THE SCIENCE WORLD

A Monthly e Magazine

ANIMAL GENETICS AND BREEDING

May 2022|Volume 1| Issue 5

Official Website
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Vol 2 Issue 6
June, 2022

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Topic: Sustainable environmental development

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Main article body (word limit: Max 400 words)
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The article should be typed in MS word only with Times new roman, 12, Justified

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THE SCIENCE WORLD

A Monthly e Magazine

Special Issue

Vol 2 Issue 6
June, 2022

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THE SCIENCE WORLD

A Monthly e Magazine

ISSN:2583-2212

www.thescienceworld.net

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Volume 2(5) May-2022

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A Monthly e Magazine

ISSN:2583-2212

www.thescienceworld.net
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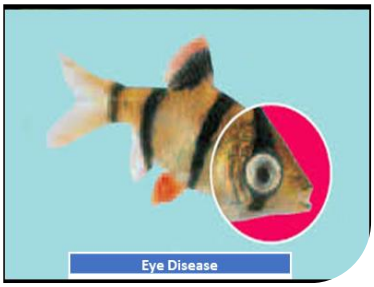
Volume 2(5) May-2022

THE SCIENCE WORLD
A Monthly e Magazine
ISSN: 2583-2212
April, 2022; 2(5), 476-479

Popular Article

Common Fish Diseases: Control and Treatment



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DOI:https://doi.org/10.5281/zenodo.6500345

Abstract

In the present world, various food producing sectors are gaining more importance to sustain the nutritional and food security of the world. Fish production sector is emerging as key sector to achieve the food security goals of the country and the world. Continuous focus on higher production targets has left the aquaculture highly susceptible to frequent disease outbreaks and consequent economic losses. It has been estimated that per annum economic loss due to aquatic animal diseases is approximately US$ 6 billion, worldwide. Though prophylactic measures such as maintenance of optimum culture conditions, probiotics and immunostimulants are regularly used in aquaculture, the application of medicated feed containing antibiotics often becomes the method of choice for the treatment of disease outbreaks. As is understood, prevention of fish diseases assumes paramount importance in terms of sustainable growth of aquaculture.

Introduction

Aquaculture is playing an increasingly important role to meet the growing food demand for human consumption. With increasing anthropogenic activities, large numbers of hazardous materials of biological and non-biological origins are frequently introduced in aquatic environment. Fish are exposed from different environmental pollutants, including drugs and chemicals and similar to other animals, they can also suffer from various types of diseases. The fish can also be infected or damaged by different pathogens, microorganisms or parasites. The most common fish diseases are gill disease, ich, tail and fin-rot, fungal infections, black spot disease, pop-eye, cloudy eye, fish lice and worms' infestation.

Causes of Fish Diseases:

There are three major causes of fish diseases:

1. Presence of environmental pathogens.
2. Low resistance of the fish stock.
3. Unsatisfactory water environment and poor management practices.

Pathogens (e.g. bacteria, viruses, fungi and parasites) exist in all natural water bodies, yet healthy fish have adequate resistance against them. They can also adapt to reasonable environmental changes and in turn avoid diseases due to pathogenic infection. Poor management practices may result in drastic changes in water quality and increased pathogen load in the aquatic environment. Under these conditions, already stressed fish may become vulnerable to pathogenic infections and diseases.

Impact of Fish Diseases:

Diseases affect the survival and growth rates of fish under culture. Given that drug treatments are expensive, fish diseases invariably lead to lower harvest and higher cost. Fish farmers often suffer hefty economic losses due to fish diseases. To alleviate such losses, it is crucial to take precautions to prevent fish diseases and reduce pathogen levels in water bodies. It is also important to prevent water quality from deteriorating and to strengthen the natural resistance of the fish stock. Regular monitoring of fish health is an effective way to identify disease uses and appropriate treatments. One major cause of serious fish kill is overlooking the contagiousness of fish diseases and thus delaying treatment. As such, adequate care and treatment should be given to infected fish promptly.

