconjugated (free) bilirubin are derived from massive hemoglobin breakdown.

Patients with prehepatic jaundice are therefore invariably severely anemic. Ongoing hemolysis of RBC's in sufficient magnitude causes persistent jaundice that would cause death due to anemia. Various causes of anemia includes infection or acute/chronic hemorrhage due to hemoprotozoan infections, bleeding disorders such as thrombocytopenia or coagulopathies drugs, and toxic plants such as warfarin poisonings. The predominant clinical signs of jaundice are anaemia, weakness, pale mucous membranes, tachycardia and tachypnea. Severe intravascular hemolysis may cause hemoglobinemia and hemoglobinuria (darkened coloured urine).



Fig. 1



Fig. 2



Fig. 3



Fig. 4

ETIOLOGY

Causes of jaundice are many. Toxic chemicals and drugs, viral and bacterial infections, obstruction of the bile duct by endoparasites e.g. liver flukes pressure upon the duct by tumors, nodules in liver, cirrhosis of liver, invasion of erythrocytes by protozoa (haemoprotozoan parasitic infection) etc.

CLINICAL AND LABORATORY EXAMINATION

On clinical examination, the dog was having body temperature of 99.80 F, pale mucous membrane with increased respiration rate. The heart functioning of the dog was found to be normal by electrocardiogram (ECG) report.

Blood samples were collected in EDTA containing vials

for complete blood count (CBC).

Serum analysis was done using Fully automated Random Access Clinical Chemistry Analyzer for estimation of different biochemical parameters using kits procured.

Urine was collected aseptically using analysis urinary catheter and urinary analysis was performed using automated urinary strip analyzer.

Biochemical Parameters	Days after initiation of treatment			
	1 st day	5 th day	12 th day	26 th day
Total protein (gm/dl)	4.8	5.625	4.516	4.608
Total bilirubin (mg/dl)	10.327	8.109	3.185	1.741
Direct bilirubin (mg/dl)	6.163	4.364	1.296	0.333
Indirect bilirubin (mg/dl)	4.164	3.745	1.889	1.408
SGOT (AST) (IU/L)	79.405	69.333	66.955	56.079
SGPT (ALT) (IU/L)	135.887	46.154	90.0	70.947
Blood glucose (mg/dl)	128.632	108.072	72.692	62.615

Table 1: Biochemical Findings

Haematological parameters		Days after initiation of treatment			
		1 st day	5 th day	12 th day	26 th day
Hb (g/dl)		9	8.8	9.4	10.6
PCV (%)		26	25	30	32
TEC (X 10 ⁶ /mm ³)		5.83	5.47	7.5	6.54
MCV (fl)		44.59	32.91	21.33	48.93
MCH (pg)		15.44	12.43	8.53	16.21
MCHC (%)		34.62	37.78	40.00	33.12
TLC (X10 ³ /mm ³)		11.75	15.9	6.4	7.2
DLC (%)	Neutrophils	72	86	81	78
	Lymphocytes	27	11	16	18
	Monocytes	1	3	2	3
	Eosinophils	0	0	1	1
	Basophils	0	0	0	0

Table 2: Haematological findings

TREATMENT

1. Rest and feeding of good quality and easily digestible carbohydrates
2. Feeding of fat free diet
3. Identification of causes and application of specific therapy

IN HAEMOLYTIC JAUNDICE

specific measures to be taken to prevent haemolysis. If due to haemoprotozoa antihaemoprotozoal drug e.g. Inj. Berenil/Protonil @ 0.8-1.6 g/100 kg body weight or Inj. Nilbery, Inj. Prozomin liquid @ 1 ml/20 kg body weight by IM route.

IN OBSTRUCTIVE JAUNDICE

if it is due to migrating larvae of endoparasites-ascaris, liver flukes, fasciola specific dewormers and flukicides e.g. Fluzic (Triclabendazole),

Oxylozanide (Nilzan, Distodin), Hexanide etc. should be fed.

IN TOXIC JAUNDICE

IV Dextrose 5 per cent, 10 per cent, 500-1000 ml by slow IV, vitamin Bcomplex preparation e.g. Inj. Tribivet, Inj. Ferolive, Inj. Hivit etc. @ 10 ml by IM route can be given.

CALCIUM THERAPY

Calcium therapy in toxicities with slow IV infusion of Calgonate, Calmex, Mifocal, Mifex @ 100-300 ml can be done.

Administration of any one of the following liver extracts e.g. Inj. Belamyl, Inj. Livobex (ITK) Inj. Livron (Vets Farma), Inj. Stronic (Vetnex) etc @ 5-10 ml IM on every alternate day should be done. Oral liver tonics e.g. Livol, Vetliv powder or Lifer, Livsee, Liv-52 syrup can be fed orally BID.

DIABETES MELLITUS IN DOG AND CAT

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A chronic disorder of carbohydrate metabolism due to relative or absolute insulin deficiency.

Characteristics of Diabetes Mellitus are hyperglycemia, polyurea, polydypsia, polyphagia and glycosuria.

Diabetes Mellitus is two types (a) Type 1 diabetes/ Insulin-Dependent diabetes (juvenile diabetes) caused by destruction of the beta cells of the pancreas. Dogs have only type 1 diabetes (b) Type 2 (Insulin-independent) diabetes – Common in cats. Resistance to insulin caused by other medical conditions or by hormonal drugs. The condition is treatable, but if left untreated -can lead to cataract, neuropathy, malnutrition, ketoacidosis, dehydration, and death.

PREDISPOSITION & SUSCEPTIBILITY

Most cases of spontaneous diabetes occur in middle-aged dogs and cats. In dogs, females are affected twice as often as males. Increased incidence in certain small breeds: Spitz, Samoyed Miniature Poodles, Dachshunds, Schnauzers, Cairn Terriers, Lhasa apso and Beagles etc. Obesity also predisposes to insulin resistance.

ETIOLOGY AND PATHOGENESIS

Primary cause Sub-acute pancreatic necrosis (a) Pancreatic fibrosis (b) Chronic pancreatitis. Secondary cause- Autoimmune disorder, hyperadrenocorticism, obesity, hypothyroidism, hepatitis & hypocalcemia. Pregnancy and diestrus predispose to Diabetes Mellitus.

Diabetes Mellitus caused by absolute/relative deficiency of

insulin hormone (β -cells of islet of Langerhans). Reason of destruction of islet cells (due to immune destruction/severe pancreatitis in dogs or amyloidosis in cats. Chronic relapsing pancreatitis with progressive loss of both exocrine and endocrine cells.

In cats selective infiltration of islets with amyloid, glycogen, and collagen leads to destruction of islet cells and degenerative changes in β cells, is the most common pancreatic lesion. As cats age, a greater percentage of their islets contain amyloid.

In dogs with hyperadrenocorticism, and chronic administration of glucocorticoids or progestins. In dogs progesterone leads to release of growth hormone which causes hyperglycemia and insulin resistance. Obesity also predisposes to insulin resistance in both cats and dogs.

Hyperglucagonemia is the result of increased secretion of pancreatic glucagon, enteroglucagon, or both. Increased levels of glucagon mobilize hepatic stores of glucose and result in hyperglycemia and also cause ketoacidosis by stimulating oxidation of fatty acids in liver.

Infection with certain viruses in humans may be responsible for certain cases of rapidly developing diabetes mellitus.

In cats degenerative changes of α and β cells is common due to amyloid infiltration because cat can not process IAPP (Islets associated polypeptide) which is responsible for conversion to amyloid and leads to Diabetes type II.

CLINICAL MANIFESTATION

Initially Polyurea, polydypsia, polyphagia and later on loss of body condition, exhaustion on exercise. In advanced cases Bleeding and clotting time increases, delay in wound healing and Ketotic odour from breath and urine. In highly advanced cases coma, convulsions and death are observed.

Decreased resistance to bacterial and fungal infections and often develop chronic or recurrent infections such as cystitis, prostatitis, bronchopneumonia, and dermatitis (due to impaired chemotactic, phagocytic and antimicrobial activity related with decreased neutrophil)

Cataracts develop frequently in dogs (not cats) with poorly controlled diabetes mellitus. Lenticular opacities appear initially along the suture lines of lens fibers and are stellate (“asteroid”) in shape. Cataract formation in dogs is related to the unique sorbitol pathway by which glucose is metabolized in the lens, which leads to edema of the lens and disruption of normal light transmission.

Emphysematous cystitis (rare) due to infection with glucose fermenting bacteria (E.coli, Proteus spp.etc).

DIAGNOSIS

Based on persistent fasting hyperglycemia and glycosuria. The normal fasting value for blood glucose in dogs and cats is 75-120 mg/dL. In cats multiple blood and urine samples may be required to confirm stress induced hyperglycemia.

In cats stress induced hyperglycemia is common (serum fructosamine level is normal) measurement of serum glycosylated hemoglobin or fructosamine (or both) can assist in differentiating between stress-induced hyperglycemia and diabetes mellitus.

TREATMENT AND MANAGEMENT

Treatment involves a combination of weight reduction, diet, insulin, and possibly oral hypoglycemic. Intact females to be neutered.

In cats high protein diet+oral hypoglycemic/insulin therapy. NPH, lente, or PZI insulin is preferred. In cats use of high protein, low carbohydrate levels in food. Newly diagnosed Cats Insulin Glargine (insulin of choice), used in conjunction with high protein and low CHO diet

In dogs diets that are high in fiber and complex carbohydrates. administer glimeperide and acarbose. Glipizide not to be used in thin or ketonuric cats.

Two doses of insulin a day NPH or lente @ 0.5 U/kg bid. Avoid diets rich in simple sugars. Insulin therapy- Initially NPH (Neutral Protamine Hagedorn)@0.5U/kg B.W, s/c,bid. (Blood glucose should not fall below 80mg/dL). If not regulated with NPH, then Basal insulin detemir is used @ 0.1U/kg B.W,bid.

In Diabetic Ketoacidosis i/v fluids such as 0.9% NaCl or lactated Ringers solution, short acting(Crystalline Zinc Insulin), supplementing electrolyte especially Potassium.

DIETARY MANAGEMENT

- Correction/management of obesity (Wt reduction improves glucose tolerance).
- Feed low calorie – dense diet (to avoid sudden postprandial hyperglycemia).
- Feed diets containing high fiber content, esp soluble fibers (gums, pectin etc.)
- Regular monitoring every month

BROILER PRODUCTION AND MANAGEMENT

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Broilers are the most popular poultry meats. The broiler business is recognized as an important source of animal protein, serving to feed the world's constantly expanding population. India produces around 5.3 MT of meat. Poultry is a highly vertically integrated sector in India that rivals the efficiency of several Western



countries. Broilers are birds of either sex up to 8 weeks old with body weights ranging from 1.5 to 2.0 kg that are raised for meat purpose. Broilers are scientifically designed to produce more delicate and soft meat. Many private enterprises work with farmers on contract farming for broiler manufacture.

Broilers can be kept

in battery cages, on slatted or wire floors, or in deep litter. Broilers can be raised in successive batches for brooding and rearing, or as a single batch at a time (all-in-all-out system). In All-in-all-out systems, only one batch of broilers kept belonging to the same hatch at any time. This strategy reduces horizontal disease transmission and subclinical infections, making it more hygienic and promoting increased growth, feed efficiency, and a decreased mortality rate. On the

other hand, this approach requires more fixed and working capital per bird and is not appropriate for large-scale farming. It includes all aspects of managing a chick from the time it is received until the day it is sold, such as housing, feeding, watering, brooding, and vaccination.

SEVERAL HUSBANDARY PRACTICES TO SUCCESSFUL BROILER PRODUCTION

FEEDING MANAGEMENT OF BROILER

The consumption of energy is a crucial component in the production of broilers as it affects growth rate, carcass quality, and the emergence of certain metabolic diseases. Especially in an intensive rearing system, feeding accounts for at least 60% of the total variable costs in the production of chickens, making it the most costly input. The challenge of producing high-quality chicken products at an economical price has been an issue for farmers and feed makers for many years. A number of factors, including feed intake, body weight gain, feed conversion ratio (FCR), digestible nutrient content, energy to protein ratio, feed form, feed processing, environment, and disease, can impact the cost of production and the quality of poultry products. It has been shown that dietary management of energy intake can reduce production costs and increase product quality more than the previously listed criteria (Ferket and Gernet, 2006).

Since feed generally accounts for a significant portion of the cost of raising broiler chickens, the industry faces significant challenges due to the limited supply of feedstuffs, particularly essential feed components like maize and oil seedcakes. The young broiler's improved nutritional condition is interdependent upon many mechanisms, all of which depend on the bird's ability to metabolize sufficient amounts of energy and other nutrients. Numerous factors including genetics, management, nutrition and processing, affect the quality of poultry meat. Vitamin E and selenium are two feed additives that may have an effect on the carcass and meat quality of chickens. Previously, the goal of broiler food formulation was to maximize animal performance. But this kind of intensely focused, high-protein diet can be expensive and have an

adverse effect on profitability. Scientists recommend farmers for enhancing broiler performance and production by implementing a holistic approach to diet formulations. This takes into account the price of raw materials, the present condition of the market, revenue generated and use of new or alternative feed ingredients. It ensures the accomplishment of sustainability goals and also protects the health and wellbeing of poultry birds.

A balanced and healthy feed intake is dependent upon the nutritional value, safety, and mode of delivery of the feed. Animal feed is always at risk of spoilage or contamination from harmful microorganisms such yeasts, mold, E. coli, and salmonella. Signs of contaminated feed include clumped particles, off odours and changes in colour. Inadequate feed hygiene has the potential to decrease an animal's metabolism and their availability of vitamins A, D3, E, K, and thiamine. If there is mold, palatability may be decreased. The amount of spoiling organisms in animal feed may be assessed in lab conditions in order to help with feed quality control. For broiler chickens, water is one of the most essential ingredients. It plays an important role in thermoregulation and serves as a vehicle for





additive like vitamins and medications. The water must have superior chemical and microbiological quality since broilers drink twice as much water as feed.

The growth and metabolism of broilers are significantly influenced by trace minerals including manganese, copper, and zinc. Providing trace minerals in the incorrect form and amount, either too low or too high, could generate negative outcomes for a broiler's productivity. Ensuring that broilers receive an optimal quantity of trace minerals on a regular basis will help their immune system, oxidative response, growth, and overall health.

HOUSING MANAGEMENT OF BROILER

A broiler can be raised in a cage, on a slatted or wire floor, or in deep litter. Battery cages may also be used to raise broilers in deep litter systems. Grower cages and broiler cages are alike. Some plastic materials may be applied to the bottom of the cage to avoid breast blisters. In cages, the required floor area is 75% of the total amount needed in deep litter.

a. Deep litter system

In this system the birds are kept in litter floor. Materials for litter might include wood shavings, sawdust, rice husks and nut hull. Litter should be three to six inches deep. Inside the home, arrangements are made for food, water and the nest. Always spread out fresh litter stuff on the ground. The birds are housed on appropriate litter that ranges in depth from 3 to 5 inches. Frequent stirring is necessary with this method, however it eliminates the need for labor-intensive feces (droppings) cleaning. Every two weeks, the litter is layered two inches thick on the floor until the necessary drying is accomplished. Birds can obtain vitamin B2 and vitamin B12 from the litter material due to bacterial

activity. Manure from deep litter is a good fertilizer. Fly nuisance is less than that of a cage system. Using deep litter helps to ensure the welfare of birds to some extent.

b. Cage system

Under this approach, chickens are grown on elevated wire netting floors in smaller enclosures known as cages, which can be suspended from the ceiling or equipped with platforms for usage on the ground level. At present, 75% of commercial layers in the world are using cage system. Feeders and waterers are attached to cages from outside except nipple waterers, for which pipeline is installed through or above cages. Auto-operated feeding trolleys can be used in this rearing system. The droppings are either collected in trays underneath cages or on belts or on the floor or deep pit under cages, depending on type of cages. The floor space requirement in cages is 50% of the floor space needed in deep-litter.

BROODING MANAGEMENT

In order to maintain the health and survival of the chicks, more care and attention must be given during the brooding phase, which begins just after hatching. A newly hatched chick cannot sustain its body temperature during the first few weeks of life because it is yet to develop its own system to control its own body temperature. The chicks will not eat and drink as much as they should if additional heat is not supplied during the cold. Inadequate digestion of the yolk occurs due to improper development of the internal organs involved in digestion, which in turn causes decreased growth rate.

In natural and artificial brooding, artificial brooding methods are most practiced to field farmers. The brooding procedure is now followed by broiler management throughout the first week of life. In tropical regions where big traditional open housing is common, brooding practices vary according to the



season. In the summer, farmers commonly utilize half of the house for brooding, whereas in the winter, they use one-third of the space.

The brooder house must be away from the all other poultry house. The brooder house must be built with a minimum of 100 meters away from other poultry structures. A brooder home's construction should be such that fresh air enters the building first before moving on to another house. Farmers have to build their poultry houses to ensure that sunlight does not penetrate directly. In order to give birds the benefit of airflow from north to south, the house should be built in an east to west direction.

a. Preparation of brooder house before receiving the chicks

- Take out all portable devices, give them a thorough cleaning and wash, dip them in an appropriate disinfectant per the manufacturer's instructions, and let them air dry for a day.
- Remove all organic material, especially by spraying 5–10% formalin and discarding it off-site from the farm..
- Remove all organic material, especially by spraying 5–10% formalin and discarding it off-site from the farm.
- Chemical Treatment: To destroy the IBD virus, soak the floor in a strong caustic soda (NaOH) flake solution for 12 to 24 hours with a dosage

of 11–12 gm/liter of water, or 2 kg/1000 square feet.

- White wash consists of lime stone with 2 to 5% formalin, 1% copper sulfate and 1% kerosene.
- Fumigation: 20 g of KMnO4 and 40 ml of formalin are used for every 100 cubic feet.
- Keep the shed vacant for 7 to 10 days.

b. Preparation of brooder house 24 hours prior to arrival of chicks:

- **Brooder House Temperature:** Set the temperature at 95°F (35°C) at the brooder's edge, 2 inches (5 cm) above the litter, for the first week after the chicks arrive. This adjustment should be made 24 hours prior to the arrival of the chicks. Lower the temperature by 5°F

(2.8°C) each week until it reaches to 70°F. A temperature of 21°C appears to be ideal during growing period. Too low or too high temperature will cause poor growth rate and ultimately poor performance of birds.

- **Ventilation:** Fresh air is required for well being and good health of chicks. Poor ventilation results in accumulation of carbon monoxide, ammonia and wet litter condition in brooder house. If concentration of carbon monoxide higher than 0.01 percent it will be poisonous to chicks. Ammonia irritates the eyes of chicks and retards growth. The level of ammonia should be less than 10 PPM in brooder house. High levels of moisture in litter are the cause of coccidiosis.
- **Space:** For the first week, a chick in an electric brooder needs 45 to 60 square centimeters of area is sufficient for broiler chickens. One



square foot of room per bird is sufficient for rearing; but, if available, 1.5 square feet per bird is preferable in order to promote greater development in broiler chickens.

LIGHT MANAGEMENT IN BROILER

In recent years, increasing attention has been paid to the effects of lighting management on growth performance, immune status, and welfare of broilers because lighting is closely linked to the development of a synchronous and rhythmic physiology in broiler chickens as well as the release of hormones related to their maturation and growth. A proper lighting regimen is crucial to improve the health and growth performance of broilers. The impacts of light on broilers mainly depend on the light source, light colour (wavelength), light intensity and light duration (program).

Recent research has shown that adjusting the right light schedule for broilers can improve their welfare and health outcomes by reducing their physiologically aggressive behaviors, increasing feed intake, and modifying the systemic immune response (Riber, 2015, De Oliveira and Lara, 2016). The term "broiler lighting regimen" describes a constant light intensity of 20 lx for the first 7 days after hatching, then 3 to 5 lx for the remaining time. (National Chicken Council, 2005). A comprehensive understanding about the potential interactions between the light characteristics and broiler physiology is essential to optimize the lighting program in poultry production. In addition, light regimen selection depends on many other indispensable factors, including rearing house type, feeding strategy, rearing density, nutritional quality of feed and season.

LITTER MANAGEMENT

Since many integrators have recently shifted to antibiotic-free broiler programs, litter management has become more and more crucial for the effective production of broilers. Poultry litter is a popular and economical method of managing litter used by broiler producers; however, if the litter is not handled effectively, using it again for several flocks might be hazardous. Conditions in the litter during the first few days of a chick's life affect the health and productivity of broiler chicks. Aerial ammonia levels are significantly influenced by proper litter management, heating, and ventilation systems. Prolonged exposure of chickens to high levels of

ammonia in the atmosphere can have a major adverse economic effect on the poultry production.

One major element affecting the quality of the litter in broiler houses is moisture. The broiler house environment (temperature, ventilation rate, and humidity) as well as the characteristics of the litter (bedding material, new vs built-up litter, depth, and moisture content) all have an impact on the moisture content of the litter. Severe footpad dermatitis can be brought on by improper litter moisture management (Shepherd and Fairchild, 2010), which has an impact on poultry' health and performance.

REARING SYSTEM OF BROILER

The rearing systems refer to either single batch at a time (all-in all-out system) or multiple batches of brooding and rearing of broilers.

- a. **All-in all-out system** - Under all-in all-out system, the farm will have only one batch of broilers, belonging to same batch at any time. The farm will purchase enough chicks to occupy its capacity, rear them, and sell them all in one batch. In turn, this approach results in a lower mortality rate, greater growth rate, and increased feed efficiency. It also has less subclinical infections and horizontal disease transmission. However, this system is not suitable for large scale farming and needs higher fixed and working capital per bird.
- b. **Multiple batch system** - The multiple batch system consists of rearing of more than one batch of chicks at any time, with a batch interval of 1 to 4 weeks. Here, the farmer purchases day-old chicks and sells mature broilers on a weekly, fortnightly, monthly, or once every three weeks interval basis. The chicks are reared for five to six weeks of age, or until they attain the desired body weight and sold for table. The ideal system for India at present is having 5 to 6 batches of broilers at any time, with weekly interval between batches and "direct retail marketing". Here, the birds will be marketed daily, from 40 to 54 days of age, based on their body weight, i.e. heavier birds will be sold earlier; giving a chance for weaker birds to have a compensatory growth.

TERMINOLOGIES ON STRUCTURAL ADAPTATION AND ASSOCIATED FUNCTIONS IN CHICKEN

Structural adaptations to support locomotion and feeding are important for the survival, growth and reproduction of a species. Birds evolved from reptiles and has many special morphological adaptations in every body systems. Changes in its locomotor apparatus, notably the pectoral limb modified in to wings with a well built pectoral girdle and a large sternum to support the flight muscles, pneumatization of bones with the air sacs, modification of the integument with feathers, scales and claws, absence of teeth, lips, cheek, soft palate, urinary bladder, right ovary and oviduct in females etc., with required neuronal competence to coordinate vision, locomotion and balance in birds do exist in the present day chicken. Unlike other domestic animals and mammals, these adaptations in birds are unique and requires attention. In this



chapter, some of the important terminologies that are associated with these structural variations are given below for the reference of practitioners in poultry medicine and other clinicians of pet and exotic birds.

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AIR SACS

They are thin-walled, transparent sacs that extend from the mesobronchi or the lungs to the interior of some of the bones and different regions of the body. They are cervical, clavicular, axillary, anterior thoracic and posterior thoracic and abdominal airsacs. All airsacs are paired except clavicular air sac. They compensate for the small inelastic and fixed lung in chicken. With the help of respiratory muscles, the posterior thoracic and abdominal air sacs act as bellows to ventilate the lungs with a continuous stream of air both during inspiration and expiration. All airsacs help reduce the specific gravity, regulate the body temperature, to distribute weight during flight and also in voice production.

ANTERIOR LARYNX

It is present at the level of pharynx and is supported by a single cricoid and paired arytenoid cartilages in fowl

ADITUS LARYNGIS

The median fissure in the floor of the mouth for the opening of the anterior larynx in chicken

BEAK

A bird's upper and lower jaws, including the external covering is called the beak/bill.

BILL TIP ORGAN

An aggregation of sensory cells at the tip of both the upper and lower beak. It is thought to sense tactile stimuli during feeding.

BIPEDAL

The ability to walk (or run) on two legs.

BODY CAVITY

The cavity inside the body that holds the viscera in chicken. Unlike animals chicken has only a common body cavity. There is no separate thoracic and abdominal cavity as diaphragm that separates these cavities is rudimentary/ absent in chicken. There is no line of demarcation between abdominal and pelvic cavity. Pelvic girdle is present but pelvic symphysis is absent.

BREAST

In chicken, the part of the lower (ventral) surface of the body, between the throat and belly is known as breast.

BURSA OF FABRICIUS OR CLOACAL BURSA

The lymphoid organ above the dorsal wall of the proctodeum. It is well developed at four months of age and disappears at one year of age in chicken. They are the source of B lymphocytes and are important for humoral response.

CARINA/KEEL

A midventral ridge of bone that projects outward from the metasternum that provides an attachment site for the pectoral muscles in birds.

CAECA

These are two blind tubes in chicken that extend forward from either side of the ileo-colic junction. They are parallel to the ileum and has a narrow proximal part that posses the caecal tonsil, a wide middle part and an expanded distal part with a pointed end. It helps in absorption of water and proteins and in microbial digestion of fiber

CARPALS

The bones of the wrist. In fowl, the distal row is fused with metacarpal while the proximal row has just two bones—the radial and ulnar carpal.

CARPOMETACARPUS

The largest bone of the manus of birds, formed by the fusion of distal row of carpals with the metacarpals.

CAUDAL / COCCYGEAL VERTEBRAE

The vertebrae of the tail in birds. The first caudal vertebrae fuse with the last sacral while the posterior series are fused to form a pointed pygostyle to support the tail feathers.

CERVICAL VERTEBRAE



The vertebrae of the neck region. Unlike other mammals they are 13-14 in number. They help the bird to turn its head more than 180 degrees.

CHOANA

A single slit in the roof of the oropharynx in fowl. It connects the oral cavity with the nasal cavity in birds.

CLOACA

The common tubular opening for digestive, urinary and genital systems at the terminal part of intestinal tract in chicken. It posses three compartments namely, Coprodeum that receives and temporarily stores feces from the colon/colorectum, Urodeum is the next compartment that receives uric acid from the kidneys through ureters (urinary bladder is absent), and eggs or sperm from the gonads, The last portion is the proctodeum which is short and opens at the vent.

CLOACAL PHALLUS

The copulatory organ of cock. It is present on the caudal end of the cloaca at its ventral aspect. It is formed of an elongate, spiral, ridged structure that erects by lymphatic pressure during copulation. Sperm travel along its surface to reach the cloaca of the female.

COLORECTUM:

In chicken the colon and rectum is short without any demarcation. This short straight segment of the large intestine that extends backwards from the cecal orifice to terminate in the coprodeum of the cloaca

COLUMELLA

Small, thin bone extending across the middle ear of birds, It is the only single auditory ossicle which corresponds to the stapes in mammals. It is attached at one end to the inner surface of the eardrum and at



the other end to the vestibular window of the inner ear; it transmits sound waves from the eardrum to the fluid-filled cochlea.

CRANIAL KINESIS

The relative movement of the upper jaw aided by the flexible craniofacial hinge in birds

CROP

A large ventral dilatation of the esophagus located just before its entry into the body cavity on the right side of the base of the neck. The crop temporarily holds the food. This capacity permits the fowl to eat its food at time intervals but helps to supply continuously to the proventriculus in fowl.

Egg tooth

A short, pointed, calcareous structure on the tip of the upper beak that develops in bird embryos shortly before hatching to break the egg shell to hatch. The egg tooth disappears within a few days post hatch.

FEATHER FOLLICLE

A small pit in the skin of the fowl from which a feather grows and to which it remains attached.

FEATHER TRACTS/PTERYLAE.

The specific pattern on the bird's skin where feathers are attached.

FILOPLUMES

Hairlike but relatively stiff feathers with a rachis but few or no barbs. These follicles have sensory receptors, which allow them to monitor the movement within the feather coat.

FORAMEN TRIOSSEUM

The foramen formed by the three bones of the shoulder girdle in fowl. This hole acts as part of a pulley system that allows the force of the supracoracoideus muscle to be redirected

GIZZARD

The lower part of the stomach in chicken that is rounded, thick walled and muscular with internal ridges. It grinds and softens foods. It is often found with grits or small stones in the lumen that is taken by the bird to aid in grinding (mechanical digestion). Koilin is the innermost tough lining of gizzard and is formed by the dense horny substances secreted by the glands of gizzard.

HEPATIC DUCTS

The ducts that collect the bile synthesized in liver. They are two in number one for the right lobe and one for the left lobe. The Hepato-cystic duct collects the bile from the right lobe of the liver and joins the gall bladder to form the ductus cysticus in chicken. The Hepato enteric duct collects the bile from the left lobe of the liver in chicken. It opens independently in the duodenum.

HYOID APPARATUS

A V-shaped unit formed of bones and cartilage that supports the tongue and lingual muscles in fowl. They help regulate the movement of the tongue in birds.

KERATIN

A hard protein that forms scales and claws in fowl and is the primary structural component of mature feathers. Keratin of fowl differs from keratin of mammals.

LEG SPUR/CALCAR

The bony outgrowths near the distal end of the tarsometatarsus that is covered by a pointed horny sheath and is used as weapons by male chickens

MANDIBLE

In birds, the lower jaw is modified in to lower beak and is supported by mandible.

MANUS

The portion of the wing distal to the radius and ulna that is supported by carpals, carpometacarpals and digits.. The primary feathers attach to the manus

MECKELS DIVERTICULUM

Meckel's Diverticulum is a remanent of the yolksac found in the free surface of the mid jejunum.

METACARPALS

In chicken, they are three in number and are fused with the distal row of the carpals to make carpometacarpus.

METATARSALS

In chicken they are three in number and are fused with the distal row of tarsals to form the tarsometatarsus.

MONOCULAR VISION

Type of vision that produces flat, two-dimensional images, in contrast to binocular vision, which produces three-dimensional images. Monocular vision is a result when the eyes are positioned on the lateral sides of the head such that an object can be seen by one eye or the other, but not by both eyes at the same time.

OCCIPITAL CONDYLE

A prominent single cylindrical articular surface on the basioccipital of the skull with which the atlas (the first cervical vertebra) articulates. In contrast, mammals have two.

OIL GLAND/PREEN

GLAND/UROPYGEAL GLAND

The gland, located at the dorsal aspect of the base of the tail that secretes oils that the birds spread over their feathers during preening. The oils prevent the feathers and scales from becoming brittle, and to waterproof the bird. Its secretion attracts male birds for mating in some species.

Operculum

It is a flap of horny skin on the dorsal border of the cartilaginous nostrils in chicken. . It partially cover the nares and it may help to keep out debris.