Monitoring of Fish Stock:

Fish farmers should carry out a simple inspection, every day. This routine can be divided into two stages:

Stage 1

Observe the fish for any uncharacteristic behavior, such as:

- Reduced feed intake. It is the first sign of many fish diseases. For this purpose, the farmer should maintain a daily record of feed intake so that any abnormality can be found out.
- Abnormal swimming pattern. Fish lying flat, rubbing against the bottom, jumping out of the water, circling in water, losing buoyancy/balance or congregating near the pond surface/dykes.

If any abnormal behavior is reported, proceed to Stage 2.

Stage 2

Check the body surface, fins and gills for presence of:

- Parasites
- Red spots, hemorrhage, loss of scales and ulcers
- Discoloration or dark body tones
- Tumor or fluid build-up in the body muscles (oedema)
- Tail rot or fin rot.
- Protruding or white/cloudy eye.
- Deep red spot, whitish colour, parasites or excess mucous in gills.

If any of the above symptoms are found, immediately separate the diseased fish from rest of stock and contact the experts for proper advice and control measures.

Symptoms and Control of Common Fish Diseases:

1. Cotton Wool Disease:

This is a fungal disease of fishes and fish eggs most commonly caused by *Saprolegnia* spp. These types of fungi are almost always present in farms and can cause the diseases due poor management practices. Malnutrition, presence of toxic substances in water, damages on skin, fins or gill and stress can lead to the secondary invasion of fish tissue by this parasite. Symptoms of this disease are presence of brown cottony growth on the fish wounds or eggs. The diseased fish behaves abnormally, fidgeting and rubbing against solid materials. As the mold continues to grow, morbid muscle rots and the fish loses its appetite, moves slowly, and eventually dies.

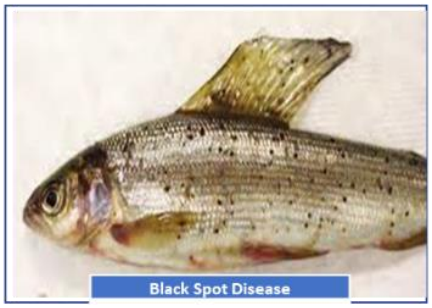
Disinfection of diseased fishes and fish eggs by following methods should be followed for control of this disease:

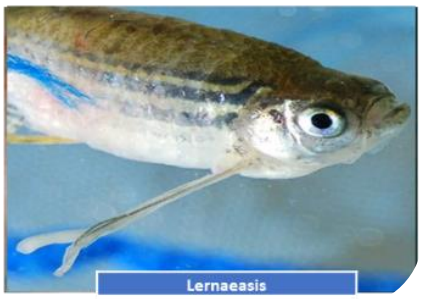
- Malachite green bath for fishes at 5 mg/L for one hour.
- Disinfect viscid eggs by immersing them with a 2-5 ppm malachite green solution for 10–15 min
- Prevention by following the BMPs is the best strategy. Maintaining optimal water quality, nutrition and stocking density is recommended to reduce fish stress and injury
- Bath treatments in NaCl (10–25 g/l for 5–30 min) or KMnO4 (5 mg/l for 10 min), are only partially effective

2. Gill Infections:

Fishes may also become susceptible to severe types of gill infections. These infections can either be caused by fungi (*Branchiomyces* spp.) or by bacteria (*Flavobacterium branchiophilum*) and called as gill rot or bacterial gill disease, respectively. The affected fishes become lethargic with loss of appetite. They can also be seen gasping for air at water surface and show poor response to external stimuli. Discoloration and necrosis of gill tissues are common signs of this disease. Microscopic examination of tissues is helpful to establish the gill rot due to fungi.

- Bath treatment for infected fish in 3-5% salt solution or with 5ppm potassium permanganate for 10 minutes
- Diseased fish can be treated with malachite green at 0.1ppm for 1 hr
- Ponds with regular branchiomycosis outbreaks should be dried and treated with lime at 150–200 kg/hectare.
- Prevention is the best control for Branchiomycosis. Recommended BMPs for maintenance of optimum water quality help to reduce fungal growth in an aquaculture.





3. Tail Rot, Fin Rot and Ulcers:

These types of infections are most commonly caused by several bacterial species such as *Aeromonas hydrophila*, *Pseudomonas fluorescence* and *Flexibacter columnaris* etc. Diagnosis of these diseases is quite easy. The first signs of the disease are milky white areas appearing in the fish's fins or tail, particularly around the edges. The fins develop a rather ragged appearance as the disease begins to eat the tissue. Eventually the disease eats all the clear fin membrane away, leaving just the fin rays.

Maintenance of water quality is very much important for control of bacterial infections. In addition, following control measures can be applied for treatment of infected fishes:

- Bath treatment for infected fish in 3-5% salt solution for 10-30 minutes.
- Partial water exchange and disinfectant/sanitizer treatment to restore optimum water quality
- Oral feed-based administration of Oxytetracycline @ 70-80 mg/kg fish body weight (BW) for 7-10 days

4. Epizootic Ulcerative Syndrome (EUS):

EUS has been reported to be one of the most destructive diseases both for farmed and wild fishes of fresh and brackish water origin. This infection is caused by fungi known as *Aphanomyces invadans.* EUS is also known as red spot disease (RSD), mycotic granulomatosis (MG) and ulcerative mycosis (UM). EUS occurs mostly during periods of low temperatures of 18–22 ^{o}C and after periods of heavy rainfall. Once an outbreak of EUS occurs in a region, it generally re-occurs with less severity over the next 2 to 3 years and with a reduced frequency thereafter. EUS causes ugly lesions in affected fish. Lesions can range from small pinpoint red spots, hemorrhagic spots, localized swelling, localized raised areas on the body surface, protruding scales, scale loss, skin erosion, reddened areas of the skin under the scales, exposure of underlying musculature, and ulceration. Lesions are observed most often in the lateral surface but can also occur on any part of the body. However, detailed microbiological and histopathological investigations are required for confirmation of EUS.

There is no effective treatment for EUS-infected fish in the wild and in aquaculture ponds. To minimise fish losses in infected areas, ponds water exchange should be stopped and lime (@ 200kg/hectare) should be applied.

- Follow-up on BMPs and the use of disinfectants such as lime (in line with the pH of the water), KMnO4 (3–5 kg/ha), and other sanitizers as a preventative measure.
- CIFAX, a drug developed by ICAR-Central Institute of Freshwater Aquaculture (CIFA), Bhubaneswar, Odisha, has been demonstrated to be effective against EUS. For a 1 m water depth*, a dose of 1 l/ha is recommended.

One litre of CIFAX should be mixed with minimum 100 Litres of water for uniform spray over the pond water surface

5. Eye Disease:

Eye disease in fish is common and can be caused due to several reasons. In carps, this disease is commonly caused by a variant of the bacterium, *Aeromonas liquefaciens*. Diseased eyes may appear swollen, enlarged (as in a pop-eyed appearance), bloody, opaque/whitish, ulcerated, or otherwise disfigured. Further progress of the infestation results is putrification of total eye tissues and ultimately the affected tissues fall of leaving behind the hollow eye cup.

- Fishes in advanced stage of disease rarely recover. However, application of Potassium Permanganate at 1 mg/l concentration, twice over a period of seven days, has been found effective.
- Oral feed-based administration of Oxytetracycline @ 70-80 mg/kg fish body weight (BW) for 7-10 days.

6. Argulosis:

This disease is caused by *Argulus* spp. (also known as fish lice). These can cause significant morbidities and mortalities in fishes during summer season. *Labeo rohita* is mainly affected by this disease. The lice can be found attached to the skin, gill chamber, and mouth. In heavy infestations, the it may be seen all over the skin and fins of the fish and in the water column. The affected fish shows patches of hemorrhagic, fin and scale loss and increased mucus production. It may become lethargic with erratic swimming behavior. Fish may also rub against surfaces in an attempt to relieve irritation or to remove the parasites.

Following measures can be applied for control of argulosis:

- Segregate the infected fishes from the young healthy ones.
- Bath treatment in $KMnO_4$ at 10 mg/l for 30 min or with (3 – 5%) NaCl solution for 10-20 mi. During the bath concentration of 10 mg/l, careful observation of fish is mandatory to avoid mortality.