ORBIT

Cavity in the skull that houses the eye. It is very big in birds to accommodate the larger eyeballs. The space available for the intraorbital movement of the eyeball is still limited in birds.

OVARY

The female gonad in fowl. It matures and releases egg cells (ova) periodically throughout the breeding season in a process called ovulation. In most birds only the left ovary is functional.

OVIDUCT/FALLOPIAN TUBE

The tube that transports the egg from the ovary to the urodeum of cloaca in chicken. Only left oviduct is developed to support the left ovary in fowl. it is suspended between two layers of the peritoneum that form its dorsal and ventral ligaments. It consists of five parts such as:

1. Infundibulum a funnel shaped structure with



delicate walls to capture the ovum as it is released from the ovary.

2. Magnum that forms the major part of the tube, thick walled and secretes about 40% of the egg albumen
3. Isthmus with narrow lumen that connects magnum with uterus. It secretes albumen and shell membrane.
4. Uterus or shell gland that secretes rest 40% of egg albumen and the shell of the egg is formed in this segment. It ends in a sphincter in front of vagina
5. Vagina is where the muscular cuticle of the egg is formed. Oviposition for laying occurs here. It terminates in the urodeum of cloaca.

PARABRONCHI

Tiny (microscopic) air tubes formed by the branching of secondary bronchi within the avian lung. It is the functional unit of the avian lung for gas exchange.

PECTEN

It is a pigmented highly vascularized structure similar to the choroid layer in chicken and other birds. It posses number of folds that projects from the optic disc into the vitreous body towards the lens where the optic nerve exits the eyeball. The pecten is believed to nourish the retina and to control the pH of the vitreous body.

PECTORAL GIRDLE/ SHOULDER GIRDLE

The part of the appendicular skeleton formed by the union of Clavicle, coracoids and scapula on each side of the avian body to support the wings. A functional and fully developed pectoral girdle is absent in



domestic animals.

PECTORALIS

They are large, powerful flight muscle of birds that attaches to the sternum. The pectoralis has two portions; pectoralis major and pectoralis minor (tender loin in chicken). They are considered as white muscle as they are rich in white muscle fibers.

PELVIC GIRDLE

The part of the appendicular skeleton that is formed by the ilium, ischium, and pubis on each side of the body to support the muscles of the pelvic limb, tail, and abdomen in birds. They also provide protection for the abdominal organs. These bones do not form symphysis as in other domestic animals..

PIN FEATHERS

Developing feathers that are still surrounded by a feather sheath

PLUMAGE

Refers to a bird's entire feather coat with regard to its color, pattern and arrangement.

PNEUMATIC BONES

The bones that are filled with air spaces and may contain the extensions of air sacs. These bones are hollow and possess one or more pneumatic foramen on their surface. Examples include the skull, humerus (arm bone), pelvis, and collar bones.

PROVENTRICULUS

The upper part of the stomach in chicken; that

is elongated, fusiform and glandular. The proventricular glands secrete mucus, hydrochloric acid, and an inactive precursor to pepsin, an enzyme that digests protein.

QUADRATE BONE

Bone on each side of the skull, between the upper and lower jaw that helps in wide opening of the mouth in birds. The four articulations are with the temporal, mandible, pterygoid and quadratojugal.

RED FIBERS

A muscle fiber that contains large amount of myoglobin and is permeated by massive capillary beds. These muscles can sustain actions for long periods of time and will not build up lactic acid that cause fatigue. They are often called as "dark meat" eg. Muscles of the thigh in chicken.

RENAL PORTAL SYSTEM

This system collects venous blood from the lower portion of the digestive tract via the caudal mesenteric vein, and conveys it to the venous ring within the kidney, where some of it passes through a capillary bed before being conveyed back to the heart. The system of blood flow, is found in birds but not in mammals

SCLERAL OSSICLES

The sclera of chicken at its anterior margin possess a small ring of bone called the sclera ossicles. they are not present in mammals.

STERNAL RIB

The ventral portion of the thoracic rib that articulates with the sternum ventrally and with the vertebral rib dorsally. Sternal ribs are absent in 1st, 2nd and 7th rib in chicken and hence they are floating.

SUPRACORACOIDEUS

The powerful upstroke flight muscle that raises a bird's wing. The tendon of it passes through the foramen triosseum and is fixed with the humerus. It also slows down the wing at the end of the downstroke and accelerates it at the beginning of the upstroke

SYNSACRUM

The segment of the vertebral column of birds that is formed by the fusion of last thoracic vertebrae with

all of the lumbar, all of the sacral, and the first coccygeal vertebrae in birds. It is in turn fused on either side with the ilium of the pelvis.

SYRINX/ POSTERIOR LARYNX

It is the organ of voice in chicken and other birds. It is at the level of tracheal bifurcation . It is a cartilaginous compartment with internal and external tympaniform membranes (homologous to vocal cords in mammals) that produce a slit like opening similar to the glottis in mammals.

TARSALS

Tarsals are present in birds but, the proximal tarsals fuse with the tibia to form the tibiotarsus, and the distal tarsals fuse with the metatarsals to form the tarsometatarsus.

TASTE BUDS

The receptors for taste sensations in all vertebrates. Humans have numerous taste buds located on the tongue, but birds have few taste buds, which are located primarily on the roof of the mouth or deep in the oral cavity, with none on the tongue.

TESTICLES

Testicles are paired, bean shaped and are intra abdominal unlike other animals. Scrotum is absent. The size of it increases about ten fold during breeding season. Spermatogenesis occur even at higher body temperature in fowl.

THORACIC DUCTS

These are paired lymph ducts in chicken that collect the products of fat digestion from the intestinal lymph trunk they run along the surface of the aorta and eventually deliver their contents to the venous system at the cranial vena cavae.

THORACIC VERTEBRAE



The vertebrae of the thorax are seven in number. The body of each articulate with the vertebral ribs and forms part of the rib cage. In chicken the 2nd, 3rd, 4th and 5th thoracic vertebrae are fused together, to form a single mass known as Notarium.

THYMUS

It is a lymphoid organ well developed in chicks. They are present as chain of lobules on either side of the entire length of the neck. They produce T lymphocytes.

ULTIMOBANCHIAL GLANDS

Two small, light-colored glands located near the parathyroid glands, they secrete calcitonin, which lowers the blood calcium concentration.

UNCINATE PROCESS

A flattened, hook-shaped extension of bone that projects caudally from the vertebral segment of the ribs in chicken. It helps to strengthen the rib cage and is absent in the 1st and 7th rib in chicken.

URINARY BLADDER

Sac that stores urine before it is excreted; It is absent in chicken.

WHITE FIBERS

Muscle fibers that appear lighter in color than red fibers because they have fewer capillaries and less of myoglobin. White fibers also are larger in diameter than red fibers. Muscles with many white fibers are used for quick bursts of action, but they cannot carry out sustained activity as lactic acid builds up quickly and causes fatigue. Muscles with many white fibers are called as “white meat” Eg. Pectorals in fowl

Wing vein

Cutaneous ulnar vein that extends as brachial vein in domestic fowl; preferred site for venipuncture



VALIDATION OF DNA METHYLATION BY – BISULFITE PYROSEQUENCING



Bisulfite conversion is the most extensively used procedure for delineating methylated DNA from the DNA that is unmethylated. Pyrosequencing, which is a non-electrophoretic synthesis technique is commonly regarded as a promising approach to unravel methylation in DNA. The bisulfite method can assess several CpG methylation sites in one reaction, is convenient, has excellent reproducibility, and is very affordable. The majority of illnesses viz., neurological, cardiovascular, cancer have been linked to abnormal methylation. In order to comprehend the underlying biological process of these disorders, analysis of DNA methylation patterns is essential.

Keywords: DNA methylation, bisulfite conversion, pyrosequencing, CpGs

CpG dinucleotide methylation is an epigenetic phenomenon which involves addition of methyl group (CH₃) to the carbon of cytosine at 5th position particularly at cytosine-guanine dinucleotides known as CpG islands.

DNA methyltransferases are the enzymes that are known to carry out the process of DNA methylation. Bisulfite pyrosequencing-based methylation detection method is a straightforward, highly reproducible, sensitive, a significant tool for biomarker identification and clinical diagnosis (Florea, 2016).

Because of the consistency and accuracy of pyrosequencing, measurement variance is minimal, enhancing the chance of early identification of modest changes in methylation levels. Pyrosequencing approach has opened up new avenues for sequence-based DNA analysis and can be

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utilized as a tool for studying genetic diversity.

BISULFITE CONVERSION

Treatment by sodium bisulfite brings out deamination of nonmethylated cytosines into

uracil while methylated cytosines are left unaltered in CpG dinucleotides (Pajares et al., 2021).

PRINCIPLE OF BISULFITE PYROSEQUENCING

Pyrosequencing, a non-electrophoretic synthesis method, provides real-time sequence information and is often used in genetic and epigenetic research and was first reported by Nyrén et al. in 1993.

The technique entails detecting inorganic pyrophosphate (PPi) produced during DNA synthesis. The reaction mixture is gradually supplemented with four deoxynucleotide triphosphates (dNTPs) in a predefined order. The ATP (adenosine triphosphate) sulfurylase converts the released PPi to ATP in the presence of adenosine, which gives luciferase the energy it needs to oxidize luciferin and create light. The amount of pyrophosphate released controls the amount of light emitted (=560 nm), which is comparable to the number of nucleotides incorporated in the reaction (Harrington et al., 2013). The quantity of light detected by a charge-



coupled device (CCD) camera corresponds to the amount of ATP released (about 6×10^{11} ATP molecules are produced by one pmole of DNA, and these molecules yield 6×10^9 photons). The dNTP and ATP that remain unincorporated are degraded and eliminated by apyrase. The methylation percentage is calculated by dividing the height of a cytosine peak (methylated signal) by the total of the heights of cytosine and thymine peaks (unmethylated and methylated signal) (Pajares et al., 2021).



CONCLUSION

Gaining a complete grasp of DNA methylation function in illnesses and developmental pathways has been made feasible by the quick development of novel techniques. Furthermore, DNA sequences with differential methylation may act as diagnostic, prognostic, and predictive markers in instances of cancer, autoimmune diseases, metabolic disorders, and neurological disorders. Therefore, by weighing the advantages and disadvantages of each approach, the optimum technique for methylation analysis of genome may be selected.

DIAGNOSIS OF MAJOR POULTRY DISEASES AND ASSOCIATED HOMEOPATHIC INTERVENTION



ABSTRACT

Poultry diseases are the major setbacks that cause huge economic losses both for the poultry farmers as well as the ever-growing poultry industry. Although scientific developments in the field of poultry science have skyrocketed, there are some pressing problems (such as rampant antibiotic use that pave the road towards antibiotic resistance) that slow down the progress. Hence, alternative or complementary treatment strategies are the need of the hour. Veterinary homeopathy practice is one such strategy that is gaining momentum in the treatment of diseased veterinary audience. This article delves into the vast realm of major diseases affecting poultry and the homeopathic treatments for curing such ailments.

Key words : Poultry, Diagnosis, Clinical Symptoms, Homeopathy, Disease

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INTRODUCTION

With the rising demands for poultry products viz. poultry meat and eggs owing to their low-cost good quality protein source in comparison to other meat sources, there is also a parallel rise in the incidences of diseases of varying origin affecting poultry. Such diseases not only affect the growth, performance and well-being of poultry, but also hold a zoonotic potential. The rising demands have compelled the poultry owners to choose quick remedies via allopathic medications especially antibiotics. This has resulted in the emergence of various hazards including a burning topic of antibiotic resistance. Hence, there is requirement for adoption of alternative or complementary veterinary medicine such as Homeopathy.

The widely used veterinary homeopathic preparations along with their indication include Arnica (for pain relief, preparation before and after surgery, injury treatment), Arsenic alb (diarrhea, enteritis, rash), Hypericum (against bad nerves, paralysis, broken nails), Pulsatilla (against colds, hormonal disorders), Rhus tox (against joint pain, rheumatism, paralysis) and Sulfur (for skin problems) (Sundqvist, 2020). Several trials using homeopathic preparations ((Amalcaburio et al.,



2009; Berchieri et al., 2006; Hadipour et al., 2011; Sandoval et al., 1998; Sato et al., 2012; Velkers et al., 2005; Wynn, 1998) have been conducted on poultry focussing mainly on the areas of growth performance/immunity, diarrhoea involving *E. coli*, Salmonellosis etc.

Diagnosis of multifactorial diseases is difficult and warrants an epidemiological approach where all possible etiological agents and associated risk factors are reviewed, selecting most relevant laboratory tests for determining the cause of the disease (Chaves Hernández, 2014). The diagnosis of any disease (particular species involved is poultry in this case) mainly encompasses Direct tests e.g., laboratory tests for detection of the pathogen in faeces, blood etc.; Indirect tests e.g. general blood parameters etc.; observation of Clinical signs/ pathognomonic post-mortem lesions as well as Measurements e.g., body temperature, body weight etc (Doehring & Sundrum, 2016).

The commonly noted major poultry diseases, their diagnosis (Chakrabarti, 2010; Chaves Hernández, 2014) and homeopathic treatment (Muhammed, 2020) are discussed as under:

RANIKHET DISEASE/ NEWCASTLE DISEASE (ND):

- Causative organism is Paramyxovirus type-1 (PMV-1) belonging to the genus Avulavirus and Paramyxoviridae family.
- It is characterised by twisting of neck and paralysis of wings/ legs, cyanosis of comb, facial edema, diarrhoea, drop in egg production, sudden death etc.
- Gross post-mortem findings include petechial haemorrhage in proventriculus, intestinal

haemorrhages, Congestion and mucoid exudates seen in the respiratory tract (trachea).

- Serological tests include HA and HI test, ELISA. Etiological diagnosis (antigen detection) via Virus isolation in SPF embryonated fowl eggs, RT-PCR and rRT-PCR techniques.
- Homeopathic intervention: Belladonna, Arsenic Album, Aconite, Veratrum album, Cicuta Virosa, Sulphur, Carbo Veg, Causticum, Gelsemium, Kali phos, Mag Phos, Calcarea phos.

MAREK'S DISEASE (MD)

- Causative organism is Herpes virus.
- It is characterised by lameness or paralysis around 12 weeks of age, sudden death, torticollis, etc.
- Gross post-mortem findings include enlarged nerves/ feather follicles, lymphoid tumors etc.
- Serological tests include AGID, ELISA. Etiological diagnosis (antigen detection) via Virus isolation in cell cultures, PCR, Real-time quantitative-PCR.
- Homeopathic intervention: Tuberculinum, Antimonium tartaricum, China, Causticum, Gelsemium, Carbo veg.

INFECTIOUS BURSAL DISEASE (IBD)

- Causative organism is Birna virus belonging to the family Birnaviridae and genus Avibirna virus.
- It is characterised by watery and whitish diarrhoea, closed eyes and death, ruffled feathers etc.
- Characteristic gross post-mortem findings include petechial haemorrhages on the leg, thigh



and pectoral muscles; haemorrhage in the Proventriculus and Gizzard junction, enlargement of Bursa of Fabricius to almost double its normal size.

- Serological tests include AGID, VN, ELISA. Etiological diagnosis (antigen detection) via Virus isolation in specific antibody- negative chicken embryos or cell cultures, Immunofluorescence, AC-ELISA, RT-PCR and RT-PCR-RFLP.
- Homeopathic intervention: Callendulla (immunity booster by stimulating lymphatic drainage, a hepatic protector, anti-microbial activity), Gelsemium (reduces pain especially neuralgic affections, Measles, Pellagra), Echinacea anguifolia (indicated in blood poisonings, virulent infections, Lymphatic inflammations), Alfalfa (promotes appetite, indicated in rheumatic diathesis), Acid phos (relieves Fatigue and Stress).

AVIAN INFLUENZA (BIRD FLU)

- Causative organism is Avian Influenza Type A virus (H5N1) belonging to Orthomyxoviridae family.
- It is characterised by sudden death, swelling of head/ eyelids/ comb/ wattles/ hocks, nasal discharge etc.
- Serological tests include AGID, HA and HI test, ELISA. Etiological diagnosis (antigen detection) via Virus isolation in SPF embryonated chicken eggs, AC-ELISA, Immunofluorescence and immunohistochemistry, RT-PCR and rRT - PCR techniques
- Homeopathic intervention: Allium cepa, Rhus tox, Aconite, Influenzinum, Ars alb, Belladonna, Drosera, Kali iod, Gelsemium, Lachesis, Argentum nitricum, Tartar Emetic, Millifolium, Kali bich.

COLLIBACILLOSIS

- Causative organism is Escherichia coli (E. coli).
- It is characterised by manifestations such as colisepticaemia, enteritis, coli granuloma, yolk sac infection, air sacculitis, mortality after first week of hatching etc.
- Gross post-mortem lesions include egg peritonitis, caseated egg mass inside oviduct, septicaemic carcass with liver, spleen, lung, kidney dark and congested etc.
- Isolation and identification of causative

organism.

- Homeopathic intervention: Bacilinum (indicated in lung affections, Bronchorrhoea, Respiratory pyorrhoea, Pneumonia, Tuberculosis), Cuprum met (Anti Bacterial and Anti-viral property, termed 'antimicrobial copper'), Drosera (indicated in Laryngeal phthisis, Vomiting, Profuse expectoration), Ipecacuanha (Action over Pneumogastric nerve, nausea vomiting and indicated after indigestible food ingestion), Influenzinum (indicated in Respiratory viral infection), Pyrogenium (indicated in Septic infections), Tuja (Anti-bacterial property, Bird flu, helps to increase oxidative metabolism of birds), Escherichia coli (indicated in E-coli infections).

INFECTIOUS CORYZA

- Causative organism is Haemophilus gallinarum.
- The disease is characterised by affections of upper respiratory tract (sneezing, coughing), sero-mucoid nasal and ocular discharges and facial oedema, conjunctivitis with closed eyes etc.
- Isolation of organism from air sac/ nasal exudates.
- Serological tests include Gel precipitation, tube agglutination, HA test. Inoculation of nasal exudate into healthy chicks by intranasal passage (symptoms appear within 24-48 hours).
- Homeopathic intervention: Arsenic album, Aconitum napellus, Mercurius vivus, Euphrasia officinalis, Hepar sulphuris.

FOWL CHOLERA

- Causative organism is Pasteurella multocida.
- Its acute stage is characterised by sudden death without any symptom. In case of less severe form, there will be rapid breathing, ruffled feather as well as comb and wattle become cyanotic, presence of yellowish diarrhoea. In chronic form, oedema of comb and wattle, hot and painful joints.
- Demonstration of gram-negative bipolar organism in blood smear or impression smear of liver/ bone marrow.
- Serological tests are rarely used for diagnosis of Fowl cholera. Etiological diagnosis (antigen detection) via Culture (Blood agar, trypticase-soy agar, and dextrose starch agar) and biochemical test, Somatic typing procedure using gel diffusion precipitin test, REA.



- Homeopathic intervention: Sulphur, Arsenicum album, Calcarea phos, Ferrum phos, Kalium phos, Kalium sulph, Veratrum album, Podophyllum, Cina.

AVIAN TUBERCULOSIS

- Causative organism is *Yersinia pseudotuberculosis*.
- It is a chronic contagious disease primarily observed in older birds (more than one year age).
- Gross post-mortem lesions include enlarged, friable liver/ spleen with white nodules of varied size.
- Demonstration of acid-fast organism in impression smears.
- Serological tests include Tuberculin test, Blood stained-antigen agglutination test. Etiological diagnosis (antigen detection) via detection of acid-fast bacilli in smears or tissue sections from affected organs, Culture (Lowenstein–Jensen, Herrold medium and other media), Typing methods: ELISA and HPLC, PCR, multiplex-PCR and PCR-RFLP.
- Homeopathic intervention: Aviaire, Tuberculinum, Arsenicum

PULLORUM DISEASE

- Causative organism is *Salmonella pullorum*.
- Otherwise known as Bacillary White Diarrhoea. It is characterized by high mortality in baby chicks within 1-2 weeks age. Affected chicks void chalky white excreta.
- Gross post-mortem lesions usually involve liver enlargement/ congestion, haemorrhagic streaks in liver or lungs.
- Serological tests include Rapid whole blood plate or serum agglutination test. Etiological

diagnosis (antigen detection) via Culture (Mac Conkey agar, xylose lysine, brilliant green agar, Rappaport–Vassiliadis soya, etc.) and biochemical test (API system for Enterobacteriaceae), PCR-RFLP.

- Homeopathic intervention: Chamomilla, Arsenicum album, Calcarea phos, Mercurius, China.

COCCIDIOSIS

- It is caused by the parasites belonging to the genus *Eimeria* such as *E. brunetti*, *E. necatrix* (highly pathogenic), *E. tenella* (highly pathogenic), *E. acervulina*, *E. maxima*, *E. mitis*, and *E. precox*.
- The disease is characterised by presence of chocolate coloured/ blood-stained droppings, dehydration, drooping wings.
- Detection of eggs from droppings can be done under microscope and examination of scrapings from intestinal mucosa, caecum etc. to find different parasitic stages.
- Gross post-mortem lesions involve distended small intestine filled with fluids/ clotted blood.
- Histopathological examination for identification of various stages of parasitic development in the intestinal/caecal mucosa.
- Homeopathic intervention: Merc cor (indicated in bloody droppings in birds), Nux vomica (indicated in Lack of appetite, GI disturbances), Chelidonium (indicated in Pale comb, inflamed liver), Sulphur (indicated in pale comb, fortify the action of other remedy). Merc sol (indicated in Bloody, slimy diarrhoea, caecal cocci), Ipecacuanha (indicated in Haemorrhages, cocci in birds, vomiting, drooping).

CONCLUSION

The present article summarizes the various diagnostic methods used to diagnose all notifiable diseases of poultry and the homeopathic remedies for the same. Although veterinary homeopathy is in its infancy stage and there is lack of skilled veterinary homeopathic professionals, efforts should be taken for the growth and expansion of the promising field. This information will be beneficial to the poultry farmers, field veterinarians and persons involved in poultry research as it provides valuable insights from ‘One Health’ point of view and encourages to take preventive measures for safeguarding poultry health as well as the health of humans and environment at large.

COLLECTION AND SUBMISSION OF LABORATORY SAMPLES FOR DISEASE DIAGNOSIS

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Collection of samples plays most important role in exact diagnosis and confirmation of the disease. Biological and non biological samples have to be collected and sent to the laboratory to arrive at a correct diagnosis. But apart from this, the most important is appropriate sampling, their preservation; its proper labeling and its transportation to laboratory in appropriate environment. There are specific methods for collection of specific samples for respective diseases.

- Correct sampling
- Correct preservation
- Correct Labelling and Identification:
- Owner's name & Address
- Species
- Breed
- Sex
- Age
- A detailed case history should include:
- Clinical signs
- Gross appearance (including size and location) of the lesion(s)
- Previous treatment (if any)
- number of animals at risk and any mortality in the group
- Mention type of sample submitted
- Tentative diagnosis
- Clinician's Name and Contact number

GENERAL CONSIDERATION FOR SUBMISSION OF SAMPLES

- If possible, Sample should be collected before

administration of any treatment.

- Samples should be collected from the affected site as early as possible following onset of clinical symptoms.
- Samples should be collected from living and recently dead animals.
- Samples should be collected from clinical cases, in-contact animals and healthy animals.
- Sample should be appropriate for the intended purpose, adequate in number and amount to provide statistically valid results.
- Samples should be collected without environmental contamination and avoid cross contamination between samples.

- Sample must be carefully packed, labelled and transmitted to the laboratory.
- Samples should be labeled with permanent marker. Use of gel pen should be avoided.
- A duplicate sample should always be kept in vitro-legal cases.
- For Bacteriological and Virological examination the material should be transported in ice.
- For paired serum samples, one sample should be collected at onset of disease and second sample should be collected at least 14-21 days after first

COLLECTION OF VARIOUS SAMPLES

Blood Sample



- In Cattle, Horses, Sheep & Goat, Blood should be collected from Juglar vein.
- In Dogs & Cats: Cephalic vein or Saphenous vein.
- Birds: Wing vein or Comb.
- Pigs: Ear vein or Juglar vein
- Blood sample should be collected in clean dry vials/tubes. **(Figure 1)**
- Hematology/culture/direct examination: Use anticoagulant (EDTA coated vacutainer be used). Heparin is also used.
- Serology: Clotted blood (Serum vacutainers)
- Parasitology: In EDTA vial or wet blood film or thin blood smear on glass slide.

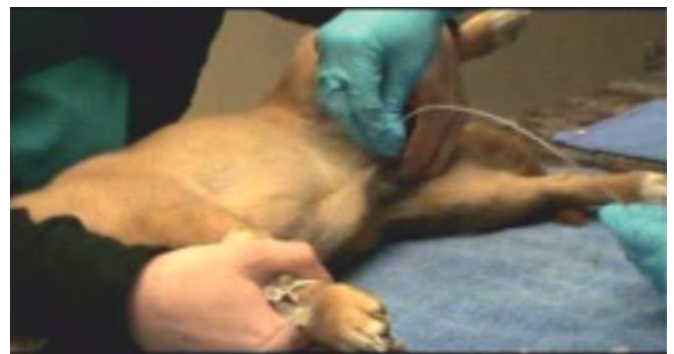
Faecal Sample

- For Parasitic or Microbiological investigation.
- Fresh faecal sample (2-5g) should be collected from rectum. **(Figure 2)**
- If transport time is likely to be longer than 24hrs, the sample should be sent on ice or refrigerated to prevent the hatching of parasitic eggs.



- Faeces are best stored and transported at 4°C and 5% formalin.

Urine Sample



- Urinalysis, Microbiological investigation.
- Fresh Urine sample should be collected aseptically by midstream or catheter. **(Figure 3)**
- Microbiological examination: Avoid contamination, refrigerate immediately and transported to lab within 1hr.
- Fresh urine sample within 20 minutes of collection should be submitted to lab to examine Leptospira motility, otherwise to study Leptospira motility submit 20ml urine sample preserved with 1.5ml of 10% formalin.

Skin Sample



- Burrowing Mites/Mange: Deep skin scraping using scalpel blade. **(Figure 4)**

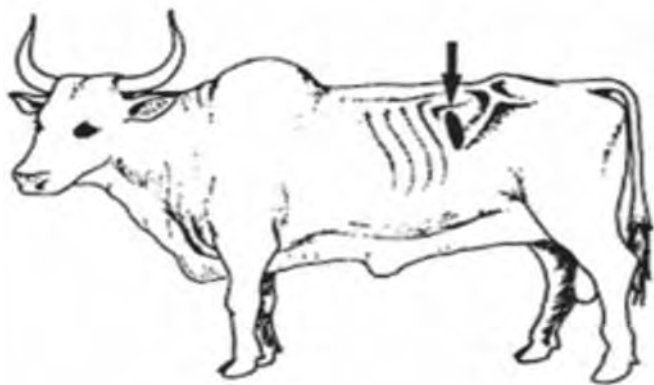
- Surface-feeding mite/lice or Fungal Infection: Plucked hair or superficial skin scrapings
- Add few drops of 10% KOH.
- Submitted in cotton plugged test tube or paper envelop.

Milk Sample



- Milk should be collected aseptically from each affected quarter and marked properly as from LF, LH, RF, RH, etc. (Figure 5)
- The initial stream of milk should be discarded.
- Bacteriological examination: Milk sample should be refrigerated and sent immediately to laboratory.

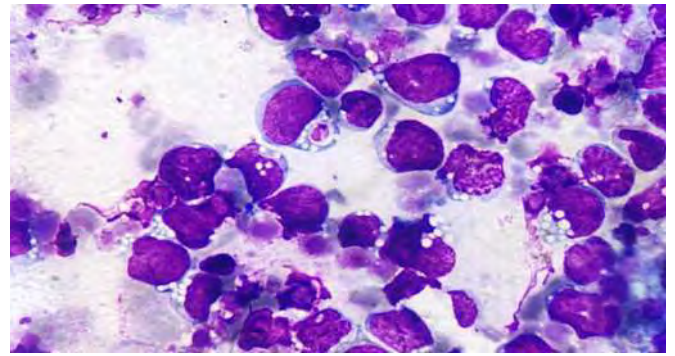
Rumen Liquor



- Collected by stomach tube, rumen fistula and by hypodermic needle (6 inch) from Paralumbar Fossa. (Figure 6)
- Mercuric chloride @ 1mg/5ml of rumen liquor can be used as preservative.

Lymph Node Smear

- Inject 1-2ml of sterile PBS to Prescapular lymph node, rub it and suck the fluid from the same. Prepare smear and stain it for demonstration of Theileria. (Figure 7)



Pus, Sputum, Nasal, Throat, Lacrimal secretions



- These are collected on sterile cotton swabs. (Figure 8)
- Swab should be allowed to remain in contact with the secretions for upto 1 minute, then place in transport media and send to laboratory at 4°C.

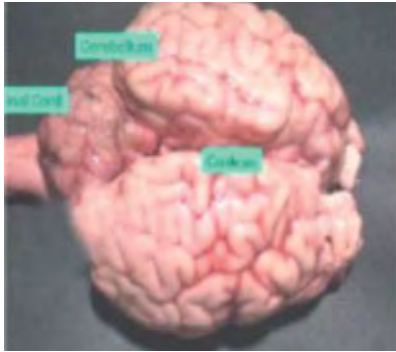
Genital tract and Semen

- Vaginal mucus swabs: For diagnosing the bacterial cause of infertility. In case of bitches, to detect stage of heat.
- Semen: Best obtained using an Artificial Vagina for examining quality of semen and in preventing spread of sexually transmitted diseases.

Preputial washings

- About 50ml of sterile PBS (pH 7.2-7.4) inserted in prepuce, massaged and collected in sterile containers
- For demonstration and culturing of Campylobacteriosis and Trichomonosis.

Brain Sample



- BSE surveillance: Complete Brain (including Brain Stem) to be sent on ice.
- Rabies: Send complete Brain on ice. **(Figure 9)**

Sample collection at Post-Mortem



- Tissues collected either via biopsy or during necropsy. **(Figure 10)**
- Each piece of tissue should be placed in a fully labelled separate plastic bag or screw capped jar.
- Samples collected for histology should never be

>1 cm thick (preferably 5–7 mm) and must be placed immediately into ≥ 10 times their volume of 10% formalin to ensure adequate fixation.

- Because the GI mucosa decomposes rapidly, short sections of Gut collected at necropsy should be opened lengthwise to allow adequate fixation.
- Tissue samples collected at necropsy should include some of the apparently normal surrounding tissue.
- Excisional biopsies of small tumors (<1.5 cm) may be cut in half. Larger tumors may be sliced like bread so that formalin can penetrate to the face of each slice.
- Autolyzed tissues are generally useless for Histopathologic examination.
- For microbiological samples care should be taken to avoid any contamination and samples should be refrigerated until shipped.
- Send Postmortem report along with samples.

Sampling in Poisoning cases

Suspected Poisoning	Samples to be submitted
Nitrate poisoning	Fodder, water serum
Urea poisoning	Feed GIT content
Fluoride poisoning	Water
Heavy metals (lead, mercury)	Blood, liver, kidney, ruminal / stomach content
Organophosphorous toxicity	Blood, liver, kidney, stomach content
Chlorinated hydrocarbon	blood adipose tissue or fat, liver, stomach
Cyanide toxicity	Fodder

- The samples for toxicological investigations be sent preferably on ice without preservative
- Desirable Sample collection for various diseases

Condition	Ante mortem sample	Post mortem sample
Haemorrhagic Septicaemia	Smear from ear vein, smear from fluid of swelling of throat, blood	Lungs, intestine, spleen, liver, heart blood
Brucellosis	Blood & serum, uterine fluid, milk of mother in sterile tube	Stomach content of aborted fetus, liver, placenta
Tuberculosis	Sputum, milk, faeces	Lungs, lymph glands showing nodular lesions, intestine, mesentric lymph glands
Glanders	Serum, Nasal discharge, pus from skin lesions	Lungs and superficial lymph nodes
Lumpy Skin Disease	Blood in EDTA, serum, Skin scab	Lung, liver, kidney or organs showing nodular lesions.
Foot & Mouth Disease	Vesicular fluid, tongue epithelium, hoof lesions sample, etc	Vesicular fluid, tongue, heart tissue, hoof lesions sample
African Swine Fever	Blood in EDTA, Serum	Lymph node, tonsils, spleen, liver, lungs
Rabies	Saliva, eye discharge	Brain
Bovine viral Diarrhea	Nasal discharge, ocular discharge, blood	Spleen, lymph nodes, liver, blood
Mastitis	Milk and pus from affected quarter	-----

Packaging and Transport of Samples

- Make sure container is leak proof, properly sealed and is not contaminated.
- If specimen is collected in syringe, remove the needle and replace it with cap prior to transport.
- The specimen just after collection is kept in appropriate preservative and sent to laboratory over ice preferably in thermos flask or insulated box.
- Box should be properly labelled.
- If a Zoonotic disease is suspected, this should also be clearly indicated on the submission form to alert laboratory personnel.
- Bacteriological samples should be refrigerated and not frozen. It should not be contaminated. Appropriate transport media should be used.
- For virological samples 50% buffered Glycerine saline is general preservative.
- Swabs for virus isolation should be placed into tissue culture fluid or isolation media.
- All parasitological samples should be dispatched in 5-10% formalin or 70% alcohol.
- Dry ice may be used if journey is longer. It is recommended that samples be sent to diagnostic laboratory without delay.

ABSTRACT

African Swine Fever (ASF) is a highly infectious and contagious hemorrhagic viral disease of pigs, wild boar/feral pigs. Pig species of all breeds and ages.



AFRICAN SWINE FEVER

A New Emerging Disease Of Pigs

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Transmitted through direct and indirect contacts, ingestion of contaminated feedstuffs and by certain tick vector species. ASFV is a DNA virus of the Asfarviridae family and genus Asfivirus. Mortality rate is as high as 100% The disease does not infect humans (not Zoonotic) or other livestock species. The incubation period varies from 4 to 19 days.

However, no vaccine or drugs are available to prevent ASF infection at present.

ASF was detected first in 1921 in Kenya and is generally prevalent and endemic in countries of sub-Saharan Africa, Europe and in some Caribbean countries. India notified the first outbreak of ASF virus in January, 2020 in the North Eastern States of Assam and Arunachal Pradesh.

SYMPTOMS

The clinical syndromes vary from per-acute, acute, sub-acute to chronic form depending on various factors like virus virulence, swine breed affected, route of exposure, infectious dose, and endemic status in the area.

Per-Acute form - High fever (41-42 °C) and

sudden death within 1-3 days.

Acute form - High fever (40-42°C) with reddening of skin of ear tip, tail, ventral aspects of chest and abdomen, and death within 6-9 days for highly virulent strains, or 11-15 days for moderately virulent isolates. Mortality upto 90-100 % .



Reddening of skin of ear tip

SUB-ACUTE FORM

Slight fever, reddening of skin and death within 15-45 days. Mortality between 30-70% .



Reddening of skin

CHRONIC FORM

The mortality rate in this form is less than 30%. Pig shows irregular peaks of temperature, respiratory signs, necrosis in skin, ulcer, arthritis, joint swelling.

- Lactating piglets
- Vomiting & Diarrhea
- High Fever & Conjunctivitis.
- Sudden death.
- Very weak piglets at birth (congenital tremor).
- High mortality.

SOWS

- Loss of appetite and high fever
- Abortions.
- Increment of stillbirths.
- Increment of mummified piglets.
- Seizures.
- Diarrhea.
- General reproductive failure.
- Blue discoloration of the skin.

NURSERY AND FATTENING ANIMALS

- Depressed pigs - with their head down.
- Diarrhea and anorexia
- Eye discharge and persistent fever
- Seizures and Lack of coordination.
- Blue discoloration of the skin.
- High mortality.

TRANSMISSION

The virus can spread through blood, tissues, secretions and excretions of sick and dead animals. Recovered pigs may also act as carrier. There are various modes of transmission,

Direct Transmission - Contact between sick and healthy animals .

Indirect Transmission - Feeding of garbage(swill)

containing ASF infected meat (ASFV can remain infectious for 3–6 months in uncooked pork products). Fomites include premises, vehicles, equipment, clothes.

Biological vector - Soft ticks of genus Ornithodoros.

POST-MORTEM (PM) LESIONS

Diagnosis is the first step in the process of controlling or containing a disease. Accordingly, it is necessary for Veterinarians to observe PM lesions to support clinical diagnosis of the disease.

Acute form - Haemorrhage in renal and gastro-hepatic lymph nodes, congestive splenomegaly, cutaneous ecchymoses on legs and abdomen, petechiae in mucus membranes of larynx, bladder and visceral surfaces, edema in mesenteric structures . There may also be excess haemorrhagic fluid in the body cavities and gelatinous fluid in the lungs

Chronic form - Focal caseous necrosis and mineralization of lungs, enlarged lymph node Acute forms can be confused with Classical Swine Fever (CSF) and other diseases like Swine Erysipelas, Poisoning, Salmonella, Pasteurellosis, Pseudorabies and other septicaemic conditions. Therefore, laboratory confirmation is important and a must for confirmatory diagnosis.



Hemorrhages on kidney and heart



Enlarged spleen

Hemorrhages S.I.

SAMPLES FOR LAB

In live animals

- Blood in EDTA 2ml
- Serum 2ml

In dead animals

- Spleen , Tonsils and lymph nodes
- No preservative should be added in tissue samples .and send on ice as early as possible.

PERFORMA FOR SAMPLE SUBMISSION

Sr.no	Name of owner and address	Total animals affected /mortality	Age and sex of animal	Clinical signs	Sample type	Sample code
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Laboratory diagnosis

The laboratory diagnosis consists of:

- Virus isolation
- Detection of genomic DNA by Real-time PCR.

TREATMENT

There is no treatment and vaccination . All infected animals must be isolated and culled immediately upon confirmation of presence of the virus.

CONTROL

It divides the pig population of the Country in 3 different subpopulations

- **Infected zone (IZ)** – 1 Km radius of infected premises (IP)
- **Intermediate / Surveillance zone (SZ)** – 10 Km radius from the infected premises (9 km outside the IZ)
- **Disease Free zone /Non-Infected area (FZ)** - Area outside the SZ

BIO-SECURITY

Bio-security measures

- Disinfection of area, personal hygiene of animal owners and handlers
- Farms should be kept under strict hygienic and bio-secured condition at all times including proper fencing to prevent disease transmission from domestic pigs to wild pigs and vice-versa.
- Additionally, scavenging-based pig production system should be avoided.
- Ensure there is no dumping of waste material from pig meat shops and pig farms. All waste material should be destroyed / disposed of preferably.
- Stop swill feeding practices, both from the domestic kitchens and from restaurant kitchen, considered to be one of the major risks for the spread of the virus.
- Prevent pigs from wandering to avoid contact with soft ticks vectors.
- Enhance awareness among all pig farmers and other stakeholders.

CONTROL MEASURES IN A

FERAL PIG - (FPCZ)

Prevention of contact between feral and kept pigs.

All kept pigs on the premises should be restricted to their living quarters

Feral pigs should be prevented from gaining access to any material that might come into contact with the pigs on the premises.

Restriction of pig movements - Pigs should not be moved on to or out of the premises.

Appropriate means of disinfection should be provided and used at the entrances and exits of those parts of the premises in which pigs are being kept and of the holding itself.

No carcass or any part of a feral pig should be brought onto a premises in the FPCZ

Carcasses of any feral pigs shot by owners on their premises to protect stock must be isolated from kept pigs and made available for examination, sampling and testing.

Keepers should instigate cleansing and disinfection of the location the feral pig was shot, where appropriate, to reduce the potential of virus spread

Other measures

No pig, semen, ovum or embryo should be moved out of the control zone except under license.

Any person who comes into contact with a feral pig in the infected area should take steps to ensure they do not spread infectious or potentially infectious material

Any person who finds the carcass of a feral pig should immediately inform officials so that the carcass can be sampled and tested for African swine fever.

Lifting of FPCZ - The FPCZ will be lifted after disease eradication is completed. However, the monitoring will continue in the area for at least 24 months after the last case of African Swine Fever in feral pigs, in order to support the cause for regaining disease freedom.

Feral = wild, swill = feeding garbage, Splenomegaly= enlarge spleen

Mummified piglets = large and dead piglet

Infected zone = area of infection

REFERENCE = field experience and national action plan of control of ASF

*Pictures are taken from net

किसान क्रेडिट कार्ड योजना के तहत ऋण के लिए आवश्यक जानकारियां

सार

इस लेख का उद्देश्य आवेदकों को आवश्यक दस्तावेजों को आसानी से व्यवस्थित करने और आवेदन पत्र को त्रुटिरहित रूप से भरने में सक्षम बनाना है।

परिचय

किसान क्रेडिट कार्ड योजना के तहत ऋण का लाभ लेने से पूर्व पशु पालक को यह

लेखक - डॉ. आयुष यादव

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संज्ञान में होना चाहिए कि यह सुविधा जानवरों, पक्षियों, मछली, झींगा, अन्य जलीय जीवों के पालन एवं मछली पकड़ने की अल्पकालिक ऋण आवश्यकताओं को पूरा करने के लिए है। ऋण एक 'परिक्रामी नकद ऋण सीमा' की प्रकृति का होगा यानी एक समझौता जो एक खाताधारक को एक निर्धारित रुपये सीमा तक बार-बार धन उधार लेने की अनुमति देता है।

ऋण की वापसी उधारकर्ता द्वारा की गई गतिविधि के नकदी प्रवाह या आय उत्पादन के अनुसार तय की जाएगी तथा ब्याज दर समय-समय पर जारी आरबीआई के दिशा-निर्देशों के अनुसार होगी। साथ ही साथ जो पशु पालक एक वर्ष के निर्धारित समय में ऋण का भुगतान करेंगे उन्हें ब्याज पर 3 प्रतिशत सब्सिडी का लाभ भी मिलेगा।

ऋण का पैमाना जिला स्तरीय तकनीकी समिति द्वारा स्थानीय लागत के आधार पर प्रति पशु प्रति पक्षी, आदि के आधार पर तय किया जाएगा जिसमें पशु दुग्ध उत्पादन, पशु आहार, पशु चिकित्सा सहायता, श्रम, पानी और बिजली की आपूर्ति, जैविक और अजैविक उर्वरक, मछली बीज और चारा, जैसे घटक मौजूद रहेंगे। प्रति दुधारू गाय के लिए रुपए 25,750/-, प्रति दुधारू भैंस रुपए 31,250/-, प्रति दुधारू बकरी रुपए 2,628/-, बकरी (10



मादा 1 नर) रुपए 28,908/-, प्रति सुअर रुपए 13,160/-, सुअर (2 मादा 1 नर) रुपए 39,480/-, प्रति पोल्ट्री बर्ड रुपए 100/- और प्रति 100 पोल्ट्री बर्ड के लिए रुपए 10,000/- ऋण का प्रावधान है। वर्तमान में ग्रामीण बैंक सहकारी बैंक 1: व व्यावसायिक बैंक 7: की ब्याज दर पर ऋण दे रहे हैं।

आवेदन पत्र भरने के लिए आवश्यक जानकारियां

पशुपालक को ऋण प्राप्त करने के लिए बैंक में आवेदन पत्र भरना होगा जिसमें निम्नलिखित जानकारियां त्रुटिरहित प्रस्तुत करनी होंगी।

1. आवेदक को अपना पूरा नाम, जन्म तारीख, आयु, लिंग, आधार



नंबर, वोटर कार्ड या ड्राइविंग लाइसेंस या पैन कार्ड नंबर की जानकारी भरनी होगी। साथ ही आवेदक को दो नवीन पासपोर्ट फोटो आवेदन पत्र के साथ जमा करना होगा।

2. आवेदक को अपने परिवार की जानकारी अर्थात परिवार के सदस्यों के नाम, उनकी आयु, लिंग, उनसे रिश्ता, उनका व्यवसाय, व व्यवसाय से होने वाली वार्षिक आमदनी की जानकारी देनी होगी।
3. आवेदक को अपना वर्तमान व स्थाई पता संपर्क नंबर सहित उल्लेख करना होगा और प्रमाण स्वरूप आधार कार्ड की दो छाया प्रति आवेदन के साथ संलग्न करना होगा।
4. आवेदक को अपने सामाजिक वर्ग एवं बैंकिंग की जानकारी भी आवेदन पत्र में भरनी होगी। वर्तमान बैंक का नाम, खाता नंबर व शेष राशि का उल्लेख करना होगा जिसमें आवेदक का बचत खाता, फिक्स डिपॉजिट खाता, प्रधानमंत्री जनधन योजना खाता, इत्यादि विद्यमान हैं। इसके साथ बैंक पासबुक की दो छाया प्रति संलग्न करना होगा।
5. यदि आवेदक के पास कृषि भूमि उपलब्ध है तो खसरा नंबर, क्षेत्रफल व सिंचित क्षेत्रफल की जानकारी देना होगी व प्रमाण पत्र की दो छाया प्रति संलग्न करना होगा। इसके अलावा सिंचाई का स्रोत व पैदा की जाने वाली फसलें (खरीफ, रबी व जैद) की जानकारी अद्यतन रखनी होगी।
6. आवेदक को पशुपालन से होने वाली सालाना अनुमानित आय का भी उल्लेख करना होगा।
7. आवेदक को अपनी चल-अचल संपत्ति का विवरण व वर्तमान बाजार मूल्य की जानकारी अद्यतन रखनी होगी।
8. यदि आवेदक ने पूर्व में कोई ऋण लिया है जिसका भुगतान अभी लंबित है तो वह ऋण का प्रयोजन, शेष देय राशि एवं जिस बैंक से ऋण लिया है उसका उल्लेख करेंगे व प्रमाण स्वरूप ऋण पुस्तिका संलग्न करेंगे।
9. चल-अचल संपत्ति के वर्तमान बाजार मूल्य व किसी ऋण की बकाया राशि (यदि हो तो) से आवेदक की कुल संपत्ति की गणना की

जाएगी।

10. मान लीजिए कि यदि आवेदक को ऋण प्रदान किया जाता है, तो उसे ऋण चुकाने में विफल रहने की स्थिति में प्राथमिक प्रतिभूति का विवरण देना होगा जैसे कृषि भूमि, मकान, इत्यादि।
11. यदि ऋण की राशि 1.6 लाख से अधिक है तो एक गारंटर की आवश्यकता होगी। आवेदक को गारंटीकर्ता का नाम, उम्र, निवास का पता, मोबाइल नंबर, व्यवसाय व कुल संपत्ति का उल्लेख करना होगा। यदि ऋण की राशि 1.6 लाख से कम है तो गारंटीकर्ता की आवश्यकता नहीं होगी।
12. अंत में, आवेदक को घोषणा पत्र पर यह उल्लेख करते हुए हस्ताक्षर करना होगा कि जब तक ऋण चुकाया नहीं जाता है तब तक जानवरों को नहीं बेचा जाएगा या यदि बेचा जाता है, तो उसके पुंज में नए जानवरों को खरीदना होगा।
13. अंततः, पशु चिकित्सा सहायक शल्यज्ञ और सहायक पशु चिकित्सा क्षेत्र अधिकारी आवेदक के पास पशुओं की संख्या व उक्त पशु रखने के लिए मापदंड के अनुरूप शेड है या नहीं प्रमाणित करेंगे।

निष्कर्ष

किसान क्रेडिट कार्ड योजना के तहत ऋण सुविधा पशु, पक्षी व मछलियों के पालन पोषण हेतु प्रदाय किया जा रहा है, जिसे एक निश्चित ब्याज दर पर 1 वर्ष की समय अवधि में चुकाना है।





पशु चिकित्सा में होम्योपैथी की मांग लोकप्रियता प्राप्त कर रही है। ऐसा इसलिए है क्योंकि पशुधन में कई बीमारियां पुरानी और आवर्ती प्रकृति की होती हैं जिसका इलाज एलोपैथी में कठिन है। जिस वजह से पशुपालकों का रुझान होम्योपैथी की ओर बढ़ता जा रहा है जो पशुधन की प्रतिरक्षा को मजबूत करता है और बीमारी के मूल कारण का इलाज करता है। होम्योपैथी के विज्ञान की शुरुआत जर्मन चिकित्सक डॉ. सैमुअल हैनिमैन ने 1796 में की थी। होम्योपैथी रोगी के लिए उपयुक्त दवा खोजने की एक ऐसी प्रणाली है जिसमें रोगी में दिखाई देने वाले सभी शारीरिक और मनोवैज्ञानिक संकेतों व लक्षणों को एक साथ इकट्ठा किया जाता है

क्या होम्योपैथी पशु चिकित्सा में वरदान साबित हो सकता है?

और उनका विश्लेषण किया जाता है जिसमें वर्षों से सूचीबद्ध उपचारों के विवरण के आधार पर रोगी के उपचार का चयन किया जाता है। होम्योपैथी में औषधि की बहुत कम मात्रा की जरूरत होती है तथा रोग से मुक्ति भी जल्दी मिलती है इसलिए उपचार का खर्च भी बहुत कम होता है। इस पद्धति से सिर्फ लाभ ही होता है। इसका कोई दुष्प्रभाव नहीं है। जबकि एलोपैथी में औषधि, समय और पैसा दोनों अधिक खर्च होते हैं। होम्योपैथी में औषधियाँ आम तौर पर छोटी गोलियों या तरल के रूप में आते हैं और जीभ या मसूड़ों के माध्यम से अवशोषित होने के लिए डिजाइन किए जाते हैं।

वर्तमान में, होम्योपैथी का उपयोग मुख्य रूप से मवेशियों, सूअरों और मुर्गी पालन में किया जा रहा है। उपरोक्त पशुधन में प्राप्त सकारात्मक परिणामों का उल्लेख नीचे बिंदुओं में किया गया है जो दर्शाता है कि होम्योपैथी पशुपालकों के लिए वरदान साबित हो रहा है। यद्यपि पशु चिकित्सा पद्धति में होम्योपैथी का उपयोग अभी भी प्रगति के प्रारंभिक चरण में है।

1. होम्योपैथी दवा प्राप्त करने वाले डेयरी पशुओं में प्रसव के दौरान सहायता की कोई आवश्यकता नहीं देखी गई, धन स्वास्थ्य और गर्भाधान दर में सुधार पाया गया, बछड़ों में कोई मृत्यु नहीं हुई,

लेखक - डॉ. आर्युष यादव

पशु चिकित्सा सहायक शल्यज्ञ, पशु चिकित्सालय सिरपुर, महारासुंद-493445, छत्तीसगढ़

2. और थनेला रोग, मेट्राइटिस, और जैर के रुकने के मामलों में कमियां देखी गईं।
3. होम्योपैथी उपचार प्राप्त करने वाले पशुओं में सबक्लिनिकल थनेला रोग के मामले 5 गुना तक कम पाए गए।
4. होम्योपैथी उपचार के बाद दूध की पैदावार में भी वृद्धि देखी गई है।
5. सूअरों में, मृत जन्मों की

संख्या (stillbirths), पिगलेट मृत्यु दर, धनैला रोग और मेट्राइटिस की संख्या में कमी पायी गई। साथ ही, पिगलेट के समूह के वजन (litter weight) में भी सुधार दर्ज किया गया।

5. वर्ष 2003 में किये गए शोध से ज्ञात होता है कि होम्योपैथी के उपयोग से सूअरों के सामान्य स्वास्थ्य में सुधार हुआ है जो एंटीबायोटिक दवाओं के उपयोग को 60 प्रतिशत तक कम कर सकता है।
6. होम्योपैथी श्वसन तंत्र संक्रमण (respiratory tract infection) और दस्त में भी कारगर है।
7. मुर्गियों में उच्च विकास दर और वजन में वृद्धि, और कम खाद्य रूपांतरण अनुपात (मिमक बवदअमतेपवद तंजपव) और मृत्यु दर दर्ज की गई।
8. गहन कुक्कुट पालन में, होम्योपैथी के उपयोग से मृत्यु दर 50 प्रतिशत से अधिक कम पाई गई।
9. होम्योपैथी का उपयोग आघात और एक्यूट इंजुरी जैसे मोच, गंभीर चोट, और कीड़े के डंक में किया जा सकता है। ऐसे मामलों में, उपयुक्त होम्योपैथिक उपचार सूजन और दर्द को समाप्त कर सकता है और ठीक होने में लगने वाले समय को कम कर सकता है।
10. होम्योपैथी का उपयोग संक्रमण और एलर्जी सहित सभी प्रकार की एक्यूट और क्रॉनिक त्वचा की स्थितियों के इलाज के लिए किया जा



सकता है, और यदि उचित रूप से उपयोग किया जाता है, तो प्रतिरक्षा-मध्यस्थ विकारों (immune & mediated disorders) के उपचार में भी प्रभावी हो सकता है।

11. होम्योपैथी गठिया और स्पोण्डिलोसिस के उपचार में भी सहायक है।
12. होम्योपैथी कैंसर से जुड़ी परेशानी को कम करने में भी मददगार हो सकता है।
13. आजकल खाद्य-उत्पादक पशुओं में एंटीबायोटिक दवाओं का उपयोग उपभोक्ताओं के बीच अलोकप्रिय होता जा रहा है। इसलिए, कई किसान और पशु चिकित्सक होम्योपैथी को पशुधन में बीमारियों के इलाज के विकल्प के रूप में देखते हैं और इस प्रकार एंटीबायोटिक दवाओं की खपत को कम करते हुए एंटीबायोटिक प्रतिरोध के प्रसार को भी रोकने में मदद कर रहे हैं।
14. जैविक खेती में रासायनिक रूप से संश्लेषित एलोपैथिक पशु चिकित्सा उपचार के स्थान पर होम्योपैथी के उपयोग को बढ़ावा दिया जा रहा है।

चूंकि “पशु चिकित्सा में होम्योपैथी” पर पर्याप्त साहित्य उपलब्ध नहीं है, ये कहना गलत नहीं होगा की पशु चिकित्सा में होम्योपैथी अभी तक पूर्ण रूप से स्थापित नहीं हुआ है। हालांकि, कुछ उपलब्ध साहित्य पशु चिकित्सा में होम्योपैथी के सकारात्मक प्रभाव और वरदान स्वरूप को दर्शाते हैं। अंत में, वैज्ञानिक मानते हैं की होम्योपैथिक उपचार बहुत सुरक्षित और आसान है।

A NOTE ON WORLD'S FIRST NOVEL



Three-dose Anti-rabies Vaccine For Humans

ABSTRACT

“ThRabis”, a three-dose anti-rabies vaccine is launched as a substitute for the five-dose anti-rabies vaccine to provide the full course of the vaccine in a short period and limit the number of rabies cases to zero in India by the year 2030. Keywords: ThRabis, Vaccine, Anti-rabies

INTRODUCTION

Rabies is a zoonotic and fatal, acute, progressive encephalomyelitis disease of the mammals caused by the Lyssa virus of the Rhabdoviridae family. The transmission of rabies almost always occurs via introduction of virus-laden saliva into the tissues, usually by the bite of a rabid animal (mostly dogs, cats, bats, and raccoons). The victims show typical signs of CNS disturbances like behavioral changes including aggression, altered phonation, and hyper excitability, and paralysis

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of the throat and masseter muscles with profuse salivation, inability to swallow and hydrophobia that ultimately leads to death.

In India, animal bite around 1.5 crore people every year. Ninety percent of these cases are of dog bites. Someone is bitten by a dog every two seconds in India and someone dies from rabies every 30 minutes on average. According to Business Standard (2022), of 1.5 crore people, around 20,000 people die due to the failure in completion of anti-rabies vaccine course. Similar response is recorded in the world where 59,000 people die yearly, of which most deaths are in Asia and Africa. At present, five-dose anti-rabies vaccines are available in the market by the trade names of Abhayrab, Rabipur, Vaxirab N, etc. for humans and Rabies Vet, Nobivac, etc. for animals.

THRABIS VACCINE



Recently, Cadila Pharmaceuticals Limited Company, Ahmedabad has launched the world's first novel three-dose recombinant nano-particle based anti-rabies vaccine "ThRabis" for humans. Aiming at the rabies-free India, the vaccine was launched with the campaign 'One, Two, Three. Rabies

Free'. All the existing anti-rabies vaccines require five injections within 28 days to complete the full regimen. Many animal-bite people fail to complete the full course of the vaccine due to their complicated

dosing schedule, frequent visits to the hospital and potential loss of income associated with these visits. This leaves them unprotected and susceptible to developing rabies, which is a fatal condition. "With this three-dose innovative vaccine, many more lives will be saved.

The vaccine "ThRabis" is prepared by using Virus-Like Particle technology. The vaccine generates antibodies against rabies G protein, which leads to virus neutralisation, as well as prevents virus attachment to the cell to confer protection against rabies. Unlike five-dose vaccines, the course of ThRabis vaccine is completed within a week with post-bite doses on 0th, 3rd and 7th day. The vaccine is administered intramuscularly and is extremely convenient to doctors as it is a 'ready to use' vaccine and does not require reconstitution with sterile water prior to its use (Anonymous, 2022).

CONCLUSION

The three-dose anti-rabies vaccine "ThRabis" is a major discovery in the field of science and is aimed toward making India a rabies-free country by the year 2030.



ARTIFICIAL INTELLIGENCE (AI) IN POULTRY INDUSTRY



Meat consumption is a significant topic, especially concerning its environmental impact and animal welfare. AI has become indispensable in computer science, enabling the development of intelligent machines capable of human-like tasks. In the poultry industry, AI and sensors are utilized to evaluate and improve ventilation systems, ensuring optimal conditions for poultry. Its application extends to data collection on microenvironment, behavior, health, and movement within poultry houses. With the majority of the global meat industry being poultry, there's a high demand for innovation. As meat and egg consumption rises, AI offers solutions to address these concerns while promoting ethical practices. It can monitor ambient conditions, poultry health, and equipment status, performing tasks like carcass removal and litter moisture analysis. AI also benefits postharvest activities, accurately grading poultry quality, optimizing processing operations, and providing insights for efficiency improvement. In commercial poultry farms, AI integration automates equipment management, enhancing performance and productivity by adjusting machinery based on collected data.

Keywords: Poultry, Artificial Intelligence, AI Sensors

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INTRODUCTION

In today's modern era, technology has become an indispensable part of our daily lives, simplifying tasks and yielding better results. Among the many advancements, Artificial Intelligence (AI) stands out as a remarkable innovation, often touted as a human substitute due to its ability to perform tasks traditionally handled by humans. AI finds widespread applications across various sectors, including the poultry industry, where it addresses specific challenges. Human intervention in poultry farms often leads to complications, affecting production efficiency. AI intervention significantly reduces human involvement, thereby improving overall farm efficiency (Amarnadh et al., 2023).

The poultry sector contributes substantially to India's economy, amounting to about 70,000 crores in Indian rupees, and is expected to play an increasingly vital role as the nation's economy grows (20th livestock census, 2019). With rising per capita income, there is an anticipated surge in demand for poultry products in the future. AI serves as a crucial component, enabling the development of intelligent machinery capable of tasks that traditionally require human intelligence. Its broad scope facilitates data integration and analysis, fostering data-driven decision-making and

enhancing overall business efficiency (Dwivedi et al., 2021).

A notable example of AI application is evident in Google's Search Engine, which leverages human intelligence to provide users with access to information on any topic through relevant keyword searches. Google's implementation of AI significantly streamlines the process of obtaining information from the vast expanse of the internet (Ilager et al., 2020).

GLOBAL POULTRY INDUSTRY - CURRENT STATE

Despite the growing popularity of vegetarianism and veganism, particularly in Europe and the United States of America, global meat consumption, especially poultry, continues to rise. Poultry holds a significant share in global meat consumption, with chicken meat constituting 43% of the total in 2019, equivalent to 14.7 kg per capita (OECD UN data). In recent years, poultry production has become more regulated, prompting producers to enhance their monitoring methods. This increased regulation, coupled with rising demand, has spurred the development of Precision Livestock Farming (PLF). PLF encompasses a range of tools aimed at improving livestock control through advanced technologies, including artificial intelligence. For further insights into how AI-based systems enhance livestock production and management, you can refer to our recent article on AI-Based Smart Farming (Owczarek 2022).

THE DIGITAL TRANSFORMATION CHALLENGE IN POULTRY FARMS

While the poultry industry has a relatively lower environmental impact compared to sectors like beef, it grapples with pressing issues that demand urgent solutions. Chief among these challenges is the increasing demand that poultry producers must address. However, efficient solutions often involve sacrificing animals' living space and reducing their level of control. Leveraging technology enables producers to boost production while mitigating these challenges. AI can recommend optimal space configurations and pinpoint areas for additional resource allocation.

In traditional poultry farming, animals are typically identified per flock, which can lead to quality control issues. Modern technology aims to break down this traditional approach by enabling individual animal monitoring. This shift allows for earlier detection of epidemiological risks and enables tracking of each animal's health and development. With the integration of artificial intelligence, such detailed animal identification becomes achievable without incurring additional costs (Amarnadh et al., 2023).