- Argulus breeds on hard surfaces, erecting PVC or bamboo poles in the pond aids in the removal of the eggs.
- Application of Cypermethrin (6 ml/acre) or Deltamethrin (Butox) (15 ml/acre) in the pond.

7. Lernaeasis:

This disease is caused by *Lernaea cyprinacea.* The body of this crustacean is elongated, worm like and its head is embedded in the body of fish. Many branches arise from this embedded head. Due to infestation, initially fish starts swimming rapidly and later on, lesions/wounds develop on the body. Catla fish is mainly affected by this disease. Baths in concentrated solution of salt and potassium permanganate are reported to be effective for control of lernaeasis.

- Segregate the infected fishes from the young healthy ones
- Bath treatment in 30 – 50 g/l (3 – 5%) NaCl solution or 5ppm potassium permanganate for 10-20 min

8. Gill Fluke and Skin Fluke:

These infestations are caused by helminth parasites *Dactylogyrus* spp. (gill fluke) and *Gyrodactylus* spp. (skin fluke). Heavily infected fish show increased production of mucous, frayed fins, skin ulcers and damaged gills. Fish may also gather at water surface and show the typical air gulping behaviour.

For control of these helminth parasites, one of the followings control measures can be tried:

- Bath in 100–250 ppm of formalin ranging from 1 to 3 hours.
- Bath treatment in 3–5% NaCl solution for 10-20 min
- Mebendazole bath treatment @ 100 mg/l for 10 min or 1 mg/l for 24 h.

9. Black Spot Disease:

This disease is caused by helminth parasite *Diplostomum* spp. It leads to development of small black or brown spots on several parts of the body and fins. Eye lens may become opaque leading to blindness in fish.

- Removal of aquatic snails and preventing the entry of birds are some of the preventive measures.
- Fish exhibiting black spots may be given an hour bath in 10 ppm picric acid solution.
- Oral and bath application of Mebendazole has been reported effective in killing metacercaria

10. Ichthyophthiriasis:

The white spot disease or 'ich' is a common parasitic disease that affects a variety of freshwater fishes and caused by the protozoan *Ichthyophthirius multifiliis.* Ich is one of the most common diseases encountered in tropical-fish aquariums. Its signs include the presence of small white spots resembling a sprinkle of salt grains on the body and gills, frequent scraping of the body against objects in the environment and loss of appetite. Affected fish may die from direct tissue damage by the parasite and secondary microbial infections.

- Segregate the infected fishes from the young healthy ones
- Bath treatment in 3–5% NaCl solution for 10-20 min and with formalin 1-2 ml/l for 15 min
- For aquarium fishes, add 1 ml of 1% methylene blue solution in 5 litres of aquarium water

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THE SCIENCE WORLD
A Monthly e Magazine

ÍSSN: 2583-2212

April, 2022; 2(5), 480-485

Popular Article

Molecular markers and their applications in livestock improvement

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DOI: https://doi.org/10.5281/zenodo.6534572

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Introduction

Molecular markers (also called DNA markers) are sites where differences in DNA sequences occur among members of the same species. Molecular markers have characteristic biological properties that can be detected and measured in parts of the body like the blood or tissue. A molecular marker is any kind of landmark along the DNA molecules of organisms (Deb *et al*., 2012; Ebegbulem and Ozung, 2013).