UTILIZATION OF ARTIFICIAL INTELLIGENCE IN POULTRY SECTOR

Utilizing AI in the poultry sector offers numerous benefits, including

- Minimizing infection risks (Reducing human interference)
- Improving efficiency (Robotics)

AI aids in farm management by analyzing data from various sensors and streamlining tasks like ventilation and feeding. Moreover, AI plays a crucial role in disease management, using machine learning and big data to detect illnesses early and minimize losses. AI also enhances trials of nutrition and medicinal products, accelerating data collection and analysis while reducing costs. Overall, AI greatly enhances efficiency and decision-making in poultry farming practices (Thornton, 2018).

FARM MANAGEMENT

Big data plays a crucial role in enhancing farm management practices, especially in agriculture, where much data is still collected manually. AI not only collects data but also processes it using cloud-stored information, enabling instant decision-making and enhancing farm efficiency (Thornton, 2018).

Robots can be programmed to gather and process data on farm management and environmental conditions, allowing for autonomous decision-making, particularly in tasks like ventilation. Machine learning and data analytics efficiently handle these tasks, continuously monitoring farm activities, a task that can be burdensome for humans. Universities are currently assessing poultry farming control systems using technologies like Zigbee and Raspberry Pi, integrating wireless sensors and GPRS, expected



to scale up in the poultry industry soon. Furthermore, AI can streamline and automate essential tasks like feeding, watering, and sanitization. Data analytics aids in predicting future outcomes by analyzing current data, facilitating accurate projections such as the weight of birds after a 30-day period. The implementation of AI in farm management promises enhanced efficiency, accuracy, and faster decision-making (Thornton, 2018).

DISEASE MANAGEMENT

Disease management is crucial in farming, with every aspect of farm activities closely tied to it. While implementing machine-based disease management can be complex due to diverse symptoms and numerous diseases, AI aided by machine learning and big data, proves instrumental in effective disease management. AI, utilizing cameras installed on farms, swiftly identifies issues like huddling and cannibalism among birds, enabling caretakers to make faster decisions and minimize losses. Birds often display unique vocalizations and abnormal behavior during illnesses, which can be captured by machines to alert veterinarians immediately upon detecting concerning behavior. Mobile applications can further aid in confirming diagnoses by utilizing mobile cameras to provide better diagnostic insights, leveraging substantial amounts of data collected by in-farm machine systems.

In a notable 2012 experiment by Oxford University scientists, dubbed "Chicken Time Warp," it was discovered that the synchronized movement of a flock can detect diseases nearly a week before their onset. Thus, AI-driven disease management holds great promise for the poultry industry, with machine learning and big data playing pivotal roles in enabling early detection, accurate diagnosis, and timely interventions, ultimately leading to better disease control and reduced losses for farmers (Amarnadh et al., 2023).

TRIALS AND EVALUATION OF NUTRITION AND MEDICINAL PRODUCTS

Furthermore, AI accelerates the evaluation of different feed formulations, a task impractical for humans at such speed. Enabled by AI, programming and robotics contribute to enhancing breed genetics and simplifying decision-making in the selection process, significantly reducing trial costs while ensuring precise results.

AI's capabilities efficiently manage the costly affair of research and development (R&D), empowering companies to conduct multiple studies within a single trial, a feat demanding significant human effort. In summary, AI's prowess in data collection, processing, and analytics greatly enhances the efficiency and cost-

effectiveness of conducting trials, comparative studies, and research and development in the poultry industry (Amarnadh et al., 2023).

APPLICATIONS OF BIG DATA AND AI IN THE POULTRY INDUSTRY - USE CASES

The poultry industry can harness the potential of AI across various aspects, from welfare monitoring to breeding optimization. Here are some key use cases demonstrating the benefits of digital transformation in poultry production:

ANIMAL IDENTIFICATION:

AI tools automate identification processes, replacing manual methods and increasing control while reducing labor demand. Computer vision-powered systems can scan identification signage or barcodes, enabling automatic identification of individual birds and easy access to their history.

AUTOMATED WEIGHING

SYSTEMS:

Utilizing cameras and sensitive sensors, automated weighing systems streamline the weighing process for poultry, minimizing stress on the birds. Data from these systems, stored in databases, facilitates health monitoring, weight uniformity tracking, and regulatory compliance.

MONITORING THE WELFARE AND IDENTIFYING DISTRESSED CHICKENS

Monitoring poultry welfare is crucial for ethical concerns, product quality assurance, and disease prevention. Artificial intelligence (AI) offers advanced tools for livestock producers to monitor animal welfare and response to environmental factors. Here's how machine learning technology can add value:

1. **AI-enabled poultry housing supports health and welfare monitoring:** through



machine vision, sound analysis, feeding behavior, water intake, animal activity, and radio frequency identification.

2. Monitoring Feed and Water Consumption:

- AI systems, paired with sensors, monitor nutrition patterns in real-time, detecting deviations that could indicate health or behavioral issues.
- These systems can identify correlations between environmental changes and feeding/water consumption patterns, helping improve animal welfare and track abnormal consumption.

3. Analysis of Activity Patterns and Movement (Daigle et al., 2014):

- AI systems linked to cameras with computer vision automatically analyze movement and posture, which can indicate animal welfare.
- By detecting anomalies, such as cannibalistic behaviors, in real-time visual data, AI systems can issue immediate warnings, preventing bird loss and improving welfare.

4. **Feces Analysis:** Fecal matter serves as a vital indicator of bird welfare. Automated systems can analyze fecal properties using computer vision or verify samples for microbiota anomalies, such as the presence of harmful bacteria.

5. **Heat Stress Monitoring:** Maintaining optimal conditions, especially temperature, is crucial for poultry welfare. Real-time temperature analysis using sensitive sensors helps detect fluctuations and triggers automatic responses like activating air conditioning and ventilation systems (Bustamante et al., 2017).

6. **Vocalization Monitoring:** Monitoring bird vocalizations provides insights into their health and behavior. AI-powered sound detection systems can identify anomalies and alert farmers to potential issues, such as cannibalistic behavior, by analyzing deviations from established patterns.

7. **Optimizing Hatcheries and Breeding:** AI plays a significant role in optimizing breeding processes and hatchery operations, improving efficiency and eliminating outdated practices. Key applications include:

- Precision livestock farming and AI in hatcheries to support embryo development, reproductive performance, and automated monitoring of laying hens.
- Automated egg grading and selection based on external features and weight, reducing wastage

and enhancing hatchery efficiency.

- Identifying live embryos in eggs using near-infrared hyperspectral imaging and machine learning algorithms, enabling the separation of viable embryos from infertile eggs early in the incubation process (Owczarek 2022).

8. Automatic Brooding Environment

Adjustment: Maintaining optimal conditions in the brooding environment is critical for the health and growth of chicks during their initial stages. AI-powered systems can continuously monitor factors such as temperature, humidity, and ventilation, automatically adjusting settings to ensure optimal conditions are maintained. This automation reduces the risk of stress-related issues and promotes healthier chick development.

9. Feeding Optimization for Growth and Nutrition:

Feeding plays a crucial role in the growth and development of poultry. AI algorithms can analyze various factors such as age, weight, and nutritional requirements to optimize feeding schedules and formulations. By tailoring feed composition and timing to the specific needs of the birds, farmers can maximize growth rates, minimize feed waste, and improve overall feed efficiency.

10. **Disease Prediction and Prevention:** AI-driven predictive models can analyze data on factors such as environmental conditions, bird behavior, and historical disease outbreaks to forecast disease risks in poultry populations. Early detection of potential disease threats allows farmers to implement preventive measures such as vaccination, biosecurity protocols, and treatment strategies, reducing the likelihood of disease outbreaks and minimizing economic losses (Okada et al., 2009).

11. Automated Egg Collection and Sorting:

AI-powered robotics can automate the process of collecting and sorting eggs in poultry farms. Using computer vision and robotic arms, these systems can identify and gently collect eggs from nest boxes, ensuring minimal damage and contamination. The eggs are then sorted based on factors such as size, weight, and quality, optimizing efficiency and egg quality control.

Overall, the integration of AI technologies in various aspects of poultry farming offers numerous benefits, including improved productivity, enhanced animal welfare, and more



efficient resource utilization. By harnessing the power of AI, poultry producers can overcome challenges, optimize operations, and ensure the sustainable growth of their businesses.

IMPROVING POULTRY HOUSES AND HATCHERIES

- Enhancing Poultry Farm Maintenance:** Predictive maintenance, facilitated by machine learning, allows poultry farmers to anticipate equipment failures and schedule repairs proactively, minimizing costly downtime and ensuring smooth farm operations.
- Post-Farm Operations for Quality Assurance:** AI extends its role beyond the poultry farms into post-farm activities, aiding processing plants in maintaining product quality and regulatory compliance. Computer vision systems can assess product quality on assembly lines, sort items accordingly, and improve processing efficiency by optimizing tasks like feather removal and meat trimming.
- Ensuring Food Safety and Efficiency:** AI-driven algorithms with computer vision capabilities enhance food safety by evaluating product compliance and streamlining processes like egg sorting and meat packing. Moreover, predictive analytics help optimize production volumes, minimizing waste and ensuring a sustainable food supply chain.
- Identifying and Improving Farm Efficiency:** Machine learning aids in identifying inefficient poultry farms by analysing key metrics such as feed conversion ratio and laying efficiency. By pinpointing areas for improvement, farmers can optimize operations and enhance overall

efficiency, contributing to sustainable poultry production.

BENEFITS OF APPLYING MACHINE LEARNING IN POULTRY FARMING AND EGG PRODUCTION SECTORS

The utilization of artificial intelligence in poultry farming and egg production offers transformative benefits, enhancing efficiency, productivity, sustainability, and safety while also revolutionizing disease management practices. Moreover, it holds the promise of discontinuing ethically questionable farming methods, thus addressing concerns raised by animal rights activists. By improving the welfare of birds, it leads to higher product quality and reduces epidemiological risks.

Additionally, by promoting the well-being of birds, the need for antibiotics and other medications decreases, adding value to the products and enabling producers to meet regulatory standards and consumer expectations more effectively.

CONCLUSION

In conclusion, the integration of artificial intelligence in poultry farming and egg production brings forth a multitude of benefits, ranging from enhanced efficiency and productivity to improved animal welfare and disease management. By leveraging AI technologies, the poultry industry can address key challenges, optimize operations, and ensure the sustainable growth of businesses while meeting regulatory standards and consumer expectations.



In the present competitive environment, survival of the organizations is getting harder and industries are becoming global. Companies now have to be more responsive, offer a better product, and keep improving. Quality control and total quality management (TQM) increases customer satisfaction by boosting quality. It does this by motivating the workforce and improving the way the company operates. In an increasingly competitive

QUALITY CONTROL AND TOTAL QUALITY MANAGEMENT IN DAIRY INDUSTRY



market, firms with a continuous improvement culture and external focus are more likely to survive and prosper. TQM is considered an important catalyst in this context.

Milk quality is all about prevention at each step of production. Quality control systems are aimed at the prevention of defects, rather than their detection. Quality

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control occurs at every step in the production, as a raw material on-farm conditions. Consumers, processors, and regulatory agencies are increasingly interested in the safety and wholesomeness of milk resulting in increased emphasis on farm management to ensure the production of milk quality.

Keywords - Quality control, HACCP, CCP, Dairy Industry, TQM



WHAT IS QUALITY CONTROL ?

Quality is defined as surpassing customer needs and expectations throughout the life of a product and creating a product of worth for all stakeholders. Quality can be defined as conformance to requirements, fitness for use, meeting and/or exceeding customer's expectations, defect avoidance etc.

WHAT IS TOTAL QUALITY MANAGEMENT ?

TQM is an approach to improving the effectiveness and flexibilities of business as a whole. It is essentially a way of organizing and involving the whole organization, every department, every activity and every single person at every level. TQM ensures that the management adopts a strategic overview of the

quality and focuses on prevention rather than inspection.

OBJECTIVES OF QUALITY CONTROL AND TQM

India is the world's largest milk-producing country for more than a decade. Quality plays a vital role for the Indian dairy industry from a food safety point of view. After 1992, due to World Trade Organization (WTO) & General Agreement on Tariffs and Trade (GATT) agreement, the world has become an open market for every product. So the quality of product is very important. Meeting the customer's requirements is the primary objective and the key to organizational survival and growth. The second objective of TQM is continuous improvement of quality. The management should stimulate the employees to become increasingly competent and creative. TQM also aims at developing a relationship of openness and trust among the employees at all levels in the organization.

QUALITY MANAGEMENT SYSTEM IN THE DAIRY INDUSTRY

The HACCP system has become a synonym for sanitary security of food products. It is worldwide acknowledged as a systematic and preventive approach to control biological, chemical, and physical dangers (hazards), using anticipation and prevention towards inspections and analyses of finite products. HACCP is a method that has to be applied by companies to secure the quality of food products, based on two main objectives: hazard analysis and determining the points, during the creation process, in which these dangers are controlled. HACCP is the best-designed quality control program for the dairy industry because it is highly farm-specific, easy to link up with operational management, relatively low cost, both product and process-oriented, and not require much labor while ISO is very laborious, costly, and non-specific in context to dairy industry.

WHAT IS HACCP ?

Hazard Analysis and Critical Control Point is a management system in which food safety is addressed through the analysis and control of biological, chemical, and physical hazards from raw material production, procurement, and handling, to manufacturing, and distribution. This concept was first developed by Pillsbury Company for NASA and was first adopted for astronauts to prevent hazards that could cause food-borne illnesses and consumption of the finished product.

Seven Principles of HACCP

- Identify the potential hazards
- Identify the critical control points (CCP)
- Establish critical limits
- Establish and implement effective monitoring procedures at CCPs
- Establish corrective actions
- Establish procedures to verify that the measures outlined above are working effectively
- Establish documents and records

Potential Hazards and Critical Control Limits

- Contamination of milk from animal and environmental sources during primary production should be minimized.
- Water used in primary production operations should be suitable for its intended purpose and should not introduce hazards in milk.

- Storage time temperature needs to be controlled during the processing and packaging.
- Microbiological hazard stems from improper personal hygiene. Chemical contaminants include plant toxins and chemicals added during the processing of milk and milk products. For example, the excess detergent left on the just cleaned equipment.
- Physical contamination is foreign material that could come from incorrect personal handling or bad environmental conditions.

SIGNIFICANCE OF TQM

The importance of TQM lies in the fact that it encourages innovation, makes the organization adaptable to change, motivates people for better quality, and integrates the business arising out of a common purpose and all these provide the organization with a valuable and distinctive competitive edge.

ELEMENTS OF TQM

1. Be customer-focused:- It requires the company to check customers' attitudes regularly and includes the idea of internal customers as well as external ones.
2. Do it right the first time:- This means avoiding rework, i.e., cutting the amount





of defective work.

3. **Constantly improve:-** Continuous improvement allows the company to get better gradually.
4. **Quality is an attitude:-** Everyone has to be committed to quality. That means changing the attitude of the entire workforce and altering the way the company.
5. **Telling staff what is going on:-** This involves improved communication. Typically, it includes team briefing.
6. **Educate and train people :-** An unskilled workforce makes mistakes. Giving more skills to workers means they can do a wider range of jobs, and do them better. It also means educating staff on the principles of TQM, which is a whole new style of working.
7. **Measure the work:-** Measurement allows the company to make decisions based on facts, not opinions. It helps to maintain standards and keep processes within the agreed tolerances.

8. **Top management must be involved:-** If senior management is not involved, the program will fail.
9. **Introduce teamwork:-** Teamwork boosts employees' morale. It reduces conflict and solves problems by hitting them with a wider range of skills. It pushes authority and responsibility downwards and provides better, more balanced solutions.

REASONS FOR FAILURE TQM FAILS BECAUSE

- Top management is not concerned for its staff.
- Top management is not committed to the TQM program.
- The company loses interest in the program after six months.
- The work force and management do not agree on what needs to happen.
- No performance measures or targets are set so progress cannot be measured.



FACTORS INFLUENCING THE DEVELOPMENT & GROWTH OF MUSCLE OF MEAT ANIMALS

The increasing pressure of world population and need to raise living standards has made the production of more and better meat. The sequence of development of various muscles in the body reflects their relative importance in serving the animal's needs. Thus, the early development of the muscles of the distal limbs confers the mobility required to forage for food; and the development of the jaw muscles promotes effective mastication of the food secured. Muscle growth is controlled by many factors like Genetic Factor, physiological age, nutritional Factor and hormones & hormones like materials.

GENETIC FACTOR

Animals of given breeds grow and develop in characteristic manners and produce carcasses with distinctive characteristics that are peculiar to breed. E.g., Duroc pigs and Angus



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cattle are known for their tendency to deposit intramuscular fat. A major difference between dairy and beef breeds is the distribution of various fat depots, dairy type animals tend to have higher proportions of subcutaneous fat than beef type animals. Mature size also is a breed characteristic, e.g., Southdown sheep are smaller than suffolk sheep.

In meat animals, Phenotypic variations are due to genotype, environment, or to an interaction of both. Genotype provide necessary potential for growth and development; the environment will tend to



maximize or minimize the realization of this potential. Occasionally, mutations occur in genes that encode for specific factors that control animal or muscle growth traits. Various genes identified by DNA isolation technique which control muscle growth.

Eg Myostatin gene for Double muscling, Callipyge gene.

MYOSTATIN GENE FOR

DOUBLE MUSCLING

It is present in cattle that results in thick, bulging muscles. Double muscled animal has the same number of muscles as normal animals but have nearly twice as many muscle fibres, which results in an exaggerated muscle hypertrophy. Coupled with nearly twice the muscle fibres, double muscle animals have a lower proportion of red fibres and a higher proportion of white fibres than normal animals.

CALLIPYGE GENE IN SHEEP

It causes enlarged muscle development in hind legs and loin area of lambs. It causes greatly exaggerated hypertrophy (as much as more than 40% more than normal) in specific muscles of loin and hind legs and less hypertrophy of muscles of forelimbs. These muscles have less fat compare to normal muscle.

At cellular level, muscle of callipyge lambs has greater protein to DNA ratio, more white muscle fibres & greater fibre diameter. This phenotype is caused by point mutation in telomeric end of ovine chromosome 18 which show polar over dominance.

PHYSIOLOGICAL AGE

Physiological age refers to stage of development of an animal that can be described by identifiable stages of body development or function, such as body weight, body composition or onset of puberty. All animals within species or breeds or among sexes do not grow, develop, fatten, or mature at the same chronological age.

Animals may attain physiological age at different chronological ages and may be described as being early or late maturing. Thus, at a given chronological age, animals from an early maturing breed would be physiologically older than animals from late maturing breed.

NUTRITIONAL FACTOR

It is possible to control the rate at which different tissues and parts of body grow and develop by altering the nutritional level of animals at critical times. Eg. When pig is maintained on high level of nutrition during first several weeks of postnatal growth, the growth rate of bone, muscle and fat is greater than pigs on a low level of nutrition. Animal full fed high concentrate diets usually produces more carcass fat & less efficient in converting feed to lean meat than are animals fed slightly below Ad libitum energy intake.

PROTEIN

An adequate amount & supply of protein is required in animal diet for growth & maintenance of tissue.

Growth rate in monogastric animals are reduced by an inadequate total amount of protein. In ruminant animals, amount & quality of dietary protein are less critical than in monogastric. If animal consume surplus of protein, the excess is broken down & uses as energy or stored as fat.

FAT

Dietary fats are used by the animal for energy & certain fatty acids are essential for growth. They also may be assimilated and deposited as body fat. All meat animals are able to synthesize fatty acids in the liver or adipose tissue from carbohydrate and proteins & fat is deposited is characteristic of species. Fat in diet of monogastric animal may be assimilated & deposited in relatively unchanged form whereas dietary fat consumed by ruminants undergo degradation & resynthesis of more saturated fat by rumen bacteria before assimilation and deposition.

HORMONES AND HORMONE – LIKE MATERIALS

Hormones are substances secreted into body fluids by ductless endocrine glands. They act as regulators of chemical reactions involved in growth process, maintenance of tissues & other physiological process. E.g., somatotropin produces lean tissue growth throughout the animal. It promotes the release of insulin like growth factor (IGF) from liver which is responsible for protein synthesis associated with somatotropins. Such hormones induced protein accretion partitions the utilization of nutrients towards lean tissue growth & away from fat deposition. Epinephrine & norepinephrine in reference to muscle tissue assist in mobilization of glycogen to provide energy however their effects influence muscle protein & lipid metabolism also. Hormones of testes & ovary play an important role in growth & development of body.

Males usually grow faster & have carcasses that are more muscular & less fat than females. Androgens stimulate growth in muscle by increasing protein synthesis, particularly muscles of forequarter of males especially those in neck & crest region shows greater development than in females. Androgens also stimulate deposition of bone salts causing increase bone growth as compare to females. Estrogens have little or no effects on skeletal muscle protein synthesis. Synthetic estrogens with synthetic progesterone are effective in increasing carcass leanness of growing wethers steers by stimulating muscle growth and suppressing fat deposition.

RULES & REGULATIONS RELATED TO MEAT TRADE

Export of animal and animal products had large contribution in Indian economy. India produced 8.80 million tonnes of meat during 2021-22, showing an annual increase of 2.31%.

India stands 5th in world meat production and accounts for 3% of the total world meat production of 220 million tonnes.

Buffaloes in India contribute about 31% of total meat production. Although India has acquired number one status in the world, contributing 13% of world's total meat production, the meat production is still lagging behind at 5th position. Meat industry (slaughter) is linked with quality leather production in which India has acquired second position in the world after Italy.

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So if proper attention will be given by government, both meat and leather market will also improve their position and hence improve export of products of animal origin.

The Government of India has laid down standards for export of meat, which include standards for abattoir, processing plants and for various meat products. The Indian meat exports are regulated as per Export (Quality control and inspection) Act, 1963 and Export of Raw meat (chilled and frozen) (Quality control and inspection) Rules, 1992.

Registration and licensing of abattoirs and meat plants is done by the APEDA and FSSAI. These laws ensure the safety and suitability of food for consumers.



FACTORS ON WHICH IT DEPENDS

Each country regulates food differently and has its own food regulatory framework. It depends on country whether a country adopts international norms developed by the Codex Alimentarius Commission of the Food and Agriculture Organization (FAO) of the United Nations or WHO (World Health Organization) or a country may also had its own suite of food regulations.

FOOD LAWS RELATED TO MEAT AND MEAT PRODUCTS IN INDIA

The Food Safety Standard Act is a little bucket for all the older laws, rules and regulations for food safety. The FSS Act took 8 older acts into one umbrella viz Prevention of Food Adulteration Act, 1954, Fruit Products Order, 1955, Meat Food Products Order, 1973, Vegetable Oil Products (Control) Order, 1947, Edible Oils Packaging (Regulation) Order 1988, Solvent Extracted Oil, De-Oiled Meal and Edible Flour (Control) Order, 1967, Milk and Milk Products Order, 1992.

1. Food Safety and Standards Authority of India (FSSAI)

The Food Safety and Standards Authority of India (FSSAI) has been established under Food Safety and Standards Act, 2006 which consolidates various acts & orders that have handled food related issues in various Ministries and Departments. FSSAI has been created for laying down science-based standards for articles of food and to regulate their manufacture, storage, distribution, sale and import to ensure availability of safe and wholesome food for human consumption.

2. Prevention of Food

Adulteration Act, 1954 (PFA)

The act promulgated by parliament in 29th September 1954 to make provision for the prevention of adulteration of food. Broadly, the PFA act covers food standards, general procedure for sampling, analysis of food,



powers of authorised officers, nature of penalties and other parameters related to food. It deals with parameters relating to food additives, preservative, colouring matters, packing & labelling of foods, prohibition & regulations of sales etc. The provisions of PFA Act and Rules are implemented by State Government and local bodies as provided in the rules.

3. MFPO (Meat Food Product Order), 1973

Meat is a highly perishable commodity i.e. why sanitary conditions and utmost hygienic measures are necessary to safeguard the quality of processed meat food products. In 1973, Government of India promulgated an Order to enforce strict quality control on the production and processing of meat food products under Essential Commodities Act 1955. The responsibility to enforce this order was entrusted to Directorate of Marketing and Inspection, Ministry of Agriculture and Rural Reconstruction.

4. Agricultural Produce (grading And Marketing) Act, 1937

The Term AGMARK was coined by the joining the words 'Ag' to mean agriculture and 'mark' for a certification mark. AGMARK provides quality standards for grading, packing and marking of agricultural and animal husbandry products including ghee and butter. AGMARK is a certification mark employed on agricultural

product in India, assuring that they conform to a set of standards approved by the directed of marketing and inspection, an agency of the Govt. of India. The central AGMARK laboratory (CAL) is located in Nagpur while there 11 regional AGMARK LABORATORIES (RALS) located in Mumbai, Delhi, Chennai, Kolkata, Kanpur, Kochi, Guntur, Amritsar, Jaipur, Rajkot and Bhopal.

5. Bureau of Indian Standard (BIS)

BIS is the national standard body of India working under the ministry of consumer affairs, food and public distribution, Govt. of India. The Bureau of Indian Standards (BIS), the National Standards Body of India is a statutory organization under the Bureau of Indian Standards Act, 1986. BIS resolves to be the leader in all matters concerning Standardization, Certification and Quality. BIS is determined to carry out its activities in close cooperation with all concerned organizations and by adopting appropriate management systems, motivating and ensuring active participation of all the employees.

6. Export (Quality Control & Inspection) 1963

- “Export” means taking out of India to be a place outside India;
- “Inspection” in relation to a commodity, means specifications stipulated in the export contract generally by inspecting either the whole batch or a selected sample or samples which purport to represent the whole batch;
- “Quality control”, means any activity having for its object the determination of the quality of a commodity (whether during the process of manufacture or production or subsequently) in order to ascertain whether it satisfies the standard.

7. The Livestock Importation Act, 1898

An Act to make better provision for the regulation of the importation of livestock. Whereas it is expedient to make better

provision for the regulation of the importation of livestock which is liable to be affected by infectious or contagious disorders.

In this Act -

1. The expression” infectious or contagious disorders” includes tick- pest, anthrax, glander, farcy, scabies and any other disease or disorder which may be specified by the Central Government by notification in the Official Gazette.
2. ” Livestock” includes horses, camels, sheep and any other animal which may be specified by the Central Government by notification in the Official Gazette.
3. ” Import” means the bringing or taking, by sea, land or air, into India.

SANITARY AND PHYTO-SANITARY REQUIREMENTS IN EXPORT ORIENTED MEAT PROCESSING PLANTS:-

The APEDA registered integrated meat processing plants receive the animals for slaughter in specially designed transport vehicles, where animals are transported in a comfortable posture without any stress. The location of the abattoir where animals are slaughtered and meat is produced should conform to BIS and should be away from environmentally polluted areas and industrial activities. Good Hygienic Practices (GHP) including protection against cross contamination between and during the operations should be followed at animal farms. The layout should have a bio-security built-in in the Plant where two zones should be clearly demarcated namely, black zone and white zone with no cross contaminations between different zones. Identification of animals by registration and tagging has to be carried out as soon as the animals arrive at the slaughter house at unloading area for slaughter which helps in traceability.

Animals after resting be subjected to ante-mortem examination by the qualified veterinarian. Only animals fit for human consumption are sent for slaughter. Animals are slaughtered by being stunned



and slaughtered mostly by Halal method in all the export oriented units. For some countries stunning is mandatory where as for other countries stunning is not allowed. After slaughter a detailed post-mortem inspection of carcasses and parts be done soon after in the abattoir. Every carcass which is found to be wholesome and fit for human consumption shall be marked as “Inspected and passed”. After the carcasses have been inspected and passed, they are washed with hot water and sanitized with 20 PPM of Chlorine. For cleaning purpose the temperature of water is kept at 65°C. For disinfection of knives hot water at 82°C be used. The quality of the water is monitored by examining the harmful metals and microbiological content through some recognized external agency. Food grade polythene film should be used in all the different procedures of packing. Proper labels should be placed in between the layers of polythene sheet. The cartons are properly strapped and shrink wrapping is done on each package so as to avoid any damage to cartons. The cartons are passed through heating tunnel (temperature at the heating tunnel is maintained from 150°C to 180°C) for 10 seconds to effect proper shrink wrapping of the film. These shrink wrapped cartons are stocked in the blast freezers at -40°C for 10 hours where deep bone temperature is brought down to -18°C. The frozen meat is kept in cold storage maintained at -18°C to -20°C till it is cleared for loading from the in-house laboratory. According to the current export and import policy of the government of India, each export consignment is subjected to compulsory microbiology and other

tests and a comprehensive pre-shipment inspection certificate is issued by the government veterinarian. Each export consignment is accompanied by the animal health certificate. The health certificate states that meat has been obtained from healthy, contagious and infectious disease free animal and also confirms that animal is subjected to ante mortem and post-mortem inspection and fit for human consumption.

POINTS TO BE CONSIDERED FOR EXPORT OF ANIMAL AND ANIMAL PRODUCTS:-

- Health requirements/guidelines of importing country
- Request of the importer
- Export rules of GOI
- Pre export quarantine and testing (as applicable)
- Inspection & certification

FOREIGN TRADE OF INDIA

- Foreign Trade (Development and Regulation) Act, 1992
- Foreign Trade (Regulation) Rules 1993
- Foreign Trade (Exemption) Order 1993
- Garments Export Entitlement Policy: 2000-2004
- Export (Quality Control and Inspection) Act, 1963
- Customs and Central Excise Duties Drawback Rules, 1995
- Foreign Exchange Management Act, 1999
- Customs and Central Excise Regulations
- Export and Import Policy – now called Foreign Trade Policy

CONCLUSION

Meat trade in India is slowly emerging as an important factor in India’s agricultural landscape. It is time for stakeholders to come up with effective business plans to take advantage of India’s largest livestock population. The demand for Indian beef is rising in the international markets, hence, one should have knowledge and awareness regarding these important laws while framing a business plan with respect to meat sector.

INNOVATIVE TECHNOLOGY & PRACTICES TRANSFORMING INDIA'S POULTRY FARMING SECTOR



Feed Transformation Proportion (FCR), which has gone from 2.5 to a great 1.6. Additionally, the time taken to accomplish the ideal body weight in grills has essentially diminished from 8 weeks to only 35

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INTRODUCTION

The Indian poultry Area has throughout the years developed dramatically and is assuming a critical part in adding to India's Gross worth added among every one of the essential areas. The area has seen an astounding development over the most recent 10 years at an accumulated annualized development rate (CAGR) of 7.5% with a combined income of ~ INR 130 Billion creating ~ 6+ Million MT of Grill meat and ~90 billion consumable eggs yearly. Today a layer bird during her financial life cycle can deliver 330 eatable eggs and a raiser bird lays around 180 eggs in her monetary life pattern of 68-70 weeks.

In worldwide egg creation, India stands firm on the third situation, delivering a stunning 82.93 billion eggs, and positions fifth in oven meat creation, yielding roughly 4.4 metric tons according to the twentieth animals evaluation. Poultry creation rehearses have developed with modernization, prompting a noteworthy improvement in grills'

days (20th livestock census, 2019).

Before this decade's over, universally, poultry meat is supposed to address 41% of all the protein from meat sources. The Indian poultry industry is ready to profit from the continuous changes in ways of life overall and dietary patterns specifically. No big surprise, the portion of coordinated business ranches is ascending as it is generally modernized and actually made do. As per government information, egg creation has been rising consistently, having ascended from 95 billion out of 2017-18 to 105 billion the next year and to 114 billion of every 2019-20. Additionally, poultry meat creation, as well, has been growing. from 3.7 mmt in 2017-18 it developed to 4.1 mmt the next year, and afterward on to 4.3 mmt in 2019-20. Albeit aggressive, a few projections propose, by 2023, the nation might create 136 billion eggs and 6.2 ml t poultry meat. The poultry business' commitment to the Indian economy is important, adding up to around 70,000 crores in Indian rupees, and it keeps on assuming an imperative part as the country's economy develops (20th livestock census, 2019) [1]. With the ascent in per capita pay,

there is a positive expectation of expanded interest for poultry items later on.

In the domain of software engineering, Computerized reasoning (artificial intelligence) remains as a fundamental part, engaging the formation of smart hardware that are fit for performing undertakings which normally required human knowledge. Simulated intelligence's wide extension works with the coordination and examination of data, empowering information driven direction and improving generally business effectiveness (Dwivedi et al., 2021). Execution of Computerized reasoning essentially decreases the work expected to acquire data from the immense spread of the web (Ilager et al., 2020).



DIGITAL CHANGE IN POULTRY INDUSTRY

Ongoing progressions in machine advances have altogether upset everyday exercises in poultry creation, expecting to decrease work prerequisites, empower day in and day out checking, and work with remote detailing. Outstanding models incorporate the execution of particular robots like GohBot and Chicken Kid. GohBot, furnished with imaging sensors and AI capacities, proficiently explores poultry house floors, gathering floor eggs, and checking ecological factors like temperatures, gases, and light levels. Chicken Kid, a creative independent



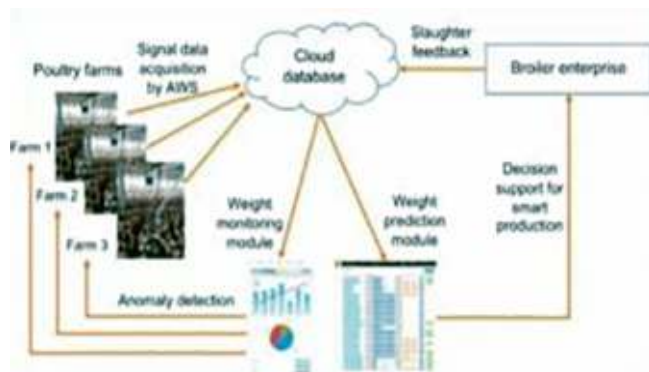
Robots in poultry production

robot suspended from the roof, uses computerized reasoning and sensor innovation to assess the general climate, recognize hardware glitches, screen the soundness of poultry and perform undertakings, for example, eliminating expired birds and dissecting dampness levels in the litter (Thornton, 2018). Mechanical innovation that utilizes man-made reasoning to assist ranchers with settling on information driven conclusions about grill creation could bring about a better, more useful developing climate. Use mechanical technology to urge the birds to be more dynamic to increment bulk, which eventually drives better upgrades with regards to the feed transformation proportion.

To work with the consistent route of GohBot inside the poultry house, it utilizes state of the art advances, for example, indoor ultrasonic GPS and Microsoft Kinect profundity information to distinguish obstructions. By utilizing way arranging and obstruction evasion schedules, GohBot can independently work while securely keeping away from connections with chickens. Moreover, sharp schedules, similar to the “bumping schedule,” delicately move birds out of the robot’s way, and a “Cruise all over” routine aides recompute the robot’s way on the off chance that a bird doesn’t move or experiences a static hindrance.

Sickness the executives holds most extreme significance in cultivating rehearses, as each part of homestead exercises is firmly connected to it. Executing machine-based sickness the executives can be many-sided, taking into account the assorted side effects and various potential illnesses. Notwithstanding, Man-made reasoning (simulated intelligence) is supposed to work on this cycle in no time, especially through its job in helping with finding. This is where AI and large information become possibly the most important factor, demonstrating instrumental in powerful sickness the executives.

New logical programming can recognize side effects of laryngotracheitis, irresistible bronchitis and possibly different illnesses as well as government assistance issues. AI strategies, sound programming can assist ranchers with recognizing debilitated birds before they can. Utilizing cameras introduced on ranches, man-made intelligence can quickly distinguish issues like crouching and human flesh consumption among birds, speedily informing overseers to settle on quicker choices and limit misfortunes. Birds frequently display remarkable vocalizations and strange way of behaving during ailments. By taking care of



Smart poultry creation and information recording for analysis

information on such eccentricities into the framework, machines can be modified to caution veterinarians promptly after recognizing any unsettling conduct.

Palatable Antibodies empower chicken makers to portion room-temperature stable immunization in the feed for both mucosal (in the stomach) and foundational (intracellular) assurance against coccidiosis. The innovation stage embeds qualities for explicit antigens into corn plants to make the immunizations. Phytogenic Mixes for Coccidiosis

Control synthetically block receptors well defined for parasites and genuinely upset the parasite fingernail skin. The mixes are made out of GRAS-recorded terpenes that normally happen in food plants referred to be protected as food flavorants. Utilizing an exclusive epitome innovation, the plan will be dynamic in the digestive system of the chicken. Nanotechnology assumes a vital part in the component of following infection section. The single infection following innovation (SVT) makes it conceivable to follow the various phases of a solitary infection in its life cycle, in this manner giving powerful bits of knowledge into the essential course of infection event in living cells (Liu et al., 2020) It help in trap avian seasonal infections for early recognition.

Biosensors have concocted a ton of commitments as far as recognizing infections and illnesses associated with them. The improvement of different sorts of such biosensors, for example, Fondness based Nano-biosensors, Nano island proclivity based biosensors, Graphene liking based biosensors, Optical Nano biosensors, All out inward reflection fluorescence, Electrochemical Nano-biosensors had helped us in the quick and touchy identification of infections. Help to these Nano sensors, viral identification presently turns out to be exceptionally delicate, quick and cost has boiled down to a critical low.

In synopsis, man-made intelligence driven sickness the board holds extraordinary commitment for the poultry business, with AI and large information assuming significant parts in empowering early discovery, exact analysis, and convenient mediations, at last prompting better infectious prevention and diminished misfortunes for ranchers.

PRELIMINARIES AND ASSESSMENT OF SUSTENANCE AND THERAPEUTIC ITEMS

Man-made consciousness (computer based intelligence) offers striking effectiveness in social event and handling information, particularly during or similar preliminaries of different items.

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Automation in checking of poultry products.

mechanization has essentially further developed the cadaver quality and bundling in the poultry handling industry. Otherworldly line Imaging frameworks have demonstrated powerful in precisely presorting oven chicken. Tyson Food varieties, has effectively conveyed a PC vision framework furnished with cameras, AI calculations and so forth. This framework actually screens the amount of chicken traveling through the creation lines. The organization has plans to grow the utilization of brilliant computerization and man-made intelligence across the entirety of its plants from one side of the country to the other.

The poultry business experiences a few obstructions, including raised unrefined substance costs and the approaching gamble of sicknesses like Avian Flu. Notwithstanding, computer based intelligence's helpful effect on the business can possibly upgrade process productivity, in this way expanding reasonableness of chicken and eggs for a more extensive fragment of the populace.

MISCELLANEOUS USES

Artificial intelligence is a flexible innovation with a few applications that can influence the poultry business in numerous ways. Specifically, machine vision and savvy computerization offer critical advantages to take care of and sustenance organizations, antibody organizations and drugs. These advances further develop precision, and effectiveness and upgrade quality control in their assembling offices.

Huge integrators in the poultry business experience

the trouble of overseeing ranches that are scattered across different topographical areas. Man-made intelligence can assist with beating this snag by empowering integrators to gather and examine information from different homesteads, regardless of whether they are arranged at different areas. Moreover, computer based intelligence empowers remote observing of these ranches, giving improved command over the whole presentation framework, which incorporates layer, grill and raiser ranches.

Besides, man-made intelligence works with the quick dispersal of new innovations. With artificial intelligence, showing the viability of new innovation turns out to be a lot more straightforward, and persuading partners to embrace these developments takes less time. This sped up reception of new advancements can prompt superior practices and proficiency in the poultry business.

DEVICES USED IN AI

•Sensors

In the beyond couple of years, there have been critical upgrades in detecting innovation, set apart by more prominent assortment, accuracy, and cost-adequacy. Remote sensors, known for their adaptability, are widely utilized across different businesses like farming, natural and structural designing and crisis the board (Ruiz-Garcia et al., 2009) [5]. While their reception in different areas has been normal for quite a while, their coordination into cultivating rehearses is a later headway. At first, the principal accentuation has been on using these sensors to diminish functional costs and further develop the prosperity of creatures in the agrarian area.

•Environmental sensors

The wellbeing, endurance, and efficiency of grill chickens are intensely impacted by ecological elements, especially relative mugginess, temperature and the term of openness to these circumstances. Moreover, the presence of hurtful gases like alkali and carbon dioxide can unfavorably affect development, feed transformation, and resistant reaction in these chickens. Studies have shown that even short openness to high carbon dioxide levels in day-old

chicks can bring about higher death rates and shifts in perspective qualities (Olanrewaju et al., 2008). Thus, intently checking and managing ecological circumstances will assume an essential part in guaranteeing the prosperity of the birds. Albeit constant multi-sensor checking and control of natural circumstances, past temperature, have not been generally embraced in business poultry ranches, headways in detecting innovation have now made it possible to make reasonable frameworks for exact ecological guideline. For instance, these multi-detecting frameworks can follow different boundaries like indoor temperature, differential air strain, and air speed inside grill runs (Bustamante et al., 2017). Via consequently assessing the ventilation framework's plan and execution, these frameworks guarantee that poultry are kept in an agreeable climate.

An extra delineation relates to the combination of sensors fit for social occasion information on relative stickiness, temperature, smelling salts and carbon dioxide fixations at the same time (Jackman et al., 2015). By coupling nonstop continuous checking of the climate with modern demonstrating instruments, it becomes possible to lay out an advance notice framework that identifies any likely deviations from weight acquires that are focused on. This framework can likewise act as a sign of wellbeing or government assistance gambles for the poultry. Such a methodology holds the commitment of guaranteeing ideal and predictable ecological circumstances just plain silly.

•Acoustic sensors

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•Movement sensors

Working with opportunity of development is a basic part of guaranteeing great creature government assistance, as creatures genuinely should move without limitations for their prosperity. By and by, a few elements in poultry raising circumstances, including packing, restricted space in lodging, and medical problems, can block their development. Thusly, the degree of development, or the scarcity in that department, straightforwardly mirrors the government assistance status of poultry.

Development sensors have been utilized to research different aspects of development in grills and laying hens. One remarkable model is the utilization of piezoelectric precious stones to assess movement issues in ovens, explicitly zeroing in on breaking down the pinnacle vertical power applied on the two feet during snapshots of shortcoming. This approach empowered the recognizable proof of imbalance in top powers between each foot, which made sense of the lopsided walk saw in male grills. Such headways address a huge step towards accomplishing continuous evaluation of grill walk. In rundown, development sensors and related advances assume a pivotal part in evaluating and

further developing poultry government assistance. By offering significant experiences into motion lacks, stride appraisal, and possible risks in elective lodging frameworks, the usage of development sensors adds to the improvement of plan and the executives rehearses zeroed in on upgrading the government assistance of grills and laying hens. These information help in distinguishing regions for development and executing estimates that focus on the prosperity and solace of the birds (Daigle et al., 2014).

A) Sensors for health status detection

In painstakingly checked exploratory circumstances, remote gadgets with internal heat level sensors and accelerometers have been utilized to recognize exceptionally pathogenic avian flu tainted chicks as long as six hours before they kick the bucket (Okada et al., 2009). Afterward, using a remote 3-pivot accelerometer and an outspread lead thermistor, a similar exploration group made more refined device. To empower the early finding of avian flu side effects, this improved framework conveyed action and temperature information to remote sensor hubs. This innovation demonstrated the capacity to recognize odd states welcomed on by the infection two times as early contrasted with utilizing internal heat level sensors alone, getting a recognition proportion of 100 percent.

In spite of the fact that executing such detecting hardware in huge poultry rushes may be testing, it very well may be successfully utilized on a subpopulation of sentinel birds, filling in as a safeguard or early discovery system, especially in high-risk regions. Moreover, as temperature changes and diminished action are normal general side effects for different illnesses, this straightforward hardware could likewise act as an alarming framework for identifying other potential wellbeing gambles.

B) Precision Livestock Farming

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CONCLUSIONS

There is areas of strength for an in regards to the critical effect of Computerized reasoning in the poultry business. In no time, computer based intelligence is supposed to change the poultry area and contribute decidedly by improving productivity and exactness at all levels of the business. Many organizations have proactively started investigating the use of man-made intelligence all through the worth chain and are effectively executing simulated intelligence arrangements. The computerization has empowered lift to many folds. Presently use of PC based advances in feed details, egg and meat creation has produced a major information on all tasks. Mechanization can be utilized to supplant difficult work on poultry ranches with regards to dreary assignments like really looking at bird government assistance, inoculations and overseeing litter. The capability of Man-made brainpower in the poultry business is massive, as it tends to various difficulties that can't be defeated without the reconciliation of machines and mechanical technology. Embracing new innovations will prompt more reasonable chicken and eggs for shoppers by upgrading the whole presentation framework's effectiveness. Nonetheless, the furthest down the line advancements will change the future cultivating frameworks assuming they are utilized appropriately searching in to the financial ramifications in embracing fresher advancements.

Leptospirosis is a bacterial disease of zoonotic importance, prevalent globally and it affects most of the mammalian species including both domestic animals and wild animals. According to WHO, in India, huge and diversified animal population with their close contact with farming community is playing an important role in the spread of the disease. Leptospirosis was described as the occupational disease in the ancient China. It occurs throughout the year with high incidence during the rainy season due to the survival of leptospira in water logged conditions and slightly alkaline environment for long time. Bovine leptospirosis has been associated with serious financial loss due to infertility, abortions, high culling rates, mastitis or

LEPTOSPIROSIS

- An Overview

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decrease in milk yield. The abortions of leptospirosis are due to interference with the implantation of embryo or with other pregnancy events.

Leptospira are thin spiral organisms of 0.1mm x 6 – 20mm, with tightly set coils. These are Gram negative, strict aerobes, motile by endoflagella on its long axis – by rotating (“spinning”) and bending – flexuous type of motility. Usually, one or both ends of this single-cell organism are bent or hooked. These are poorly stained by conventional methods but different staining techniques dark field microscopy, phase contrast microscopy, silver impregnation technique and immunological staining are used.

Earlier they were classified based on serological reactions into 2 species as: *L. interrogans* which is pathogenic and *L.*

biflexa which is saprophytic. Currently 20 recognized species which can be classified into 3 groups viz., pathogens, nonpathogens and organisms of uncertain pathogenicity. About >250 pathogenic serovars in 24 serogroups are defined.

Synonyms: Canicola fever, Hemorrhagic jaundice, Mud fever, Swamp fever, Swine herd's disease, Weil's disease.

Host : Man, buffalo, camel, cat, cattle, dog, horse, pig, rodents



PATHOGENESIS

Organisms localize in PCT of kidneys & are excreted in urine for long by reservoir hosts without clinical signs. Many serovars of leptospirae can be roughly categorized as host adapted or non adapted.

HOST ADAPTED SEROVARS

Mild and sporadic infection, with venereal transmission and lifelong colonization of the genitourinary tract. Serovars hardjo in cattle and bratislava and tarassovi in swine are examples.

NON ADAPTED STRAINS

More likely to produce catastrophic infections, with abortion storms in pregnant animals and, not infrequently, death of adult hosts. The carrier state is generally brief. Serovar pomona is non adapted for swine and cattle, canicola for dogs, Icterohaemorrhagiae adapted to rats and Ballum are adapted to mice. The relationship between hosts and adapted strains gives rise to a minor but long-lasting serologic response, whereas non adapted strains provoke high antibody titres.

Leptospiral endotoxin is of low potency, compared with that of many other gram-negative bacteria. It mediates adherence of neutrophils to endothelial cells and platelets, suggesting a role in development of thrombocytopenia. LPS is immunogenic, activates HIR via TLR 2 & is responsible for serovar specificity. In acute leptospirosis, damage to vascular endothelium is common, with resulting haemorrhage and disseminated intravascular coagulation (DIC). The DIC may be mediated, at least in part, by endotoxin, but sphingomyelinase haemolysin produced by many serovars may be responsible for this vascular damage and for specific clinical signs such as haemoglobinuria.

MODES OF TRANSMISSION

Carriers are major means of host-to-host transmission. By direct or indirect contact through nasal, oral, or eye mucosal membranes or abraded or traumatized skin with urine or carcasses of infected animals. Urine: Indirect exposure through water, soil, or foods contaminated by urine from infected animals is the most common route. After a short period of circulating high levels of the spirochete in their blood, animals shed the spirochete in their urine, contaminating the environment. Indirect exposure depends on environmental moisture, neutral soil pH, and a

sufficiently mild climate to favour survival of leptospira. Inhalation of droplet aerosols of contaminated fluids can occasionally occur. Urine aerosols in milking parlours (especially those of the herringbone configuration). The organism can also be isolated from milk of infected cows, and this probably serves as a means of transmission to humans and calves.



TRANSMISSION CYCLE

• Incubation period

The incubation period is usually 2-26 days, but usually (7 – 12 days) days

Period of Communicability or Infectious Period

Humans with leptospirosis usually excrete the organism in the urine for 4-6 weeks and occasionally for as long as 18 weeks.

Person-to-person transmission is considered extremely rare. Cases are seen sporadically throughout the year. But an outbreak occurs during the rainy season because of widespread contamination by infected rodent urine in flood water. Rodents are displaced from their burrows and drains by the water. High humidity and heavy rainfall intensify the outbreak. Rats and bandicoots distribute more virulent leptospores through their urine into the environment than other animals.

• Clinical Signs:

Man: High fever, jaundice, conjunctivitis, epistaxis, death due to acute renal failure.

Animals: Periodic ophthalmia (horses), icterus, hypogalactia, still birth, abortions.

LABORATORY DIAGNOSIS OF LEPTOSPIROSIS

Direct Diagnosis include, demonstration of the organism in body fluids by DFM, Culture and isolation of the bacteria from blood, urine or tissues, direct staining of the organisms, Immuno fluorescence, polymerase chain reaction, animal

Inoculation studies etc., where as in Indirect Diagnosis, in which demonstration of antibodies to leptospire by various serological primary, secondary and tertiary immune assays or tests, namely, Microscopic agglutination test (MAT), ELISA, Macroscopic slide agglutination test (SAT), Lateral Flow assays, Indirect Haemagglutination test (IHA), Counter immuno electrophoresis (CIE), Complement –fixation test (CFT), Latex agglutination tests (LA), Indirect fluorescent antibody test (IFAT), etc., however, ELISA and MAT are the commonly used sero-diagnostic techniques.

Clinical signs with history – expzure to contamination of urine

DEMONSTRATION OF LEPTOSPIRES OR THEIR PRODUCTS:

Dark field Microscopy

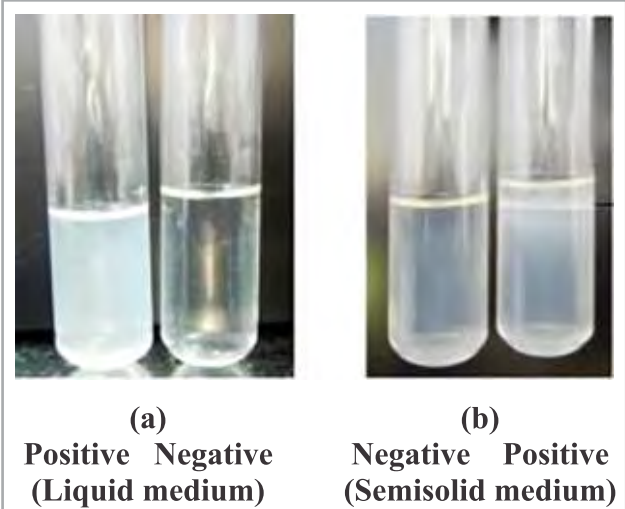
- Microscopy : silver impregnation method
- Dark-field Microscopy
- Phase contrast microscopy
- FAT
- Body fluids or impression smears

Fontana's silver staining

It is used to stain the Leptospira. In this fixative solution and mordant are used.

CULTURE MEDIA

- **Fletcher's medium** – semisolid medium, Stuart's medium, Korthoff medium and EMJH (Ellinghausen, McCullough, Johnson and Harris) medium are used. EMJH is liquid medium supplemented with 5-10% rabbit serum or BSA & Tween 80 (long chain FAs). Since the organisms are fastidious. Contaminated samples (or cultures) can be filtered through a 0.45 µm bacteriological filter and inoculated into a medium containing 5-fluorouracil at 200 µg/mL. The media can be inoculated with one to three drops of urine within a few minutes of collection, or urine diluted 1: 10 with 1% BSA, as soon as possible after collection. 10% tissue suspension in 1% BSA (one to two drops) or a few drops of oxalated or heparinized blood. Cultures are incubated at 30°C for up to 13 weeks. A drop of the culture is examined by dark-field microscopy once weekly. Serovar Hardjo is one of the slowest growing serovars.



SERODIAGNOSIS

Ideal method for diagnosis of leptospirosis is the demonstration of significant levels of antibodies to leptospire in the serum of recovered animals. Plate agglutination test with killed antigens (Macroscopic) and microscopic agglutination test (MAT) with live organisms are used as antigens. Antibodies in the test serum react with antigens on the surface of the bacteria and agglutinate them. The endpoint (titer) is taken as that dilution which gives 50% agglutination, leaving 50% of the cells free when compared with a control suspension of Leptospira is considered positive at 1:100 dilutions.

ELISAs: Detection of antibodies to the predominant serovars. Tests for the detection of both IgM and IgG are available. Use broadly reacting antigen. Serogroup cannot be identified. Readymade reagents with long shelf life. Need ELISA reader and washer.

Molecular methods are used for identification & subtyping

- PCR (serum & urine) – 16S or 23S rRNA genes of repetitive elements
- REA, RFLP, PFGE, dot blotting, in situ hybridization.

TREATMENT

Penicillin and Tetracyclines are generally used to treat the disease.

PREVENTION AND CONTROL

Prevention of environmental contamination by animal excreta. Rodent control in human habitation and agriculture fields. Provision of protective clothing to occupational workers. Do not enter pigsties or cowsheds in bare feet. Cover blisters, cuts, scratches with waterproof plasters during the work. Proper washing of the hands after handling an infected animal. Mechanization of agriculture. Avoid swimming in contaminated water. Disinfection of swimming pool with chlorine, kennel with cresol and agriculture field with copper sulphate. Regular immunization of animals. 7 in 1 vaccine is available for dogs which contains in activated Leptospira Canicola and icterohaemorrhagica. Infected bulls should not be used for breeding purpose. Maintenance of hygienic conditions insheds and kennels.

Diabetes mellitus (or 'sugar diabetes') is a complicated condition caused by either an absolute or relative lack of the hormone insulin.

Insulin is hormone is critical in the control and utilisation of blood glucose (sugar), produced by special cells in the pancreas (an organ close to the liver). Insulin is produced and released into the blood in response to increasing levels of blood glucose, and this allows the glucose to be taken up by cells in the body (and used for



CARING YOUR CAT with Diabetes

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energy) and helps to maintain normal levels of glucose in the blood.

Diabetes is one of the most common endocrine (hormonal) disorders of cats, but fortunately in most cases it can be diagnosed and managed successfully, although management options can be quite complex and treatment has to be adjusted to the individual cat.

CAUSES OF FELINE DIABETES:

There are two types of diabetes in cats. Type I occurs when there is a decrease in insulin production, while Type II occurs when cells in the body do not respond appropriately to insulin. Cats most commonly suffer from Type II diabetes.

Risk factors for feline diabetes include:

- Obesity
- Increasing age
- Lack of physical activity
- Being a male cat
- The use of glucocorticoids (steroids) to treat other illnesses

COMMON SYMPTOMS OF DIABETES IN

CATS:**• Weakness in the back legs**

Diabetes can cause nerve damage (or neuropathy) that changes the way a cat walks.

• Increased thirst

Diabetic cats aren't able to absorb and use glucose properly, which leads to high levels of glucose being filtered out through the urine, this means that your cat is losing too much water and will start trying to counter this by increasing its water intake

• Excessive urination

Since the glucose in its body is leaving via urine, you may notice that your cat is peeing more often than usual.

• Weight loss

Without proper glucose levels, cats can't fuel their bodies. You may notice that your cat has lost a lot of weight recently, even though it's eating the same amount of food.

• Increased appetite

You may notice that your cat is constantly hungry or eats more food than usual. This could be because it isn't getting the glucose that it needs from its normal diet, so it's eating more to make up for it.

• Distended abdomen

Your cat's liver may be enlarged, which can distend its belly

• Vomiting

Hyper-glycemia, or high blood sugar, happens when your cat has too little insulin in its body (or it can't use its insulin properly). When this happens, your cat may feel nauseous or even throw up.

• Cloudy eyes

High blood sugar can form cataracts over time. you'll see cloudy eyes as a symptom of diabetes in dogs, not cats. However, it can occur in both species.

ROUGH COAT

A lack of nutrients can affect your cat's fur, although many other conditions can affect the skin coat.

INVESTIGATION

Diagnostic tests should include a complete blood count, chemistries, urinalysis with culture, and thyroid testing to rule out other diseases and identify concurrent disease processes that may

complicate diabetes management. Serum fructosamine should also be evaluated to differentiate between short-term stress hyperglycemia versus long-term problems with glucose regulation.

TREATMENT OF FELINE DIABETES

- Feline diabetes can be treated by a combination of insulin and dietary therapy.
- The main goals of treatment are restoring normal blood glucose concentrations,
- Stopping or controlling weight loss,
- Stopping or minimizing signs of increased thirst and urination, and
- Avoiding inappropriately low blood sugar due to treatment (hypo-glycemia).
- While there is no cure for feline diabetes, the prognosis for a good quality of life is good with adequate management at home.

Administering Insulin:

Your veterinarian will teach you all about administering insulin for your kitty. Insulin administration is typically given 12 hours apart after meals. The needle size is small and most cats do fine with it. If you will be giving insulin, make sure you never shake the bottle of insulin and please keep your insulin refrigerated. Make it a comfortable experience for your kitty with appropriate treats and cuddles.

Monitoring Your Cat at Home

Monitoring a diabetic cat at home requires careful attention to a few things. Cats with well-controlled diabetes should maintain a normal activity level and demeanour. Owners should also monitor daily water intake, urine production, appetite, body weight, amount of insulin or medication administered, and possibly blood or urine glucose levels. Monitoring is best coordinated in close collaboration with your veterinarian to achieve optimal control over your cat's diabetes.



WORRIED ABOUT A LUMPS OR BUMPS ON YOUR PET?

A step by step guide to lumps and bumps

TAKE A CLOSER LOOK TO EXAMINE

The moment you discover a new lump on your pet's body, you need to take the time to examine it. Is it on the surface of the skin or is it underneath the skin? What is the size and shape? Use references—is it closer to a pea or a golf ball? Is it flat or raised? Bumpy or smooth? Is it firm or soft? Does it move? Is it bleeding? Establish a weekly routine of inspecting your dog from the tip of their nose to the end of their tail.

During your inspection, be sure to scan your pet's body thoroughly for any other masses and make note of them as well. How long have they been there? Have you noticed any changes in size, colour, texture, shape, or firmness? Does your pet have any sores or open wounds that aren't healing?

SEE YOUR VETERINARIAN

Most lumps and bumps are harmless, but it's important to schedule an appointment with your veterinarian for every new growth you find on

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Finding a lump or bump on your pet's body can be a worried experience, but don't panic. This article is going to enlighten the step by step guide lumps and bumps.



your pet's body.

Your veterinarian will perform a full physical exam, they may carry out couple of blood tests and may ask u for further diagnostics for the confirmation. They will also palpate your pet's abdomen to feel for any potential masses within the body. In addition, an examination of your pet's mouth may allow detection of malignant cancers that are often missed until they become advanced. Like you, they will also keep a record of each mass and its location to help monitor any changes that may occur over a period of time.

IDENTIFY THE MASS

When it comes to cancer, early detection is the key for the successful treatment. The first step in diagnosing any new lump or bump is to perform a fine needle aspiration, or FNAC. This simple procedure allows your veterinarian to determine the nature of the growth by collecting a sample of cells and viewing them under a microscope.

Keep in mind that malignant masses are not painful; therefore the only definitive way to know whether a growth is cancerous is to examine the cells. Occasionally, an FNA does not provide enough information and a biopsy is also needed.

TYPES OF SKIN

GROWTHS IN DOGS

A skin growth is a benign (non-cancerous) lump of tissue that projects out from the surrounding skin. Below are some of the more common skin growths on dogs: abscess, cyst, injection site reaction, hematoma, hives and allergic reactions

TYPES OF SKIN

TUMOURS IN DOGS

The word tumour is one of the scariest words a pet parent can hear. However, not all tumours are cancerous, and even those that are can still be treated. A tumour, simply, is a mass of tissue that forms as the result of the accumulation of abnormal cells. Read on to learn about some of the different types of tumours and where they might form on your dog's body: histiocytoma, lipoma, sebaceous gland hyperplasia, malignant skin tumours.

CONSIDER THE

TREATMENT OPTIONS

Once a mass has been identified, your veterinarian will decide further treatment plan. Fatty tumours known as lipomas are benign and typically do not

require additional treatment, unless their size or location is bothersome to your pet and can be removed surgically.

If a mass removal is recommended, there are a few options depending on the cell type, location, and size of the growth.

SURGERY

Surgical excision involves your pet undergoing local or general anaesthesia to remove the mass. This procedure is best for large or malignant growths, as well as those located in areas that may affect your pet's quality of life.

Occasionally, excision may be scheduled with another procedure, like a dental cleaning, to minimize your pet's time under anaesthesia.

CRYOTHERAPY

Non-invasive cryotherapy, also known as cryosurgery, is the process of rapidly freezing tissue to destroy unwanted growths on the skin. This is a great option for small, superficial masses and lesions such as warts or skin tags.