The properties of ideal molecular markers

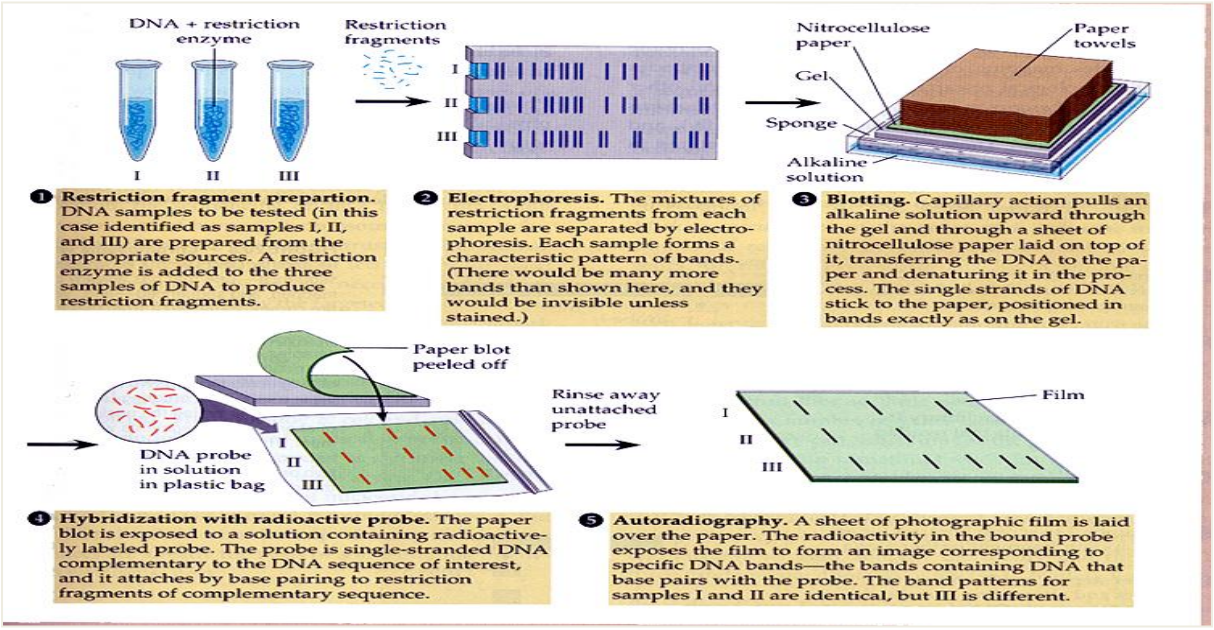
1. They should have highly polymorphic in nature.
2. They exhibit co-dominant inheritance.
3. Marker should evenly and frequently occur in genome.
4. Selective neutral behavior.
5. Their assay is easy, fast and inexpensive.
6. Easy exchange of data between laboratories.
7. Marker must show non-epistatic behavior

Types of Molecular Markers

S. No.	Base technique	Molecular marker
1.	Hybridization-based DNA markers	(i) Restriction Fragment Length Polymorphisms (RFLPs) (ii) Oligonucleotide fingerprinting
2.	PCR-based DNA markers	(i) Random Amplified Length Polymorphic DNAs (RAPDs) (ii) Simple Sequence Repeats or microsatellites (SSRs) (iii) Amplified Fragment Length Polymorphisms (AFLPs)
3.	DNA chip and sequencing-based DNA markers	Single Nucleotide Polymorphisms (SNPs)

1. Hybridization-based DNA markers: –

(i) Restriction Fragment Length Polymorphisms (RFLPs): - Genomic DNA digested with Restriction Enzymes. DNA fragments separated via electrophoresis and transfer to nylon membrane. Membranes exposed to probes labelled with P^{32} via southern hybridization. Film exposed to X-Ray (Ngo and Narinesing, 2007).