CHEMOTHERAPY

Certain drugs (chemicals) destroy cancer cells. This type of treatment is called chemotherapy. It can be used to manage and treat several types of cancer. When it is used, the most common treatment goal is to shrink, stop the growth of, or destroy the cancer without long-term negative effects on the quality of life for the animal. Veterinarians will prescribe chemotherapy based on the type of cancer to be treated, the stage of the cancer, the overall condition of the animal, and any financial constraints that may be present.

RADIATION THERAPY

One of the most common treatments for cancer in both humans and animals is radiation therapy. This treatment is sometimes also called x-ray therapy, radioisotope irradiation, or cobalt therapy.

FOLLOW UP

Regular annual or semi-annual exams with your veterinarian and monthly examinations at home can help you stay on top of any changes in your pet's existing lumps and bumps—and quickly detect any new ones.

The most important thing for you to do is stay alert to any lumps on your pooch and let your veterinarian know about them; that way, they can determine if treatment is necessary.

INTRODUCTION

In an era marked by increasing concerns about food security, environmental sustainability, and animal welfare, backyard poultry farming has emerged as a viable solution for individuals and families



BACKYARD POULTRY FARMING

A Pathway to Sustainable Livelihoods

looking to take control of their food production. Unlike large-scale commercial poultry operations, backyard poultry farming allows enthusiasts to raise chickens, ducks, or other poultry species in a smaller, more manageable setting, such as a backyard or urban homestead.

This article aims to explore the benefits of backyard poultry farming, the essential considerations for starting

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Backyard poultry farming (BYPF) is a traditional practice that has evolved, contributing significantly to both food security and rural livelihoods. In this comprehensive review, we delve into the history, current status, production systems, management practices, and socio-economic impact of BYPF, with a special focus on the Indian context. Native chickens, reared under free-range scavenging conditions, have been a cornerstone of BYPF. However, the introduction of high-yielding chicken varieties has transformed BYPF into a lucrative venture. It plays a vital role in poverty alleviation, malnutrition eradication, women's empowerment, and employment generation in rural and tribal areas. We explore the breeding, nutritional strategies, housing, and healthcare practices specific to BYPF in India.

Keywords: Backyard poultry farming, Sustainable agriculture, Food security, Animal welfare, Local food production, Community resilience.

and maintaining a backyard flock, and its role in promoting sustainable agriculture and community resilience.

BENEFITS OF BACKYARD POULTRY FARMING:

One of the primary benefits of backyard poultry farming is the access to fresh, nutritious eggs and meat produced in a humane and sustainable manner.

By raising poultry in their backyard, individuals can ensure the quality of the feed, minimize the use of antibiotics and chemicals, and reduce the environmental impact associated with large-scale poultry production.

Furthermore, backyard poultry farming promotes self-sufficiency and food security by empowering individuals to produce their own food locally. In times of economic uncertainty or disruptions to the food supply chain, backyard poultry farmers are better equipped to meet their dietary needs and support their communities.

CONSIDERATIONS FOR SUCCESSFUL BACKYARD

POULTRY FARMING:

Successful backyard poultry farming requires careful planning, adequate resources, and a commitment to responsible animal husbandry practices.

Prospective poultry farmers should consider factors such as housing and shelter, access to clean water and nutritious feed, disease prevention and biosecurity measures, and compliance with local regulations and zoning ordinances.

Additionally, maintaining the health and welfare of backyard poultry requires regular monitoring, proper nutrition, and prompt veterinary care when needed. By prioritizing the well-being of their flock, backyard poultry farmers can ensure the longevity and productivity of their birds while upholding ethical standards of animal care.

CONCLUSION

BYPF holds immense potential for expansion, given its widespread preference across India. It remains a sustainable pathway to livelihood improvement and food security.



BATTLING EXTERNAL PARASITE INFESTATION IN FARM ANIMALS

PREVALENCE AND EFFECTIVE MANAGEMENT

INTRODUCTION

External parasites pose a significant threat to the health and productivity of farm animals worldwide. The main ectoparasites includes ticks, mites, lice, and flies, not only cause discomfort and distress to the animals but also lead to economic losses for farmers due to reduced productivity and the cost of treatment.

Understanding the prevalence of external parasite infestation and implementing effective management strategies are crucial for maintaining the welfare and profitability of farm operations.

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TYPES OF EXTERNAL PARASITES

1. **TICKS:** Ticks are small creatures with oval-shaped bodies. Ticks don't have antennae and suck blood from animals, which can lead to

anemia. They can also spread diseases like Theileriosis and Babesiosis.

2. **MITES:** Mites are tiny creatures, less than 1mm in length. They have unsegmented bodies and are usually seen under a microscope. Mite infestations, known as mange, cause severe irritation to the skin and can be a nuisance for animals.
3. **LICE:** Lice are flat-bodied parasites. They come in two groups: sucking lice, which feed on the host's body fluids, and chewing lice, which feed on skin, hair fragments, and debris. Lice are specific to particular hosts and can cause discomfort and

irritation.

4. **FLEAS:** Fleas are flightless. They have flattened bodies, strong claws, and are usually brown in color. Fleas feed on the blood of their hosts and can jump up to 20-30cm with their hind legs.
5. **FLIES:** Flies have wings, mobile heads, and compound eyes. They have piercing and sucking mouthparts and come in various types, including stable flies, horse flies, and face flies. Flies can act as mechanical vectors for diseases, transmitting bacteria, viruses, and parasites to farm animals. They are most commonly seen in the summer and can be both biting flies and nuisance flies, causing irritation and discomfort to animals.

These different types of external parasites pose a threat to the health and well-being of farm animals and require proper management to prevent infestations and minimize their impact.

EFFECTS OF EXTERNAL PARASITES ON FARM ANIMALS

1. **BLOOD LOSS AND ANEMIA:** External parasites like ticks and lice bite and suck the blood of farm animals, causing severe anemia. This makes the animals weak and can even be life-threatening.
2. **DISRUPTION OF FEEDING:** Flies buzzing around animals while they graze can be irritating. This disturbance makes it hard for animals to eat properly, leading to weakness and debility. Examples include horn flies and forest flies.
3. **WINTER INFESTATIONS:** In winter, lice populations increase on animals' bodies. They suck blood, causing anemia, and also irritate the skin, leading to hair loss.
4. **SKIN PROBLEMS FROM MITES:** Mites cause mange in animals, mainly affecting areas like the head, legs, body, and tail. This condition causes itching, crusted skin, and hair loss, making

animals uncomfortable and affecting their feeding.

5. **TICK-BORNE DISEASES:** Ticks can transmit diseases like paralysis tick paralysis, pyemia, and tick toxicosis, which harm animals' health.
6. **NUISANCE FROM FLIES AND MOSQUITOES:** Flies and mosquitoes bite animals and suck their blood, causing irritation during feeding and leading to health problems and reduced production.
7. **SKIN ALLERGIES AND IMMUNE**

External Parasite	Transmission of Disease
Ticks	Thileriosis, Babesiosis, Anaplasmosis, Staphylococcal infections, Lumpy skin disease
Fleas	Diphylidium caninum, Rickettsia typhi, Yersiniosis
Sheep ked Culicoides	Blue tongue
flies	Transmits E Coli, Salmonellosis, Trypanosoma spp., Leishmaniasis, Yellow fever, Fileriosis. Pink eye disease, Thelaziasis.
Lice	Swine pox virus, Trichophyton spp., Anaplasma marginale

REACTIONS: Parasite bites can trigger skin allergies and even severe immune reactions in animals.

8. **WOUND INFESTATION:** Flies lay eggs on open wounds or skin surfaces, causing myiasis. This results in blood loss, inflammation, and a decrease in production.
9. **TRANSMISSION OF DISEASES:** External parasites act as vectors for

various diseases. These diseases can cause severe production losses and economic harm to farmers.

External parasites acts as vectors for various diseases.

Overall, external parasites have significant negative effects on farm animals' health, welfare, and productivity. Proper management and control strategies are essential to minimize these impacts and ensure the well-being of livestock.

EFFECTIVE MANAGEMENT OF EXTERNAL PARASITES IN FARM ANIMALS INVOLVES MULTIPLE STRATEGIES:

1. **Housing and Environment:** Maintain clean, well-ventilated housing with proper drainage to reduce moisture and limit breeding grounds for parasites. Regular cleaning and disinfection help control parasite populations.
2. **Biosecurity Measures:** Implement strict protocols to prevent parasite introduction and spread. Quarantine newly acquired animals, restrict visitor access, and control wildlife populations around the farm.
3. **Pasture Management:** Rotate grazing areas to break the parasite life cycle. Techniques like mowing and targeted grazing with other animals can naturally

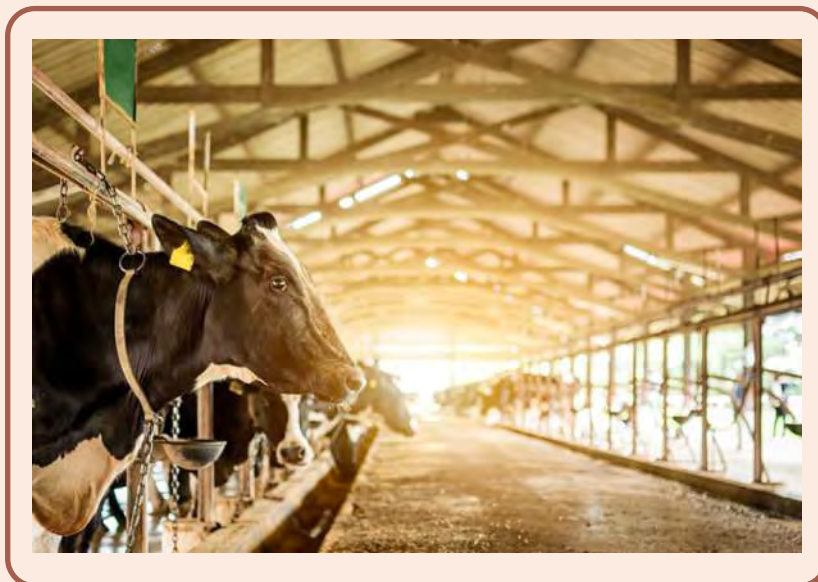


control parasite populations.

4. **Chemical Control:** Use acaricides, insecticides, and dips to manage infestations when necessary. Follow label instructions and rotate active ingredients to prevent resistance and minimize environmental impact.
5. **Biological Control:** Utilize natural enemies of parasites, such as predatory mites and parasitic wasps, to suppress populations. Introduce beneficial organisms to reduce reliance on synthetic pesticides.
6. **Genetic Selection:** Breed animals for resistance to parasites. Selective breeding programs aim to develop breeds with inherent resistance, reducing the need for chemical interventions and improving overall animal health.

In conclusion, effective management of external parasites is crucial for maintaining farm animal health and productivity. By combining preventative measures, monitoring, and targeted treatments, farmers can control parasite populations while promoting sustainable and environmentally friendly farming practices. Embracing integrated pest management approaches and advancements in genetics and biological control methods are key to mitigating the impact of external parasites on farm animals in the long term.

INDIGENOUS TECHNICAL KNOWLEDGE IN DAIRYING



ABSTRACT

India has a very rich heritage of traditional health control and treatment systems (Ayurvedic, Unani and Homeopathic) that have been used for animals since time immemorial. These practices have been percolating from one generation down to the next by oral transmission and considered to be the holistic approach for livestock management. The indigenous technical knowledge regarding animal husbandry is as old as domestication of various livestock species. Over the last decade, policy makers, development planners and the public at large have become increasingly aware of the important role that traditional knowledge of the indigenous peoples can play in the promotion of sustainable development (Davies and Ebbe, 1993). The significance of such a pool of knowledge for sustainable development was recognised as far back as 1987 in the Brundtland Commission Report, Our Common Future (1987).

Keywords: Indigenous technical

knowledge, livestock, indigenous people

INTRODUCTION

The role of indigenous knowledge was similarly acknowledged at the Earth Summit in Rio de Janeiro in 1992, and is incorporated in the Agenda 21 documents of the United Nations and the International Convention on Biodiversity. Both reports emphasised the need to use directly the environmental expertise of local people in managing natural resources. They stressed the sustainable management of natural

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resources could only be achieved by developing a science based on the priorities of local people and creating a technological base that blends both traditional and modern approaches to solving problems (Johnson, 1992). Interest in indigenous knowledge systems has been fuelled by the recent worldwide ecological crisis and the realization that its causes lie partly in the overexploitation of natural resources based on inappropriate attitudes and technologies.

A critical assumption of indigenous knowledge approaches, for example, is that local people have a good understanding of the natural resource base because they have lived in the same, or similar, environment for many generations, and have accumulated and passed on knowledge of the natural conditions, soils, vegetation, food and medicinal plants etc. Note that under conditions where the local people are in fact recent migrants from a quite different ecological zone they may not have much experience yet with their new environment. In these circumstances, some indigenous knowledge of the people may be helpful (e.g. traditional systems for allocating community forest access to women for collecting fodder), or it may cause problems (e.g. use of agricultural systems adapted to other ecozones). Therefore it is important, especially when dealing with recent migrants, to evaluate the relevance of different kinds of indigenous knowledge to local conditions. Most observers, in fact, suggest that a combination of both IK and science be used to solve development problems, in order to capitalize on the strengths of each.

INDIGENOUS TECHNICAL KNOWLEDGE IN DIFFERENT AREAS OF DAIRYING BREEDING PRACTICES TO INDUCE HEAT

Feeding of jaggery, common salt, pigeon faeces, sprouted wheat, masur dal (*Lens esculenta*), hen's egg mixed with oil cake, Arbi tubers (*Colocasia esculenta*), sprouted chhole (*Cicer*

ariestinum), crushed soyabean (*Glycine max/Gycine suja*), 'Madua flour' (*Cynosurus coraccanus*) and sprouted 'Methi' seed (*Trigonelle foenumgraecum*) to the animals to induce heat.

Boiled methi (*Trigonella foenum- graecum*) grain @ 1kg/day fed empty stomach for 5 days or 1 kg/day bajra (*Pennisetum typhoides*) and ½ kg/day jiggery for 10-15 to induce heat in dairy animals.

Feeding of Hing (*Ferula assafoetida*) and mustard cake (*Brassica spp.*) to the animals to induce heat.

FOR REMOVAL OF RETAINED PLACENTA

Paddy, banana, and "Soanf" is boiled in water and then filtrate is given to animal in case of retained placenta.

Feeding of Kathal leaves or boiled paddy along with bamboo leaves are given for easy expulsion of placenta.

Drenching the affected animal with 50 ml of castor oil.

ABORTION

Drenching desi ghee @ ½ litre/ day for 3-4 days.

REPEAT BREEDING

Feeding of only dry fodder to the animals up to 22 days following service.

Extract of Kela leaves (*Musa paradisica*) fed to cattle for the treatment of repeat breeding.

PROLAPSE OF UTERUS AND RECTUM

Animal is forced to stand and fed 2-3 kg tuber of elephant foot yam (*Amorphophallus compandulatum*) along with other feed.

Animal suffered from prolapse in past, given 10 kg of onion to eat when it is not carrying. This prevents prolapse at delivery time.

Surukkuthamarai, Thottachinungi (*Mimosa pudica*) are to be macerated and administered orally to the animals.

HEALTH CARE

ABSCESS

Fomentation with warm mustard oil and firing with hot iron in the developing stage of abscess, while other use onion roasted in cow dung along with little common salt Turmeric powder (*Curcuma longa*) is mixed with deshi ghee in equal proportion and applied on the abscess.

CONSTIPATION

100 ml castor oil given to animal or crushed bark of Arjun (*Terminalia arjuna*) mixed with water and fed to affected animals.

200g of guruh (*Saccharum officinale*) is dissolved in water and given to affected animals.

DIARRHOEA

Linseed plant/soaked gram/thorn apple/arhar wood mixed with ash, salt and water is given to animal passing watery stool.

Pulp of 100 g old ripened Tentul (*Tamarind, Tamarindus indica*) is fed to the animal for two to three days to cure diarrhoea.

Dissolve salt and sugar in 1:2 ratio in water and drench the animals 2-3 times a day.

ERADICATION OF ECTOPARASITE

Burning of neem leaves near the animal in case of lice infestation.

Tobacco shoot with kerosene oil should be applied all over the body.

FOOT AND MOUTH DISEASE (FMD)

The suspension of ajma (*Trachyspermum ammi*) 50 gm seed, jiggery 100 gm and tea powder 25 gm in half litre of water is given to the affected animal.

Banana fruits are soaked in castor oil overnight and fed to the animal. Pork is cooked with water from Samai (*Panicum miliare*) grains and fed to the animals.

A paste of the leaves of Sadad (*Terminalia crenulata*) is made and applied on the affected area.

FEVER

Bark of rayan (*Soymida febriluga*) tree is powdered separately and given to animals along

with water for 4 to 5 days continuously.

In case of ephemeral fever, urine obtained from cows, leaves of Vellaikundumani (*Arbus precatorius*) bearing white seeds and Veliparuthi (*Pergularia daemia*) are to be pounded and fed to affected animal.

FRACTURE

A mixture prepared from two spoonfuls of turmeric powder and a hen's egg is applied on the site of the fracture and covered it with five to seven leaves of Gundi (*Cordia garhaf*).

Bovine fat is melted and applied on the affected place or Egg and black gram (*Vigna mungo*) is grounded and applied in the fractured place and bamboo stick is tied around the fractured bone.

WOUND

About 3 to 4 droppings of goat and one or two leaves of aval (*Cassia auriculata*) are mixed together and applied daily over the animal's wound.

A handful of neem leaves (*Azadirachta indica*), *Acorus calamus* leaves, ten pods of garlic, 3 to 4 naphthalene balls and some carbon powder from a waste battery are crushed and mixed together into a paste and applied on the affected part of the skin.

TYMPANY

A mixture of whey milk, onion and leaves of Sitafal is given to the animals.

Soda (*Sodium bicarbonate*) and mustard oil (*Brassica nigra*) is mixed together and poured in a litre of water and then drenched to animal.

EYE RELATED DISEASES

An unusual solution is chewing common salt and spitting it into the injured eye of the animals. Crepe jasmine (*Erratamia coronaria*), thumbai and clove (*Syzygium aromaticum*) are taken into equal quantity and juice of this extract is applied on the eyes or eyes are washed with tobacco (*Nicotiana tabacum*) mixed water.

POISONOUS BITE

A handful of leaves of each plant, namely Siriyanangai (*Polygala grinerisis*), Periyanangai (*Andrographis alata*),

Kottagasalai, Kupaimeni, Arugambal (*Cynodon dactylon*) are to be grounded into paste. The mixture is added to 100 ml of neem oil and 200 ml of warm water and administered to animal.

Sacred basil and *Acalypha indica* are crushed and the juice is poured in the nostrils of affected animal or Pelican flower (*Aristolochia gigas*) is grounded and mixed with equal quantity of butter and should be given to animal for one week.

MAGGOT INFESTATION

The leaves of *Erythrina mysorensis* are crushed and mixed with eucalyptus oil. The mixture is applied on the affected part of the animal and the wound is covered with a bandage. After 3 days, the bandage is removed and the wound is pressed softly so that the maggots come out.

SWOLLEN UDDER

The juice of pilodi (*Salvadora persica*) leaves are used to cure this condition. This juice is applied on the swollen udder twice a day.

250 g of coriander is fed to animals twice a day.

Juice of lemon and powdered chalk piece (CaCO_3) are mixed with water and applied on the udder.

ARTHRITIS

Decoction of the root of Babul (*Acacia Arabica*) is mixed with mustard oil in the ratio of 1:3 and to be drenched to the animal.

MOUTH ULCER

Lukewarm pure mustard oil smeared on the neck proves to be an effective remedy for the pain.

FOOD POISON

Chotrukatrashai (*Aloe vera*), Vanai nerunji (*Pedaliem murex*), Athi (*Bauhinia racemosa*) are to be crushed together and it is mixed with water and administered to the animals three times in a day with the help of kottan (hallow bamboo funnel).

RESPIRATORY DISEASES

Ruptured leaves of Bahufali (*Corchorus sp.*) is fed to the bullocks which breathes too much

during work.

The use of Kupaimeni (*Acalypha indica*) is widely acknowledged for curing the respiratory disorders, dry cough, bronchitis, lung ulcers.

JAUNDICE

A mixture of 'haritake' (*Terminalia chebula*), Amla (*Emblica officianlis*) is prepared and fed to the animals twice a day.

Turmeric is grounded and made into arecanut size and given to animals.

INTESTINAL WORMS

Extract of 'neem' leaves (*Azadirachta indica*) mixed with water and sugar and then drenched to animal.

Seeds of Subabul (*Leuceana leucocephala*) is mixed with water and grounded. This mixture is taken with 200ml of water and given to goats.

CONCLUSION

Developing countries have a valuable, but largely untapped, reservoir of indigenous agricultural and natural resource experience and knowledge. Development planners and policy makers are beginning to recognize the need to understand existing knowledge systems and decisions-making processes as they focus their attention on the role that small-scale dairy and agricultural producers can play in achieving national food self-sufficiency.

These systems influence current farming practices and responses of the small-scale producers to agricultural and natural resource policy initiatives and technological innovations. There is a growing body of evidence describing the positive uses of ITK in development projects and many successes in building upon it.

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Authors declaration – I wish to confirm that there are no know conflicts of interest associated with this publication

FEEDING SCHEDULE FOR TRANSITION ANIMALS TO INCREASE MILK PRODUCTION



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Cows that fail to transition efficaciously into lactation are susceptible to several problems just after the calving. Further consequences in the early lactation period include lowered milk production, Immunodepression and compromised reproductive performance. Dry matter intake (DMI) starts to decrease a few weeks before parturition, with the lowest level occurring at calving. During the dry period, energy and protein requirements are lower, as there are no needs by the udder for milk production. Generally, dairy cows require around two times more energy for milk production than maintenance with progress in the lactation period. Cattle can compensate for deficits in food energy by mobilising adipose reserves. Most fat-soluble antioxidant vitamins such as retinol, -tocopherol and -carotene decrease when parturition and are reported to be associated with several health problems. The optimal body condition score for a dry cow is 3.0-3.25, and the cows conditioned at BCS-3 had higher feed intake coupled with peak milk yield. Dry cow therapy treats cows at the end of lactation with a long-acting antibiotic with or without a teat sealant.

INTRODUCTION

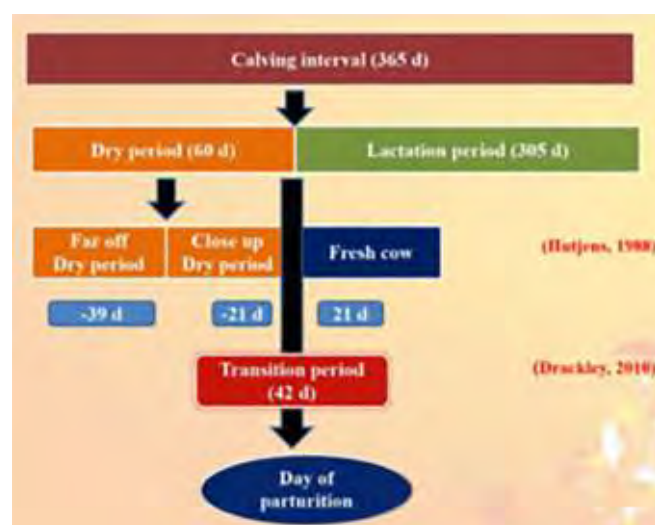
The transition period extends from 2-4 weeks before parturition (close-up dry period) upto first 2-4 weeks of lactation (early fresh period), however, the most critical time period is the 21 days before and 21days after parturition. During this time, the cow transits from a low maintenance

phase to a high performance period in her productive life. Therefore, in the last three weeks of the dry period, many changes are needed in the nutritional management of the dry cow. At the same time, feed intake decreases and nutrient requirements increase because of increasing nutrient demand for the developing conceptus and the impending lactogenesis. This period is characterized by dramatic changes in the endocrine status of the animal in their lactation–gestation cycle. This period imposes enormous stress and may impair dry matter intake, milk production and animal health.

Dairy animals of good genetic potential usually experience negative energy balance prior to calving due to decrease in feed intake and modest increase in energy requirements during late gestation for growth of foetus. DM

intake is a major factor influencing both milk yield and body weight change in early lactation. Feed intake tends to decrease as calving approaches and this situation continues upto 10 to 12 weeks after calving while the nutrient requirements for milk synthesis after parturition continue to increase up to 6-7 weeks post-parturition which often results in negative energy balance in lactating animals especially those yielding more than 15-20 liter milk/day.

Minimizing the duration and extent of a negative



energy balance also has a positive impact on reproduction. Poor feeding and management during the transition period can also result in problems around calving such as dystocia (difficult calving), retained placenta, milk fever (hypocalcaemia), grass staggers (hypomagnesaemia), rapid weight loss and ketosis. Better feeding strategies during this critical period has tremendous impact on the animal's ability to produce to its maximum potential with lesser health and reproductive disorders.

CONSEQUENCES OF IMPROPER FEEDING DURING TRANSITION PERIOD

Energy related disorders– Rumen acidosis/lameness, ketosis, fatty liver syndrome and displaced abomasum

Mineral and vitamin related disorders– Milk fever, Udder edema, hypomagnesemia

Immune system related disorders – Retention of placenta, metritis and mastitis

Digestive disorder – Rumen acidosis

FEEDING MANAGEMENT OF CATTLE AND BUFFALOES DURING TRANSITION PERIOD

There are four aims of transition cow management which include reducing ruminal disruption, minimize macro mineral deficiencies, minimize lipid mobilization disorders and avoid immune suppression.

MINIMIZE REDUCED FEED INTAKE

In last week of pregnancy, feed intake reduces upto 30%. Nutrients supply becomes less than actual requirements. A high level of fibre diet reduces feed intake. Fibres are slowly digestible and produce impaction effect in rumen. Ration should have 35% of fibres out of which 75% should from green fodder. Amount of non-fibrous carbohydrate should be 40-45% in whole ration. Over mature fodder and dried roughages (straw, strover) have more amounts of fibre, that's why it should be restricted to use in diet. It's necessary to give special concern for rumen health during transition period. The typical decrease in DM intake before calving results in the need to increase contents of crude protein and net energy of lactation by about 2 % units and 0.10 mega calories per pound (M cal/lb) of DM, respectively, in the close-up diet.

ENERGY RELATED NUTRITION MANAGEMENT

During the transition period, expected DM intake declines to 5% per week for 2-3 weeks prior to calving and by a total of 30 % during the last 3-5 days prior to calving and this energy intake below requirements as reflected by elevated NEFA concentrations which is associated with increased incidence of postpartum metabolic disorders, lower milk production and poor reproductive performance. Consequently, to maintain the energy balance, the energy density of the diet should be increased. Feeding a high non-fibrous carbohydrate diet prepartum increased dry matter and energy intake, which improved energy balance of cows throughout the transition period. Grains have to be introduced to the cow's ration for at least 3 weeks before the due date and for heifers this should be 5 weeks. The energy density of feed should be between 1.56-1.62 Mcal/kg, increasing the energy density up to 1.6 Mcal of NEL/kg in diets during the last month before parturition improves nutrient



balance of cattle prepartum and decreases hepatic lipid content at parturition. Grain may be fed up to 0.5% of body weight for cows in good condition and up to 0.75% of body weight for cows below the optimum body condition. Animals in more than 20 kg milk production level can be fed upto 3 kg grains per day. If grains are given at this level, it is necessary to use buffer in ration. Reduced feed intake can be minimized by preventing ruminal acidosis using buffer in concentrate which also helps to prevent milk fat depression. NaHCO_3 and MgO should be used in ratio of 3: 1. Buffer should be used 1-1.5% of concentrate feed.

Fat can also be used to increase energy density of diet. Total dietary fat should be below 6% and 1-2% of total fat could be rumen protected fat. Reduction in feed intake can be prevented by supplementation of protected fat.

PROTEIN SUPPLEMENTATION

It is very important to fulfil protein requirement of transitional animals. Ration formulated for high producing animals should have 15-16% crude protein with 60-65% RDP and 35-40% UDP. Now-a-days, more emphasis is being given towards use of amino acid balanced diet. Use of rumen protected protein in diet increases proportion of metabolizable protein. During formulation of feed, it is targeted to balance 6.6-6.8% lysine and 2.2% methionine in digestible protein. Maize gluten

meal, solvent extracted soya bean meal, fish meal and solvent extracted cotton seed cake are used as source of rumen protected protein.

MINERALS AND VITAMINS SUPPLEMENTATION

Minerals are essential for production, reproduction and sustenance of the animals. Minerals mixture should be used @ 2% of concentrate mixture in case of lactating animals. Lactating animals should be supplemented with 50-100 g/day of mineral mixture according to their stage and amount of milk production. High dietary Ca concentrations (1.0-1.2%) are desirable with anionic salts. Potassium should not be over 1.0% in the total ration for dry cows but K, Na and Mg should be 1.5, 0.5 and 0.35% of DM, respectively in milking cows during heat stress. Nitrogen to sulphur ratio should be 11-13: 1 in the total ration to meet rumen bacterial needs. Rumen microbes need 0.2-0.22% S to operate efficiently. Cobalt is a component of vitamin B12. Microbes in rumen are the only natural source of vitamin B12. Rumen microbes need 0.11% Co to perform efficiently. Dietary Cu is absorbed to the extent of 1 and 5% by adult cattle. A diet high in Zn (>1000 mg/kg), S and Mo can block Cu absorption. The Cu: Mo ratio should be 2:1. Diets containing 0.1 ppm of Se are recommended but field studies suggest this is not enough. Legally Se can be added up to 0.3 ppm. Depending on the

DM intake, the dietary level of iodine should be about 0.25-0.5 mg/kg DM. NRC (2001) recommended dietary Fe should not be exceed 1000 mg/kg DM.

Feeding 6 to 12 g of niacin per cow per day helps to prevent ketosis and promotes dry matter intake. Feed niacin to close-up dry cows and ketosis-prone cows. Feed niacin until maximum DMI has been achieved usually within 10 weeks after calving. Do not feed niacin to thin cows with BCS below 2.0.

Fresh cows are more prone to rumen acidosis, the consequence of which is often lameness (laminitis). Zinc is useful in promoting hoof strength, integrity and health. Vitamin levels should be met to optimize milk production. Vitamin A should be provided @ 3600 IU per kg DM/day. Vitamin D 900 IU per kg/DM day and vitamin E 14 IU per kg/DM day.

BODY CONDITION SCORES FOR STAGES OF LACTATION

Cows at Calving	-	3.75 – 4.25
Early Lactation	-	3.0 – 3.5
Mid-Lactation	-	3.5
Late Lactation	-	3.75
Dry animal	-	3.75 – 4.25

Maintain body condition throughout dry period until calving. Avoid fat (BCS= 4.25 or greater). Dairy cows are more susceptible to fatty liver and ketosis and consume less feed (energy) upon freshening.