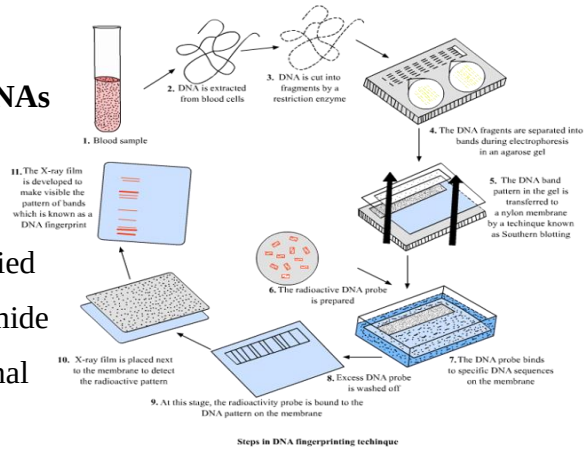


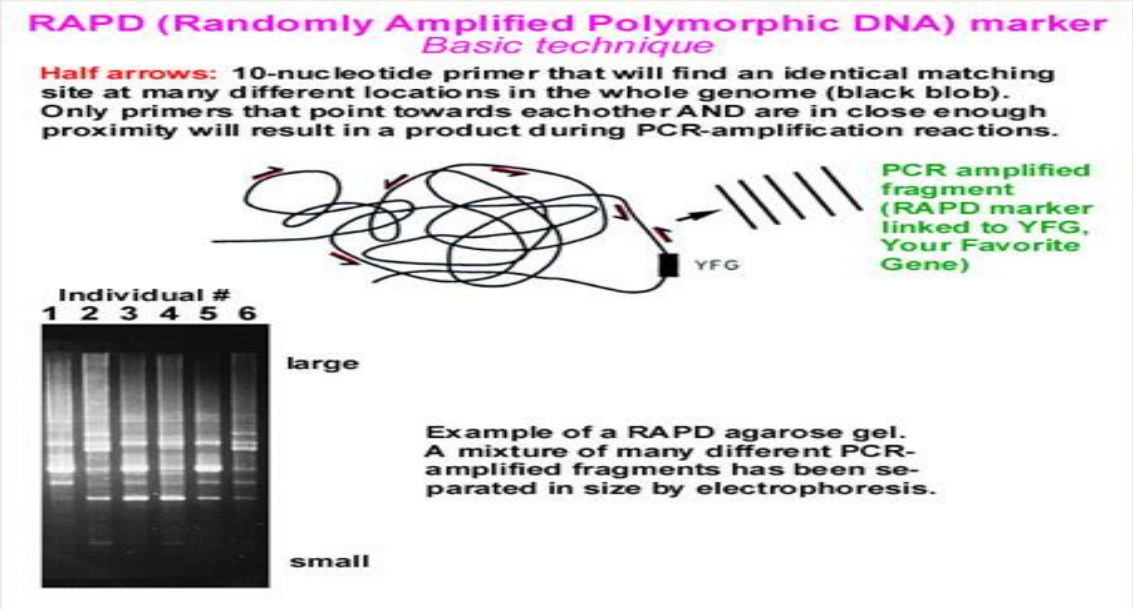
S. No.	Advantages of RFLP markers	Disadvantages of RFLP markers
1.	Produces co-dominant markers	Long methodology
2.	Stable and reproducible	Labour intensive
3.	Selective neutrality	Requires high quality and large quantities of DNA
4.		RFLPs limited the identification of the whole genome variation in animals

(ii) Oligonucleotide fingerprinting: - Also called genetic fingerprinting or DNA profiling. DNA fingerprinting is a way of identifying a specific individual. A DNA fingerprint of an individual is prepared by digesting its DNA.

2. PCR-based DNA markers: –

(i) Random Amplified Length Polymorphic DNAs (RAPDs):- Arbitrarily primed PCR (AP-PCR) or DAF used. PCR based marker with 10-12 base pairs. Random amplification of several short fragments of DNA. Amplified fragments run in agarose gel detected by ethidium bromide (EtBr). Spectrum of products resolved and visualized (Vignal *et al*., 2002).

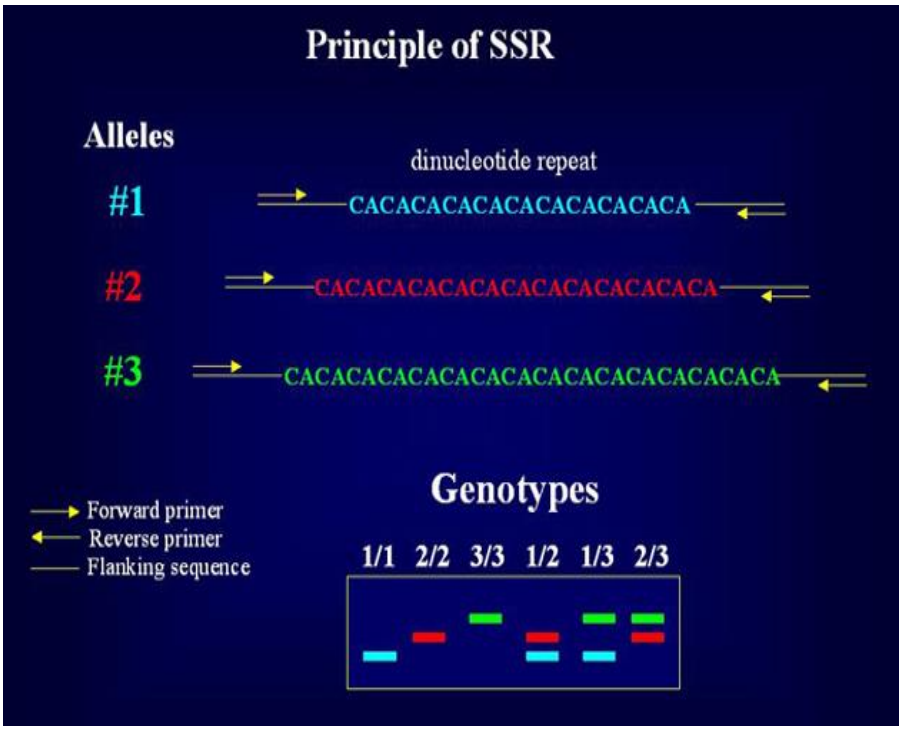




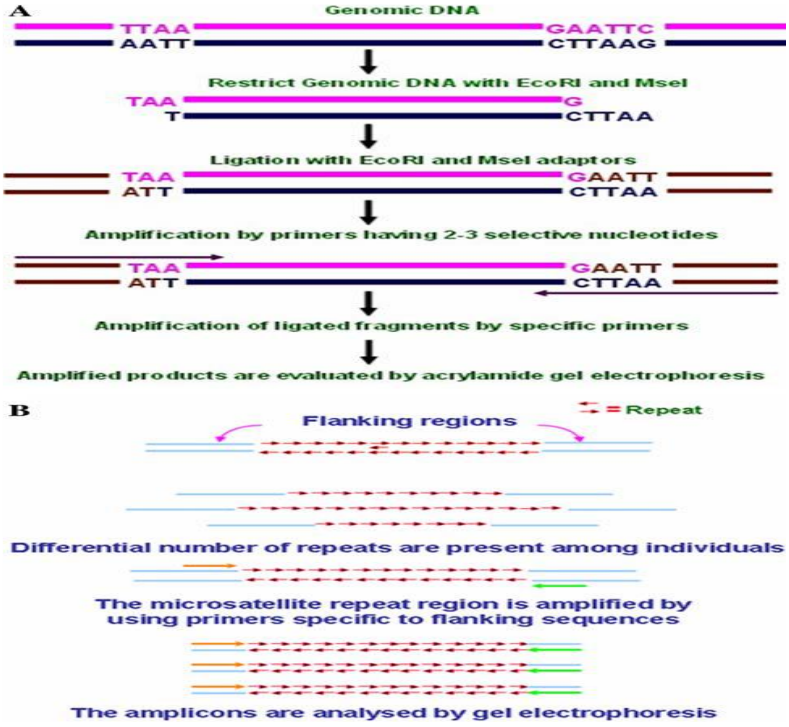
S. No.	Advantages of RAPD markers	Disadvantages of RAPD markers
1.	Cost effective	Detection of polymorphism is limited
2.	Simple and quick	Reproducibility of results may be inconsistent
3.	Large number of bands are produced	Dominant markers
4.	The required samples are very small	

(ii) Simple Sequence Repeats or microsatellites: Microsatellites also known as SSR's, STR's, SSTR, VNTR, SSLP, STMs. PCR based markers with 18-25 base pair primers. They map quantitative trait loci for production and functional traits. They are used for identification of animals, evaluation of genetic resources, parentage determination, disease research and determination of genetic variation within and among breeds (Adamov *et al*., 2011).