ANIONIC SALTS

Dietary supplementation of an anionic mineral mixture is recommended during the last month of pregnancy. It causes a mild metabolic acidosis which enhances resorption and bone and facilitates mobilization of more calcium and phosphorus from bones at the onset of lactation. Feeding such type of slightly negative-charged ration for three to four

weeks prior to calving with properly balanced calcium, phosphorus and magnesium reduces the incidence of milk fever. The most common salts used are ammonium sulphate, calcium sulphate, magnesium sulphate, ammonium chloride, calcium chloride, and magnesium chloride. Approximately 90 g of anionic mixture/day is recommended for three weeks pre partum.

CONCLUSION

In a dairy cow, the transition from a non-lactating to lactating stage requires special metabolic adaptations through continual changes in nutritional strategies. Sub-optimal nutrition during this period may impart nutritional stress on the cows that may be manifested by one or more common periparturient disorders. A key issue is improving reproductive efficiency and embryo production may be to supply the nutritional needs of animal in a physiological way and avoid abnormal or unbalanced amount of any component in the diet. Thus, nutritional balancing is critical for high yielding dairy cows, in particular. In addition to ration formulation and monitoring, feeding management may impact transition success.

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Authors declaration – I wish to confirm that there are no know conflicts of interest associated with this publication



ONE WORLD ONE HEALTH

Prevent Zoonosis

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Zoonotic diseases are infectious diseases that can be spread from animals to human being and vice versa. It spreads via direct contact or can be vector borne or food borne. As per International Livestock Research Institute, three quarter of emerging human infections are zoonotic. 60 percent of these are transmitted by animals and 70 percent have animal origin. According to a report of UNEP, two million people in low and middle income countries die each year from neglected endemic zoonotic diseases. Studies have found that 75% of new emerging and re-emerging disease pathogens accounts for zoonotic diseases. Amongst them, 60% spread from domestic and wild animals, and almost 80% of them are of concern regarding bioterrorism.

Since last 20 years, the world has experienced several waves of dramatic zoonotic disease outbreaks, like the deadly viral diseases of Ebola virus, hantavirus disease, the mammoth pathogenic avian

World Zoonosis day is a global day to raise awareness and action on prevention and control of Zoonotic diseases. It is celebrated every year on 6th July to commemorate the scientific achievement of Louis Pasteur who successfully administered the first vaccine against Rabies in 1885. Since then, this day is observed as 'World Zoonosis Day' all over the globe. This year's theme is 'One World, One Health: Prevent Zoonosis'



influenza, West Nile disease, Rift Valley fever, severe acute respiratory syndrome, Marburg disease, rabies, Middle East respiratory syndrome, monkeypox disease, and the COVID-19 pandemic, and the bacterial diseases of anthrax, brucellosis, tuberculosis, salmonellosis, and Escherichia coli (O157:H7) and Yersinia pestis infections. Some zoonoses are seen to be causing recurring outbreaks, whereas others has the potential to cause worldwide pandemics and have been declared diseases of public health emergencies of international concern by the World Health Organization (WHO).

Covid-19 virus that has left a dramatic impact on the human health, society and economy is surmised to have link with bats and hence

considered as a zoonotic disease. This is not the first of the kind where the occurrence of a human infection can be traced back to have an animal origin. Earlier in 2003, China was smacked by an epidemic caused by another strain of SARS COV that is believed to be an animal virus of unknown reservoir. In the recent past it was observed that multitude of human infections have an animal link. The 2009 Influenza H1N1 pandemic, SARS COV1, Middle East Respiratory Syndrome (MERS) CoV, NIPAH virus outbreak in Kerala, ongoing monkey pox outbreak in endemic and non endemic countries are some examples of zoonotic infections that have wrecked havoc in the mind of people.

As per a report published by UNEP, the factors that have exacerbated the risk of zoonotic infections are ever increasing human population and its unchecked activities, growing demand for animal protein (in the last five decades, meat production has increased by 260%), unsustainable agricultural intensification, destruction of nature habitat and wild spaces, extensive utilisation, poaching and exploitation of wildlife, unsustainable utilisation of natural resources due to rapid urbanisation, change in the land use pattern and industrialisation, swift international trade and travel that have erased borders and distances, alteration in the food supply chain and climate change and biodiversity loss. The unchecked use of antimicrobials in food animals is another factor responsible for emerging zoonotic infections. Its increases the potential for development of drug resistant strain of zoonotic pathogens which may jump from animal to human population. Such antimicrobial resistant strains are a matter of concern as it makes the easily available antimicrobials ineffective against the zoonotic diseases. Antibiotic residues in food of animal origin generate potential pit falls to man as low level of exposure to antibiotic causes alterations of microflora, and increases the possibility of Antimicrobial resistance. Antimicrobials are of paramount importance in treating bacterial infections in both man and animals. Few antimicrobials utilized for treating diseases or promoting growth in livestock are also used for therapeutic purpose in human. So, there is every possibility of cross resistance of bacteria to antimicrobial drugs that are used in human medicine. Microbiological and chemical evidence reveal the fact that these resistant bacteria or resistance determinants could pass from animal to

humans, causing infections that are harder to treat. Negative outcome of antimicrobial resistance include increasing incidence of human infections caused by resistant pathogen, therapeutic failures, increased severity of infections, prolonged duration of treatment, increased mortality, increased cost of society etc.

Looking into the economic and public health burden of the ongoing pandemic and its devastating impacts, we need to be more proactive to stop another pandemic from happening. With an eye to curb the transmission of zoonotic diseases, we must raise awareness and increase knowledge on zoonotic and emerging pathogens, threats they possess to human health and measures to tackle the risk of future outbreak at all levels. This requires a line of scientific enquiry into the complex social, economic and ecological dimensions of emerging zoonotic diseases. We should pinpoint the core drivers of the emerging zoonotic diseases from animal husbandry settings (both in industrialised agriculture and small production) to conversion of land and climate change. These factors are crushing natural habitat, causing large scale ecological imbalance thus pushing people closer to the disease vectors. We should upgrade the sanitary measures and develop effective means to monitor and regulate the traditional food markets and incentivise the legal wildlife trade and animal husbandry to take up measures to combat zoonotic infections. The drivers of zoonotic diseases generally coincide with the drivers of the climate change and biodiversity loss. Animal extinction due to exploitation, deforestation and poaching is another cause of zoonotic spill over. In order words, the health of mankind hinge on the health of the planet Earth and other species. Hence, we should build a healthy, green and safer planet. Certain viruses have the tendency for genetic mutation that may produce a new genotype and a new pandemic. An article in the Indian Journal of Medical Research says nearly 7,00,000 animal viruses may causes human infection. Wild animals are regarded as veiled threats for many global pandemics. Many domesticated animals may act as the amplifier host of pathogens emerging from the wild. Since the infection results from human-animal interface, collaborative efforts should be made by both medical and veterinary professionals in conformity with “One Health” that was introduced in 2007 amidst global scare of H5N1 pandemic. This concept was advocated by World Health

ANIMALS



Organisation (WHO), Food and Agricultural Organisation (FAO), World Organisation for Animal Health (OIE) to fight human infections by human-animal- environment interface. One Health approaches requires multi sectored, multidisciplinary and multi speciality coordination. One Health approach is an approach to conduct joint disease surveillance; control and prevent zoonotic diseases outbreaks; improve food safety and security; and decrease antimicrobial resistant infections to improve human and animal health. Implementation of One Health is a challenging task. Because most countries are devoid of formal mechanisms for coordinating and integrating activities taken across the human health, agricultural, and environmental sectors, which are traditionally dealt by separate ministries or government agencies having different mandates on activities and spending. Thus, practical applications of One Health approaches are ad-hoc, leading to delayed or incomplete prevention and control measures. Appropriate research should be carried out both at animal and human levels and their results should be integrated. Its success depends on institutional collaboration, joint planning etc. Strong surveillance should be implemented with a view to curb such brutal viral outbreaks at its commencement. Comparative medicine is acknowledged since a long time for its benefits in scientific research and One Health increases comparative medicine's scope to surveillance in animals and the environment for early diagnosis and proper understanding of the threats in order to mitigate risk and impacts. Centre for Disease

Control and Prevention (CDC) is holding international events on 'zoonotic diseases' to help countries to prepare action plan for these diseases containment. An innovative 10 years partnership Global Virome Project (GVP) has put tremendous efforts to detect the unknown viral menace. International Health Regulations (IHR2005) that was adopted in 2005 aims to provide public health responses to prevent and control international spread of diseases. WHO is collaborating with all international organisations dealing with animal health to bolster the contribution of veterinarians in the enforcement of IHR (2005) and monitoring zoonotic diseases. Neglected tropical diseases have tremendously affected not less than 1 billion people in disadvantaged and marginalized communities throughout the globe. Acting promptly to efficiently control the burden of zoonoses through One Health is immensely critical. As of now, plethora of international One Health initiatives have been used and developed to help countries in enhancing the capacity of One Health approach, along with developing strategies, implementation of programmes, legislation, policies and undertaking studies to make global health security better and, achieve sustainable development goals and to comply with International Health Regulations and handle common health threats. Controlling zoonotic transmission is a tedious job and requires the collaboration of all stakeholders in line to act in consortium for addressing the issues.

PEOPLE



THE IMPORTANCE OF SANITIZATION AND HYGIENE IN MEAT PROCESSING

ABSTRACT

Sanitation and hygiene are pivotal elements in the meat processing industry, essential for ensuring food safety, compliance with regulations, and maintaining product quality. The industry is susceptible to contamination by microorganisms such as Salmonella and E. coli, causing foodborne illnesses. Maintaining cleanliness helps in preventing the spread of such organisms, complying with regulations like HACCP, and avoiding legal ramifications. Measures including personnel hygiene, thorough cleaning and sanitizing, effective pest control, and meticulous environmental monitoring are critical. Utilizing advanced technologies can optimize sanitation processes, making the industry more secure,

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PRINCIPLES OF MEAT HYGIENE



Prevention

Prevention of microbial contamination by adopting proper cleaning and sanitation practices

Minimization

Minimization of microbial growth in meat products by storing them at a low temperature



Elimination of the risk

Reduction or elimination of the risk of microbial contamination by applying suitable heat treatment and packaging systems at the final processing stage

efficient, and eco-friendly. Regular implementation and monitoring of these measures are crucial for consumer safety and satisfaction.

INTRODUCTION

The meat processing industry is responsible for providing safe and healthy meat products to consumers. However, meat products are highly susceptible to microbial contamination, making it essential for meat processing industries to maintain a clean and hygienic environment to prevent the spread of harmful microorganisms that can cause foodborne illnesses. This article will discuss the importance of sanitation and hygiene in meat processing industries and the measures that can be taken to maintain a clean and safe environment.

IMPORTANCE OF SANITATION AND HYGIENE IN MEAT PROCESSING

Sanitation and hygiene play a crucial role in meat processing industries for the following reasons:

FOOD SAFETY

Food safety is the primary reason why sanitation and hygiene are essential in the meat industry. Meat

products are susceptible to microbial contamination during processing, packaging, and transportation. Harmful microorganisms such as Salmonella, E. coli, and Listeria can cause foodborne illnesses, which can be severe and even fatal. Therefore, meat processing industries should implement measures to prevent the growth and spread of these microorganisms. Good sanitation practices, such as cleaning and sanitizing surfaces, equipment, and utensils, can help prevent cross-contamination and reduce the risk of foodborne illnesses.

One important aspect of food safety is the Hazard Analysis Critical Control Point (HACCP) system. This system is a preventive approach to food safety that identifies potential hazards in the food production process and takes steps to prevent them. HACCP is a mandatory requirement for meat processing plants in the United States, and it involves monitoring critical control points in the process to ensure food safety.

COMPLIANCE WITH REGULATIONS

Meat processing industries are subject to various regulations and guidelines that govern food safety and sanitation. The United States Department of Agriculture (USDA) has established guidelines for meat processing plants to ensure the safety and quality of meat products. The USDA's Food Safety and Inspection Service (FSIS) inspects meat processing plants to ensure that they comply with these guidelines. Failure to comply with these regulations can result in fines, penalties, and legal actions. Therefore, meat processing industries must maintain a clean and hygienic environment to comply with these



regulations and avoid legal consequences.

In addition to HACCP, meat processing plants are required to follow other regulations, such as the Food, Drug, and Cosmetic Act and the Federal Meat Inspection Act. These regulations cover various aspects of food safety and sanitation, and non-compliance can result in significant penalties.

PRODUCT QUALITY

In addition to food safety, sanitation and hygiene also play a crucial role in maintaining the quality of meat products. Meat products that are not properly handled and stored can spoil and become unfit for consumption. A clean and hygienic environment can help prevent the growth of bacteria and other microorganisms that can spoil meat products. Maintaining product quality is essential for meat processing industries to maintain customer satisfaction and retain their market share.

Meat processing plants can take several steps to maintain product quality, such as using proper storage techniques, monitoring temperature and humidity levels, and using safe handling practices.

MEASURES TO MAINTAIN SANITATION AND HYGIENE IN MEAT PROCESSING

To maintain a clean and hygienic environment, the following measures can be implemented in meat processing plants:

PERSONNEL HYGIENE

Personnel hygiene is an essential component of sanitation and hygiene in meat processing industries. Meat processing plant employees

should be trained on proper hygiene practices, including handwashing and wearing appropriate clothing, such as hairnets and gloves. Employees who are ill or have open wounds should be restricted from handling meat products to prevent the spread of harmful microorganisms. In addition to training, meat processing plants can implement measures such as regular health checks for employees and providing hand sanitizers and disinfectants.

CLEANING AND SANITIZING

Cleaning and sanitizing are critical components of sanitation and hygiene in meat processing. Meat processing plants should have a robust cleaning and sanitizing program in place to prevent the growth and spread of harmful microorganisms. All surfaces, equipment, and utensils should be regularly cleaned and sanitized using appropriate cleaning agents. The use of color-coded cleaning tools and equipment can help prevent cross-contamination. Meat processing plants can also use advanced technologies such as ultraviolet light and ozone to sanitize surfaces and equipment, which can be more effective than traditional cleaning methods.

PEST CONTROL

Pests such as rodents and insects can spread harmful microorganisms and contaminate meat products. Therefore, meat processing plants should have an effective pest control program in place to prevent the entry and proliferation of pests in the processing plant. This can include sealing gaps and openings in the building, using insecticides and rodenticides, and monitoring for signs of pest activity. Meat processing plants can also use non-toxic methods such as traps and ultrasound to control pests, which can be safer



and more environmentally friendly.

ENVIRONMENTAL MONITORING

Environmental monitoring is an essential component of sanitation and hygiene in meat processing. Meat processing plants should regularly monitor the environment to detect any potential sources of contamination. This can include swabbing surfaces and equipment to test for the presence of harmful microorganisms. Regular monitoring can help identify potential contamination sources and allow meat processing plants to take corrective actions to prevent contamination. Meat processing plants can also use advanced technologies such as sensors and data analytics to monitor the environment and detect potential contamination sources more efficiently.

CONCLUSION

Sanitation and hygiene are crucial components in meat processing industries to ensure food safety, compliance with regulations, and product quality. Meat processing industries should implement measures to maintain a clean and hygienic environment, including personnel hygiene, cleaning and sanitizing, pest control, and environmental monitoring. By implementing these measures, meat processing industries can ensure that their products are safe for consumption and maintain customer satisfaction. Advanced technologies can also be used to enhance sanitation and hygiene in meat processing, making the industry safer, more efficient, and more environmentally friendly.

COLD PLASMA TECHNOLOGY APPLICATION IN MEAT SECTOR

INTRODUCTION

The rising global consumption of meat and the imperative to ensure its safety, quality, and longevity, given meat's susceptibility to microbial contamination and spoilage. Cold Plasma (CP) technology emerges as a prominent solution in this context. CP involves ionizing gas under atmospheric or low-pressure conditions, creating bio-active agents such as reactive oxygen species (ROS) and reactive nitrogen

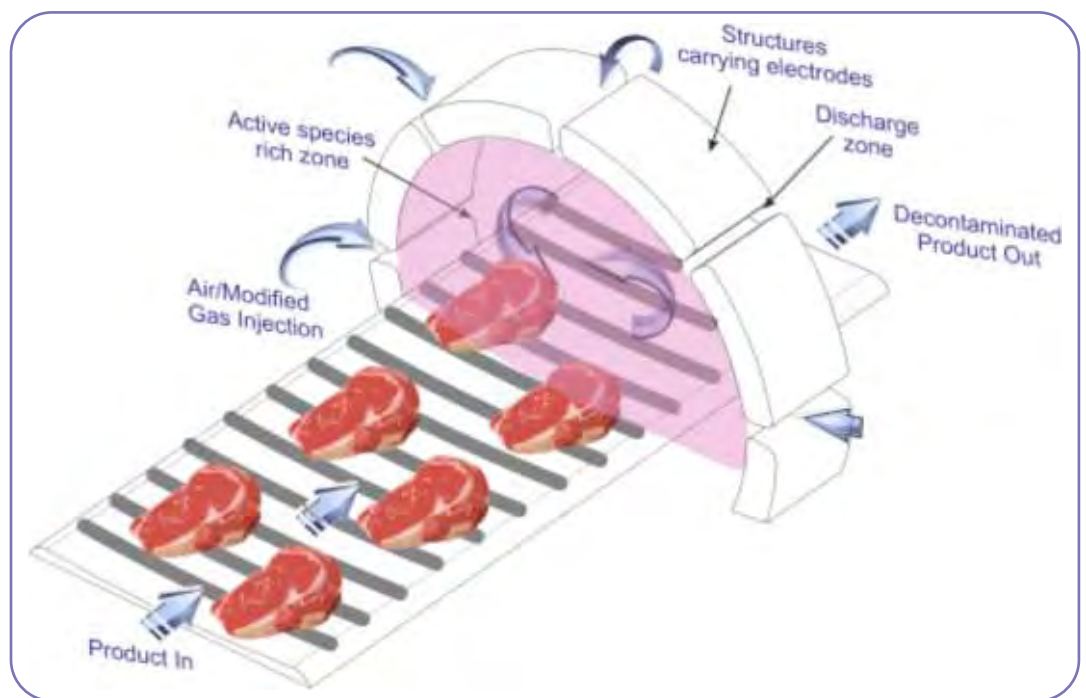
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species (RNS), ultraviolet (UV) light, and charged particles, which have demonstrated effectiveness against various microorganisms, thereby maintaining the safety and integrity of various meats and meat products.

Cold Plasma offers a non-thermal, environmentally friendly, and efficient method for meat treatment and

preservation, ensuring microbial safety while maintaining the food's nutritional and sensory qualities.

It has shown potential in inactivating a broad spectrum of microorganisms and ensuring the microbiological safety of meat products without compromising their quality attributes like color, texture, and flavor. Furthermore, Cold plasma technology stands out due to its operational advantages such as quick treatment, easy device operation, low energy requirement, and ability to operate at room temperature, positioning it as a potentially widely-adopted technology in future meat processing.

FUNDAMENTALS OF COLD PLASMA TECHNOLOGY

PLASMA AND COLD PLASMA

Plasma, recognized as the fourth state of matter, undergoes phase transformations from solid to liquid to gas and eventually becomes plasma through increased energy levels, exhibiting its distinct characteristics. Cold plasma is comprised of various excited species – atomic, molecular, radical, and ionic – and several reactive species, such as electrons, ions, atoms, free radicals, and excited molecules, plus electromagnetic radiation like visible light and UV photons. Plasma can be categorized based on pressure (low atmospheric and high-pressure plasmas) and thermal properties (thermal and non-thermal). While thermal plasma is achieved by heating gas to exceptionally high temperatures, non-thermal or cold plasma is characterized by non-equilibrium, where uncharged molecules and ions cool significantly more effectively than the energy transfer from electrons, keeping the gas at a low temperature.

Cold plasma, whether generated at atmospheric pressure (atmospheric cold plasma, ACP) or low pressure (low-pressure cold plasma, LCP), produces reactive species and electron densities which inhibit microorganisms similarly. The technology is hailed as non-thermal, since during cold plasma formation, most applied energy is focused on electrons, while gas molecules generally maintain approximately ambient temperature. Cold plasma technology has proven effective for applications in meat processing where high temperatures are undesirable, and it is environmentally friendly due to its minimal water usage, absence of chemical residues, and utilization of ambient air as a working gas.

COLD PLASMA FORMATION

• Generation of Cold Plasma:

Electrical energy is applied to carrier gases (e.g., oxygen, nitrogen) using electrodes. The gas ionizes and forms plasma when power surpasses a certain threshold. At higher power levels, initial sparks can transition into a high-current flame.

• Transition from Gas to Plasma

When gas molecules gain enough energy, they ionize to form plasma. Various energy forms (thermal, electromagnetic, etc.) can facilitate this

ionization.

• Chemical Complexity

The chemical reactions in plasma involve multiple species and are highly complex. Wet air plasma chemistry, involving additional elements like water droplets, is particularly intricate.

• Reactive Species Creation

Reactive oxygen species (e.g., O₃, O₂⁻) and reactive nitrogen species (e.g., NO, NO₂) are generated. These reactive species have the ability to neutralize microbes.

DEVICES FOR COLD PLASMA GENERATION

• Dielectric Barrier Discharge (DBD)

Here, the plasma is generated between two electrodes separated by a dielectric material. It's one of the most common methods for food treatment.

• Atmospheric Pressure Plasma Jet (APPJ)

A plasma jet generates plasma in a gas stream which can be directly applied to the food surface.

• Corona Discharge

A method where plasma is formed around a sharp electrode tip.

APPLICATIONS OF COLD PLASMA COLD PLASMA AND MEAT SAFETY:

- **Pathogen Reduction:** Effectively eliminates harmful microorganisms like E. coli, Salmonella, and Listeria from meat surfaces, ensuring safer consumption.
- **Extended Shelf Life:** By reducing microbial load, cold plasma treatments delay spoilage and extend the freshness of meat products.
- **Chemical-Free Decontamination:** Offers a non-chemical approach to disinfect meat, reducing the potential for chemical residues and allergens.
- **Surface Sterilization:** Targets the outer surface of meat cuts, reducing cross-contamination risks in packaged products.

COLD PLASMA AND MEAT QUALITY:

- **Preservation of Nutritional Value:** As a non-thermal technology, cold plasma avoids the degradation of heat-sensitive nutrients, preserving the meat's inherent nutritional quality.
- **Improved Meat Texture:** Cold plasma can induce subtle changes in muscle fibers, potentially leading to enhanced tenderness in certain meats.
- **Color Retention:** Cold plasma treatments can stabilize meat color by affecting myoglobin, ensuring the product retains its fresh appearance for a longer period.
- **Minimal Impact on Sensory Properties:** When applied correctly, cold plasma doesn't introduce off-flavors or odors, preserving the natural taste and aroma of the meat.
- **Enhanced Food Integrity:** Cold plasma, as a non-thermal process, ensures meat safety without compromising its quality, texture, or nutritional value.

SURFACE DECONTAMINATION

- **Microbial Reduction on Meat Surfaces:** Cold plasma targets and reduces harmful pathogens like E. coli, Salmonella, and Campylobacter on meat surfaces, making it safer for consumption.
- **Meat Packaging Sterilization:** Prior to packaging, cold plasma can be used to decontaminate the inner surfaces of meat packaging materials, further ensuring meat safety during storage and transportation.
- **Cutting Tool and Conveyor Sanitization:** Cold plasma can be used to sanitize meat processing equipment, preventing cross-contamination and ensuring consistent meat quality.
- **Decontamination of Processed Meat Products:** Products like sausages, cured meats, and others can benefit from cold plasma treatments, reducing surface contaminants and enhancing product shelf life.

APPLICATION IN PACKAGING

- **Packaging Sterilization:** Cold plasma can be employed to sterilize the inner surfaces of meat packaging materials, ensuring an added layer of safety against contamination.
- **Enhanced Shelf Life:** By reducing microbial contaminants on both meat and its packaging, cold plasma treatments extend the shelf life of packaged meat products.

- **Barrier Properties Enhancement:** Cold plasma treatments can modify packaging surfaces to improve gas barrier properties, benefiting the preservation of meat freshness.
- **Adhesion Promotion:** Plasma treatments can modify the surface energy of packaging materials, improving the adhesion of labels or any printed information.
- **Eco-friendly Approach:** Reduces the need for chemical disinfectants in the packaging process, leading to a more sustainable and environmentally friendly approach.
- **Odor and Residue Prevention:** Ensures that packaging doesn't introduce any off-odors to the meat, maintaining the product's natural aroma.
- **Improved Seal Integrity:** Cold plasma can enhance the sealability of packaging materials, ensuring airtight packages that preserve meat quality.

APPLICATION IN MEAT TENDERIZATION

- **Protein Modification:** Cold plasma induces oxidative changes in muscle proteins, leading to a breakdown of certain protein structures, which can enhance meat tenderness.
- **Collagen Breakdown:** Cold plasma treatments can lead to a partial breakdown of collagen in the meat, making the meat more tender and easier to chew.
- **Non-Thermal Process:** Unlike traditional tenderization methods that use heat, cold plasma tenderizes meat without cooking it, preserving its raw state and inherent flavors.
- **Shortened Marination Time:** Cold plasma can increase the meat's porosity and surface reactivity, allowing marinades and tenderizing agents to penetrate more efficiently, reducing the required marination time.

REGULATORY CONSIDERATIONS

- **Approval for Food Contact:** Any cold plasma system used for meat processing must be certified as safe for direct or indirect food contact according to regional food safety authorities.
- **By-Product Monitoring:** There's a need to monitor and analyze potential by-products formed during plasma treatment to ensure no harmful compounds are generated.

- **Treatment Consistency:** Regulations may require consistent and standardized treatment parameters (e.g., treatment time, power levels) to ensure product safety and uniformity.
- **Worker Safety:** Occupational safety standards must be met, considering potential exposure to ozone or UV radiation generated by some cold plasma sources.
- **Labeling Requirements:** Depending on the region, there may be requirements to label meat products treated with cold plasma, providing transparency to consumers.
- **Continuous Monitoring:** Systems should be in place for regular monitoring and validation of the cold plasma process to ensure ongoing compliance with food safety standards.
- **Training and Education:** Personnel handling cold plasma equipment might need specialized training, as mandated by regional or industry-specific regulations.

CHALLENGES AND LIMITATIONS:

- **Depth of Penetration:** Cold plasma primarily acts on the surface of meat, making it challenging to treat internal contaminants or achieve deep-tissue tenderization.
- **Potential Flavor Alteration:** While cold plasma may not introduce off-flavors when correctly applied, there's a potential for flavor changes if parameters aren't optimized.
- **Cost and Scalability:** Integrating cold plasma technology into existing production lines can be expensive. Scaling the technology for large-scale meat processing might pose challenges.
- **Uniformity of Treatment:** Ensuring consistent and uniform plasma treatment across different meat cuts or batches can be challenging, given the irregular surfaces and sizes.
- **Consumer Acceptance:** There may be hesitancy from consumers in accepting meat treated with a relatively new technology, especially without proper education on its safety and benefits.

FUTURE TRENDS:

- **Integration with Smart Technologies:** The fusion of cold plasma systems with IoT and AI for real-time monitoring, optimizing treatment parameters, and ensuring consistent meat quality.
- **Sustainability and Green Processing:** Emphasis

on cold plasma as an eco-friendly alternative to traditional meat preservation and treatment methods, supporting sustainable food production.

- **Compact and Portable Units:** Development of smaller, more portable cold plasma units, allowing for on-site treatments at smaller meat processing facilities or farms.
- **Consumer Education and Transparency:** Increased efforts to educate consumers about the benefits and safety of cold plasma-treated meats, bolstering consumer trust and acceptance.
- **Advanced Research on Flavor and Quality:** Continuous research aimed at optimizing cold plasma parameters to ensure no adverse effects on meat flavor, texture, and nutritional value.

CONCLUSION:

Cold plasma is an emerging and highly reliable technique for decontamination, preservation and sterilization of food materials. It positively improves the bioactive profile, physicochemical property, rheology and shelf-life, as apparent in some foods. Besides, the CAP improves the nutritional quality such as total phenolic compounds, amino acids and sugars in some food products. However, these modifications depend on the mixture of gas utilized for the production of plasma and mode of exposure/ penetration over the food material. Limited literature on the toxicity, lethality, food allergens and biosecurity of the CAP treatment on foods is available.

Therefore, more research on genotoxic/cytotoxic effect of CAP treatment is required to understand the chemical reaction and mechanism of plasma and its secondary products on food.

Moreover, it should be noted that the possibility of migration of bioactive compounds in the plasma-treated packaging film necessitates the need to authenticate the existence of hazardous particles and species inside the packaging materials.

Hence, safety assessment of packaging application with the selectivity of gases for CAP generation and appropriate elucidation of chemical changes on plasma-treated foods need strict assessment.

It is therefore suggested that operational conditions of plasma treatment.

ONE HEALTH AND EMERGING ZOO NOTIC DISEASES

Infections Affecting Humans & Animals

ABSTRACT

One Health is a multidisciplinary concept aimed at improving human, animal, and environmental health. Emerging zoonotic diseases significantly impact human health, particularly those who live in poverty and have close contact with domestic or wild animals. Nearly 75% of zoonotic diseases are transmitted directly from animals to humans or indirectly via vector/agent interactions between animals and humans. Growing populations, globalization, urbanization, and the interaction of the environment with humans and livestock all play roles in the emergence and spread of zoonotic diseases.

Keywords: *Emerging zoonotic diseases, one health, human, animal, environmental health*

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INTRODUCTION

Not a single year passes without which we can tell the world: here is a new disease Rudolf Virchow, 1867. His saying is still valid in this present era where we have advanced our knowledge about diseases and develops advance diagnostics and technology but still emerging zoonotic diseases remain a crucial global challenge. In the 19th century, Robert Virchow coined the term “zoonosis” to describe pathogens that are naturally transmitted

between vertebrate animals and humans. Later, during the 20th century, Calvin Schwabe revived the concept of “one medicine.” The one health approach plays a significant role in the prevention and control of zoonoses. Approximately 75% of new emerging human infectious diseases are defined as zoonotic. Approximately 60% are caused by multi host pathogens, characterized by their movement across various species. Zoonotic diseases are most commonly spread through direct contact from

animals to humans or indirect contact via vector/agent interactions. India has the largest population, approximately 1.42 billion which shares common environment with total 303.76 million cattle, 148.89 million goats, and 9.06 million pigs and 851.81 poultry. In rural parts of India, animal lives in close proximity with humans. Interactions between humans, animals and environment provides opportunities for pathogens to spread.

Outbreaks of Severe acute respiratory syndrome (SARS), Nipah virus, highly pathogenic avian influenza viruses (HPAI), Middle East Respiratory Syndrome (MERS) coronavirus in the Gulf, and the Ebola virus in West Africa have augmented public awareness of the links between wild animals, livestock production, and global public health. Currently, One Health aims to develop the capacity and infrastructure to prevent and respond to the rapidly expanding zoonoses through research that is not only focused on the disease but also on the promotion of health at the individual, population, and ecosystem levels.

ECONOMIC BURDEN OF ZOOONOTIC DISEASES- IN INDIA

Large parts of the country have demonstrated to be global “hot spots” at high risk for emergence of pathogens from wildlife as well as domestic animals. In India, where approximately 80% of population lives-in rural areas in close contact with large domestic animal population. Abundance of vectors because of suitable climate, low socio-economic conditions and lack of proper medical care zoonotic diseases have great public health significance. However, because of inadequate diagnostic facilities, unfamiliarity of physicians with these diseases and lack of co-ordination between physicians, veterinarians, and epidemiologist, the extent of their existence is obscured. The plague outbreak occurred in September, 1994 incurring a total loss of over US\$ US \$ 1.7 billion (WHO, 2007). Brucellosis alone has contributed to loss of 30 million-man days and economic loss of Rs. 24 crores a year.

FACTORS RESPONSIBLE FOR EMERGENCE OF ZOOONOSSES

Many factors contribute to the emergence of infectious diseases. Those frequently identified include microbial adaptation and change, human

demographics and behavior, environmental changes, technology and economic development, breakdown in public health measures and surveillance, and international travel and commerce. New outbreaks of zoonotic disease continue to occur as the human-animal interface grows. Destruction of animal habitat and human population sprawl increases contact between humans and animals. Human can be exposed to new, unexpected zoonotic diseases or re-emerging previous diseases. Zoonoses that were previously limited to certain geographical locations can spread due to globalization of markets and increased worldwide travel.

EMERGING ZOOONOTIC DISEASES

• Bovine tuberculosis (bTB)

Most cases of human TB are caused by the bacterial species, *Mycobacterium tuberculosis*. Bovine tuberculosis is a chronic bacterial disease of animals caused by members of the *Mycobacterium tuberculosis* complex, primarily by *Mycobacterium bovis*. It is a major zoonotic disease, and cattle are the main source of infection for humans. It also affects other domesticated animals such as sheep, goats, equines, pigs, dogs and cats, and wildlife species such as wild boars, deer, and antelopes. Humans get infection by ingesting raw milk from infected cows, or through contact with infected tissues at abattoirs or butcheries.

2017. *bovis* which is estimated to account for up to 10% of human tuberculosis cases in developing countries. Infection of *M. bovis* is extrapulmonary and is naturally resistant to pyrazinamide, one of the antimicrobials that is commonly used to treat human tuberculosis. The WOA, the World Health Organization (WHO), the Food and Agriculture Organization of the UN (FAO) and the International Union Against Tuberculosis and Lung Disease (The Union) jointly launched the first-ever roadmap to tackle zoonotic TB in October 2017. It is based on a One Health approach recognizing the interdependence of human and animal health sectors for addressing the major health and economic impacts of this disease.

• Avian influenza: H5N1

H5N1 has killed millions of poultry in a growing number of countries throughout Asia, Europe and Africa. Health experts are concerned that the coexistence of human flu viruses and avian flu



viruses (especially H5N1) will provide an opportunity for genetic material to be exchanged between species-specific viruses, possibly creating a new virulent influenza strain that is easily transmissible and lethal to humans. The mortality rate for humans with H5N1 is 60%. From 2003 to 25 March 2024, a total of 888 worldwide human cases of infection of influenza A(H5N1), including 463 deaths, have been reported to WHO from 23 countries. On 21 July 2021 India notified first human case of avian Influenza A(H5N1) from Haryana state, northern India.

• Nipah Virus

Nipah virus (NiV) infection is an emerging zoonotic disease of public health importance in the South-East Asia Region with a high case fatality rate estimated to range between 40 and 75%. The 2018 Kerala Nipah virus outbreak traced to the fruit bats in the area. The outbreak was localized in Kozhikode and Malappuram districts of Kerala and claimed 17 lives. Between 12 and 15 September 2023, a total of six laboratory-confirmed cases of Nipah virus infection including two deaths were reported by the State Government of Kerala. Two previous outbreaks occurred in the state of West Bengal in 2001 and 2007.

• Severe acute respiratory syndrome (SARS)

It is first Emerging Infectious disease of the 21st Century. It is a viral respiratory disease of zoonotic origin caused by the SARS coronavirus (SARS-CoV). Bats and civet cats are considered as

reservoir. Between November 2002 and July 2003, an outbreak of SARS in southern China caused an eventual 8,098 cases, resulting in 774 deaths reported in 37 countries.

• Middle East respiratory syndrome coronavirus (MERS-CoV)

Middle East respiratory syndrome (MERS) is a viral respiratory disease caused by Middle East respiratory syndrome coronavirus (MERS CoV) that was first identified in Saudi Arabia in 2012. MERS-CoV is a zoonotic virus and has been identified and linked to human infections in dromedary camels in several Member States in the Middle East, Africa and South Asia (WHO).

• Scrub typhus

Scrub typhus, a rickettsial infection caused by *Orientia tsutsugamushi*, a gram-negative obligate intracellular coccobacillus is transmitted to humans by the bite of larval stage (chigger) of trombiculid mite. The disease has been reported from all over the world, but it is endemic in

terrains of the *tsutsugamushi* triangle, a geographical region comprising of South and East Asia and the Southwest Pacific. Recent reports from India suggest that there is a resurgence of scrub typhus and that the resurgence is associated with considerable morbidity and mortality. This is a cause of concern. Though considered as disease of rural areas, this disease has been urbanized and the prevalence has broadened further. Increasing prevalence of scrub typhus may be attributed to combination of climate change and expansion of

humans into previously uninhabited areas and widespread use of Beta-lactam Antibiotics. India, no definite statistics available due to lack of awareness, high cost of diagnostic kits and the fact that it is not a reportable illness (Viswanathan et al., 2013).

• Rabies:

Rabies is known to be present in more than 150 countries and territories of all continents except Antarctica. About 60 000 people die of rabies every year, mostly in Asia and Africa. Rabies virus infects domestic and wild animals and is spread to people through close contact with infected animals' saliva via bites or scratches. The main route of rabies transmission to humans is the bite of rabid dogs.

• Tick Borne Zoonoses

It includes: Lyme Borreliosis, Crimean – Congo Haemorrhagic Fever, Kyasanur forest disease.

• Crimean-Congo haemorrhagic fever

CCHF virus is a member of the genus Nairovirus of the family Bunyaviridae. Ixodid ticks of the genus Hyalomma specifically act as a vector and reservoir for the virus and numerous wild and domestic animals can serve as amplifying hosts. Asymptomatic in infected animals but highly fatal in humans. During the past decade, the virus has emerged in new areas of Europe, Africa, Middle East, and Asia and has increased in disease endemic areas (Leblebicioglu et al., 2010). In India on January 2011, the nosocomial outbreak of CCHF has been reported from Gujrat, India (Makwana et al., 2015). Since then, numerous outbreaks and sporadic cases of this disease have been reported from different districts of Gujarat State.

• Kyasanur Forest Disease (KFD)

It is viral haemorrhagic disease transmitted through bite of infected ticks. KFD virus is an enzootic in India and maintained in ticks, mammals, and birds. KFD was first recognized in 1957 in the Kyasanur Forest of Shimoga District, Karnataka State, India. More than 3,314 monkey deaths attributed to KFD were reported in KFD-endemic states in India during 1957–2020 (Chakraborty et al., 2021). People with recreational or occupational exposure to rural or outdoor settings (e.g., hunters, herders, forest workers, farmers) within Karnataka State are potentially at risk for infection by contact with infected ticks. Its geographical distribution now expands to Tamilnadu and Kerala states. About 22.4

percent of persons living in the Andaman and Nicobar Islands were found to be seropositive for KFD in 2002; and human infection by closely related agents is reported in Saudi Arabia (Alkhurma virus) and China (Nanjianyin virus). Since January 2024, two people have died due to Kyasanur Forest Disease (KFD) in Karnataka.

• Japanese encephalitis

Japanese encephalitis is a mosquito-borne viral disease that can cause reproductive losses in pigs, and encephalitis in horses. Japanese Encephalitis Virus (JEV) is the main cause of viral encephalitis in many countries of Asia with an estimated 68, 000 clinical cases every year. Case-fatality rate among those with encephalitis can be as high as 30%. Permanent neurologic or psychiatric sequelae can occur in 30%–50% of those with encephalitis. Seasonal outbreaks: JE cases in India often follow a seasonal pattern, with increased transmission during the monsoon and post-monsoon periods when mosquito populations are higher. Outbreaks typically occur from May to October, peaking during the rainy season.

• Q fever

It is an emerging occupational and foodborne zoonoses caused by the bacteria *Coxiella burnetii* which can infect mammals, birds, reptiles and arthropods. Veterinarians, laboratory workers, farmers and abattoir workers at risk. It can cause abortions and still births in cattle, sheep, and goats. It is an endemic in many countries including India. It is spread by close animal contact and common housing. Q fever can also be spread by ticks which pass the bacteria. Since it is also shed in the milk of an infected animal, it can be contracted by drinking non-pasteurized infected milk. In Netherland it forced Culling of 55,000 goats in order to control Outbreak in Humans (Nature, 2010, 2nd Highest in the world history following BSE episode). It has been reported from Punjab, Haryana, Rajasthan, UP, M.P. & Karnataka (Vaidya et al., 2010). In 2023 Hyderabad-based National Research Centre on Meat confirmed through serological tests that five butchers among 250 samples.

• Leptospirosis

Leptospirosis are important zoonotic disease that can be transmitted to humans. In the wild, the disease occurs in animals, mostly rodents (rats and mice), dogs, cattle, goats and wild boars. In the past decade, leptospirosis has emerged as a globally



important infectious disease. It occurs in urban environments of industrialized and developing countries, as well as in rural regions worldwide. Mortality remains significant, related both to delays in diagnosis due to lack of infrastructure and adequate clinical suspicion, and to other poorly understood reasons that may include inherent pathogenicity of some leptospiral strains or genetically determined host immunopathological responses.

• Anthrax

The disease anthrax occurs generally in herbivores and the causative organism (*Bacillus anthracis*) infects humans who come in contact with infected animals or their products. A recent study mapping the distribution of anthrax across 70 countries estimated that approximately 1.83 billion people lived within the regions of anthrax risk globally, mostly concentrated in rural rainfed systems throughout arid and temperate land across Asia, southern Europe, sub-Saharan Africa, North America and parts of Australia (Carlson et al., 2019). India is an endemic country for animal anthrax which leads to sporadic and seasonal outbreaks in humans. The case fatality rate of cutaneous anthrax ranges from 2% to 38%, while the gastrointestinal and inhalational types are usually 100% fatal. Poverty, socio-cultural practices & environmental factors exacerbated the risk.

• Echinococcosis

Echinococcosis is a serious zoonosis, with rates of human cystic echinococcosis infection ranging from less than 1 per 100,000 to more than 200 per 100,000 in certain rural populations where there is close contact with domestic dogs. A total annual loss of

Rs. 11.47 billion in India is estimated with cattle and buffalo population. Laboratory workers, animal handlers, veterinarians, dog owners are all at higher risk of infection. Since the eggs are shed in the environment, they can contaminate fruits, vegetables or water, or can stick to the fur of an animal and be transferred on hands to the mouth.

CONTROL AND PREVENTION OF ZONOTIC DISEASES

Early detection of zoonotic pathogens through enhanced laboratory capacity and surveillance at the animal–human interface is a crucial step toward controlling and preventing zoonoses. Rapidly detecting, responding to, and controlling public health emergencies at their source, including those caused by outbreaks of zoonotic diseases, is essential for global health security. In India, there is an active effort to strengthen surveillance for early diagnosis and effective, timely containment. The National Centre for Disease Control plays an important role in strengthening capacity across the country and bringing together epidemiologists, microbiologists, veterinarians, entomologists, etc., to effectively launch required multi-sectorial action to address zoonotic diseases. Under Niche Area of Excellence on Centre for zoonoses the Maharashtra Animal and Fishery Sciences University, Nagpur in collaboration with ICAR-ICMR has been established as a unique platform for veterinary and human medicine to combat zoonotic disease to achieve One Health approach. National Institute for One Health (NIOH) established in will further expedite the country's efforts in enhancing health research to serve our vulnerable populations.

ETHNO-VETERINARY APPROACH OF AUGMENTING REPRODUCTIVE HEALTH IN DAIRY CATTLE

ABSTRACT

Reproductive performance of the dairy cow is directly dependent on three essential reproductive processes viz., Fertilizable quality oocyte, conducive oviductal and uterine environments for fertilization and embryonic development and endocrinologically competent corpus luteum (CL) for maintenance of gestation. Perusing through these processes, it is very clear that basics of bovine fertility rely on one individual factor i.e., 'THE OVARIAN FOLLICLE'.

Anoestrus and repeat breeding were found to be the major reproductive disturbance among the heifers and post-partum cows. Ultrasonographic monitoring of the follicular turnover in anoestrus crossbred cows revealed that ovaries exhibited follicular wave activity as that of normal cycles but the dominant follicle did not culminate in ovulation resulting in acyclicity.

Murraya koenigii leaves, popularly known as curry leaves, has the potential to augment the ovarian function in terms of follicular development and

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steroidogenesis. About 64.0 per cent of anoestrus cattle treated with herbal combination viz., *Raphanus sativus*, *Aloe vera*, *Moringa oleifera*, *Cissus quadrangularis* and *M. koenigii*, returned to cycle and about 56.0 per cent of them conceived on insemination. The combination of these herbs has beneficial effects on clearing uterine infections, providing micro- and macro-nutrients and antioxidants. Further, they possess proteins simulating steroidogenic / gonadotrophic activity.

Thus the fresh herbal combinations have the potential for improving folliculogenesis, improving sero-concentrations of endocrine/growth factors and augmenting the fertility in anoestrus and repeat breeding dairy cattle.

Keywords: Dairy cattle; Infertility; Hormone therapy; Ethno-veterinary; Reproductive health



RECENT ADVANCEMENTS IN THE DIAGNOSIS AND MANAGEMENT OF LIVESTOCK AND POULTRY DISEASES

The agriculture sector is essential to the world economy because it feeds billions of people and supports their lives. This industry's essential components—livestock and poultry farming—contribute substantially to the global food supply. Nonetheless, infections that can affect animal health, welfare, and productivity remain one of the industry's ongoing



problems. New developments in the identification and treatment of diseases in cattle and poultry are revolutionizing the field of veterinary medicine by providing creative ways to reduce the effects of infectious agents and raise agricultural output as a whole.

DIAGNOSIS:

• Molecular diagnosis

The broad use of molecular diagnostic methods in recent years has been one of the major innovations. Because it is now possible to precisely identify pathogens at the molecular level, polymerase chain

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reaction (PCR) and other nucleic acid amplification techniques have revolutionized the detection of disease. High sensitivity and specificity are provided by these methods, allowing for quick and precise diagnosis even in the early stages of infection. Determining the cause of an illness makes it easier to implement customized treatment plans, which lessens the need for broad-spectrum drugs.

• Next-Generation Sequencing (NGS)

Technologies utilizing Next-Generation Sequencing (NGS) have enhanced diagnostic capacities even more. Researchers can learn more about virulence factors, mechanisms of antibiotic resistance, and the genetic variety of infectious agents by deciphering the complete genetic makeup of pathogens. This information is essential for creating vaccinations that are more successful and creating therapies that are suited to the unique traits of the infections.

• Point-of-care testing

In the field, point-of-care testing has shown to be revolutionary. With the use of portable diagnostic instruments, farmers and veterinarians can immediately evaluate the health of cattle and poultry on the spot. By facilitating prompt decision-making, this instant feedback loop stops infections from spreading within and between farms.

MANAGEMENT

• Vaccination strategy

Disease control has benefited greatly from vaccination strategy advancements. Scientists are working on vaccines that will be more effective in



the fight against both current and potential threats to poultry and cattle. A wider range of durable protection against infectious pathogens is possible with novel vaccine delivery technologies including DNA and vector vaccines.

• **Data analytics and Bio security**

The integration of sensor technologies and data analytics in precision livestock farming is revolutionizing the approach to herd management for farmers. Real-time monitoring of animal health parameters minimizes the impact on productivity by enabling early disease detection and prompt intervention. By giving farmers the tools to implement focused preventive measures, this data-driven approach improves bio security measures.

• **Artificial Intelligence**

It is impossible to overestimate the importance of machine learning and artificial intelligence (AI) in the management of disease. By analyzing large datasets, these technologies are able to predict disease outbreaks and identify patterns. Artificial Intelligence (AI) in veterinary medicine improves our knowledge of disease dynamics and helps us take preventative action to protect animal health.

• **Antimicrobial stewardship**

With worries over antibiotic resistance

growing, antimicrobial stewardship has taken centre stage. To lessen dependency on conventional antibiotics, researchers are looking into pro-biotics, alternative therapies, and creative treatment modalities. By taking a comprehensive approach, antimicrobials are used responsibly, maintaining their effectiveness and protecting the health of both humans and animals.

• **Global Surveillance Networks**

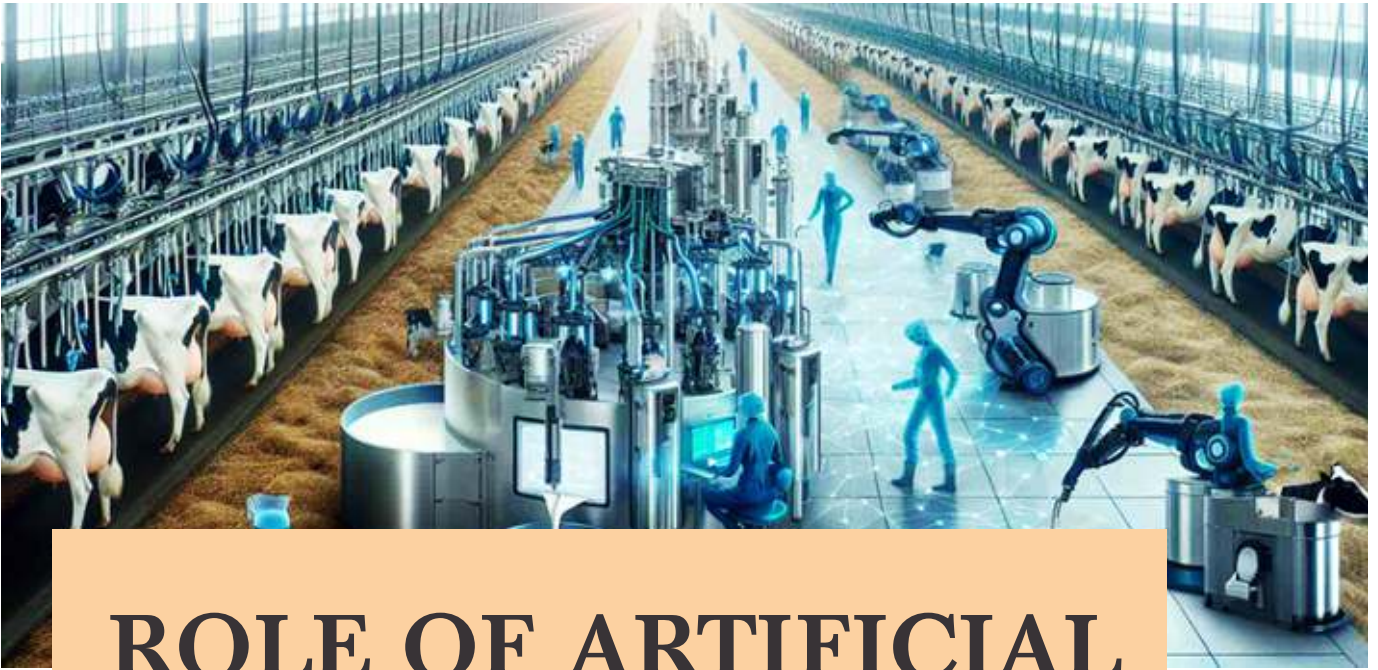
International cooperation and the creation of global surveillance networks are helpful in tracking the spread of illnesses and putting coordinated responses into action.

A paradigm shift in veterinary medicine has been brought about by recent developments in the diagnosis and treatment of diseases in livestock and poultry.

Artificial intelligence, precision farming, molecular diagnostics, and other innovations enable farmers and veterinarians to combat illnesses more skillfully, protecting animal health and welfare and promoting a resilient and sustainable agriculture sector.

Future developments in technology could lead to even more advanced and focused approaches to addressing the problems that the livestock and poultry farming industry faces.





ROLE OF ARTIFICIAL INTELLIGENCE in the Dairy Industry

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The dairy business is an important component of the global food supply chain, supplying nutrition to millions of people throughout the world. With the integration of artificial intelligence (AI) technology in recent years, the sector has seen a significant revolution. AI has transformed several elements of dairy farming, including milk production and general operations. This essay examines the various applications of artificial intelligence (AI) in the dairy business, emphasizing its substantial contributions to efficiency, production, and sustainability.

WHAT IS ARTIFICIAL INTELLIGENCE (AI)?

Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems. Specific applications of AI include expert systems, natural language processing, speech recognition and machine vision.

AUTOMATED MILKING SYSTEMS:

The development of automated milking systems is a significant use of AI in the dairy sector. Artificial intelligence systems are used to identify cows, monitor their health, and optimize the milking process. Sensors on the cows capture information about milk yield, udder health, and behaviour patterns. These data points are analyzed in real time, ensuring timely and effective milking with the least amount of human intervention. Automated milking systems boost productivity while also improving animal comfort by delivering individualized care.

HERD MANAGEMENT:

Artificial intelligence (AI) is essential for monitoring and managing dairy herds. AI algorithms can monitor individual cow health, fertility, feeding patterns, and milk output by collecting and analyzing

massive statistics. Farmers can take proactive efforts to avert possible concerns by recognizing anomalies or early indicators of disease, resulting in healthier cows and increased milk output. AI also aids in optimizing feed rationing, breeding decisions, and overall herd performance, allowing farmers to make data-driven farm management decisions.

PREDICTIVE ANALYTICS:

The application of AI-powered predictive analytics in the dairy business has proven to be beneficial. AI systems can estimate future milk yields, find patterns, and establish factors that influence production by analyzing large datasets containing milk production records, meteorological conditions, genetic information, and more. These insights enable farmers to make more informed decisions, better allocate resources, and improve overall operational efficiency. Dairy farmers can use predictive analytics to react to changing conditions, mitigate risks, and increase productivity.

QUALITY CONTROL:

Quality control is critical in the dairy sector to ensure the production of high-quality milk. By analyzing milk samples, AI-driven solutions aid in quality control. Machine learning algorithms are capable of analyzing milk composition, detecting pollutants, and identifying probable anomalies that may influence milk quality. Farmers can prevent inferior products from accessing the market by quickly recognizing and correcting any problems. AI-based quality control solutions increase consumer trust, protecting dairy products' reputation.

PRECISION FEEDING:

Through precision feeding, AI technology has optimized the feeding process in dairy farming. AI algorithms can build personalized feeding regimens for individual cows by analyzing data on cow behaviour, milk production, and nutritional requirements. This personalized technique guarantees that each cow is fed the best diet possible, resulting in increased milk production efficiency and general animal health. Precision feeding also decreases waste and environmental effect by avoiding overfeeding and wasting resources.

REPRODUCTIVE MANAGEMENT:

AI aids in reproductive management, which is an

important element of dairy farming. AI systems assist farmers in determining the best timing for artificial insemination by analyzing data on cow estrus behaviour, fertility history, and genetic information. This method improves breeding success rates and shortens the time between calving intervals, resulting in a more efficient reproductive cycle. AI-powered reproduction management helps dairy companies to be more sustainable and profitable.

ROBOTIC HERD MONITORING:

AI-driven robotic systems outfitted with sensors and cameras have revolutionized herd monitoring. These technologies can monitor cows' health, behaviour, and well-being in real time. The acquired data is analyzed by AI algorithms, allowing for the early detection of indicators of discomfort, illness, or anomalous behaviour. Interventions can be done to ensure animal welfare and prevent any health risks by swiftly informing farmers. Robotic herd monitoring systems enable continuous surveillance, allowing farmers to manage their herds more effectively.

CONCLUSION:

The incorporation of artificial intelligence (AI) technologies into the dairy industry has resulted in transformative changes, revolutionizing farming practices and increasing productivity. AI applications in automated milking systems, herd management, predictive analytics, quality control, precision feeding, reproduction management, and robotic herd monitoring have ushered in a new era of efficiency and sustainability in the dairy industry. As AI advances, it has the potential to further revolutionize the dairy business. Dairy farmers can make data-driven decisions, cut costs, enhance milk quality, and maintain the well-being of their herds by leveraging the power of AI, ultimately satisfying the growing demand for high-quality dairy products in a sustainable manner.



PAW-SITIVE PROTECTION KEEPING PETS SAFE WITH VACCINATIONS



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ABSTRACT

Vaccination plays a critical role in safeguarding the health and well-being of our beloved pets. Vaccines protect pets from serious diseases like rabies, distemper, and parvovirus, shielding them from pain and potential death. They also prevent the spread of diseases to humans, which is especially important for zoonotic diseases like rabies. By vaccinating pets, we can stop outbreaks of diseases among animals, making the world safer for everyone. From preventing infectious diseases and protecting public health to saving costs and ensuring long-term health and quality of life, vaccination is an indispensable component of preventive healthcare. Compliance with legal requirements, especially concerning diseases like rabies, underscores the responsibility of pet ownership. Vaccination also aids in

controlling disease outbreaks, particularly crucial for vulnerable populations like puppies and kittens. Vaccinating puppies and kittens is particularly important since their immune systems are still developing. Additionally, customized vaccination protocols tailored to individual pets' needs maximize protection while minimizing unnecessary vaccinations. The concept of herd immunity highlights the collective impact of vaccination on community health. In conclusion, collaboration between pet owners and veterinarians is essential in devising appropriate vaccination schedules tailored to individual pets' lifestyles and needs, ensuring their long-term health and well-being.

INTRODUCTION:

As pet owners, we all want our furry companions to live long, healthy lives filled with joy and vitality. One of the most crucial aspects of ensuring their well-being is by keeping them up-to-date on their vaccinations. Vaccinating your dogs and cats is not just a legal

requirement in many places, but it's also a fundamental responsibility that can safeguard their health and protect them from a range of serious diseases. In this blog, we'll explore the vital importance of vaccination for our beloved pets.

1. PREVENTION OF INFECTIOUS DISEASES:

Vaccines protect pets from a variety of potentially serious or even fatal infectious diseases. These diseases can include rabies, canine distemper, parvovirus, feline panleukopenia, feline herpesvirus, and feline calicivirus, among others. Vaccination helps to build immunity against these pathogens, reducing the likelihood of infection and its associated health risks.

2. PROTECTION OF PUBLIC HEALTH:

Some of the diseases that vaccines prevent can also affect humans. For example, rabies is a zoonotic disease that can be transmitted to humans through the bite of an infected animal. Vaccinating pets against rabies helps protect not only the animals themselves but also the human population by reducing the risk of transmission.

3. PREVENTION OF OUTBREAKS:

Vaccination helps prevent outbreaks of infectious diseases within animal populations. By reducing the prevalence of these diseases, vaccination contributes to the overall health and well-being of pets and helps maintain a healthier environment for both animals and humans.

4. COST SAVINGS:

Preventing infectious diseases through vaccination is generally more cost-effective than treating sick animals. Vaccines are typically less expensive than the cost of veterinary care for treating diseases, complications, and associated medical expenses.

5. LONG-TERM HEALTH AND QUALITY OF LIFE:

Vaccination contributes to the long-term health and quality of life of pets by protecting them from potentially debilitating or life-threatening

diseases. Vaccinated pets are less likely to suffer from severe illnesses, reducing their pain and suffering and improving their overall well-being.

6. COMPLIANCE WITH LEGAL REQUIREMENTS:

In many regions, vaccination against certain diseases like rabies is required by law. Keeping pets up-to-date on vaccinations ensures compliance with these legal requirements and helps prevent legal issues or penalties.

7. PUPPY AND KITTEN PROTECTION:

Vaccination is especially crucial for puppies and kittens, as they have immature immune systems and are more susceptible to infections. Vaccinating young animals helps provide them with the necessary immunity to protect against common diseases during this vulnerable stage of life.

8. PREVENTION OF PAINFUL AND DEBILITATING CONDITIONS:

Some infectious diseases, such as parvovirus in dogs and panleukopenia in cats, can cause severe and painful symptoms, including vomiting, diarrhoea, and dehydration. Vaccination helps prevent these conditions, sparing pets from unnecessary suffering and discomfort.

9. FACILITATION OF TRAVEL AND BOARDING:

Many boarding facilities, groomers, and pet care services require proof of vaccination before accepting pets. Keeping pets up-to-date on vaccinations ensures they can travel safely and participate in various activities without restrictions.

10. PRESERVATION OF THE HUMAN-ANIMAL BOND:

Vaccination helps protect the bond between pets and their owners by reducing the risk of serious illnesses that could result in prolonged separation or even death. Keeping pets healthy through vaccination supports the lifelong companionship and emotional well-being of



both animals and their owners.

11. CONTROL OF RESURGENCE IN DISEASES:

In some regions, certain diseases have experienced resurgence due to decreased vaccination rates or lapses in preventive measures. Maintaining high vaccination coverage helps control the spread of these diseases and prevents them from reemerging as significant health threats in communities.

12. CUSTOMIZED VACCINATION PROTOCOLS:

Veterinary professionals can tailor vaccination protocols to suit the individual needs, lifestyle, and risk factors of each pet. This personalized approach ensures that pets receive the appropriate vaccines at the right time intervals, maximizing protection while minimizing unnecessary vaccinations.

13. CONTRIBUTION TO HERD IMMUNITY:

Vaccination not only protects individual pets but also contributes to herd immunity within animal populations. By vaccinating a significant

portion of the population, the transmission of infectious diseases is disrupted, offering indirect protection to unvaccinated or vulnerable animals.

14. ADVANCEMENT OF VETERINARY MEDICINE:

Ongoing research and development in veterinary vaccinology contribute to the improvement of existing vaccines and the development of new vaccines against emerging infectious threats. Supporting vaccination efforts helps drive progress in veterinary medicine and public health.

CONCLUSION:

In conclusion, vaccination is a cornerstone of preventive healthcare for cats and dogs. It helps protect pets from infectious diseases, safeguards public health, prevents outbreaks, saves costs, promotes long-term health, and ensures compliance with legal requirements. Pet owners should work closely with their veterinarians to develop an appropriate vaccination schedule tailored to their pet's individual needs and lifestyle.