S. No.	Advantages of microsatellites	Disadvantages of microsatellites
1.	Low quantities of template DNA required	Initial high development costs
2.	High genomic abundance	Time-consuming and expensive to develop
3.	Random distribution throughout the genome	Microsatellite markers help to identify neutral biodiversity but do not provide infromation on functional traits biodiversity
4.	High level of polymorphism	
5.	Co-dominant markers	



(iii) Amplified Fragment Length Polymorphisms (AFLPs): - It is the restriction endonuclease digestion of DNA. Ligation of adaptors specific primers is practiced. Amplification of these ligated fragments. Separation of the amplified fragments via electrophoresis and visualization. They are considered as the "gold standard" for molecular epidemiological studies of pathogenic microorganisms (Ajmone-Marsan *et al.*, 2002).



S.No.	Advantages of AFLPs	Disadvantages of AFLPs
1.	Fast technique	Markers are dominant
2.	Relatively inexpensive	Presence of a band could mean the individual is either homozygous or heterozygous for the Sequence - can't tell
3.	Highly variable	

3. DNA chip and sequencing-based DNA markers: -

(i) Single nucleotide Polymorphisms: - The "snip" are the most recent contribution to studying DNA sequence variation. SNP is found where different nucleotides occur at the same position in the DNA sequence. Single nucleotide polymorphisms can be detected using SSCP, ASO, Reverse dot blot on DNA chips, DASH (Mburu and Hanotte, 2005).

S.No.	Advantages of SNPs	Disadvantages of SNPs
1.	Detect level of variation within a species	The lower informational content compared with that of a highly polymorphic microsatellite, but it can be compensated by the use of a higher number of markers.
2.	Follow patterns of evolution	
3.	Mark genes	
4.	Distinguish alleles of "disease" genes	

Application of Molecular Markers

- ✓ Polymorphisms observed at the DNA sequence level have been playing a major role in animal genetics
- ✓ Gene mapping
- ✓ Pre and post natal diagnosis of genetic diseases
- ✓ Anthropological and molecular evolution studies
- ✓ Identification of animals carrying the transgenes
- ✓ DNA fingerprinting with oligoprobes (OAT18 and ONS1) has been used for determining the parentage of IVF buffalo calf
- ✓ The PCR-based RAPD fingerprinting assays are being used for characterization of zebu cattle breeds, highly inbred chicken lines and for detection of genetic variations in cattle and sheep
- ✓ DNA fingerprinting techniques and PCR-RFLP assay using sex-chromosome-specific primers, has enabled the identification of freemartin animal
- ✓ The use of multiplex PCR allows simultaneous genotyping for important loci like milk proteins, diseases carrier
- ✓ Genetic disorders caused by a single point mutation, BLAD, and DUMPS in cattle identified easily using PCR-RFLP assay
- ✓ A marker also helps in physical mapping of the genes using *in situ* hybridization
- ✓ Molecular markers are capable of unraveling genetic variations in both the coding and non-coding sequence regions

Conclusion

The genetic polymorphism at the DNA sequence level has provided a large number of markers and revealed potential utility of application in animal breeding. Selection of markers for different applications are influenced by certain factors - the degree of polymorphism, the automation of the analysis, radioisotopes used, reproducibility of the technique and the cost involved. The genetic improvement of animals is a fundamental and complex process. The putting into practice of marker-based information for genetic improvement depends on the choice of an appropriate marker system for a given application. It is expected that molecular markers will serve as an underlying tool to geneticians and breeders to create animals as desired and needed by the society.

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Cite as
Jayesh Vyas, Ashish Chopra, Vishnu Kumar, & Satendra Kumar Yadav. (2022). Molecular markers and their applications in livestock improvement. The Science World a Monthly E Magazine, 2(5), 480–485. https://doi.org/10.5281/zenodo.6534572

THE SCIENCE WORLD
A Monthly e Magazine

ISSN: 2583-2212

April, 2022; 2(5), 486-489

Popular Article

Critical Vitamins for Ruminants

Keshav Gaur [1], Sheela Choudhary [2], Monika Karnani[3]* & Manju [3]

DOI: https://doi.org/10.5281/zenodo.6534887

Abstract

Ruminants are those animals, who perform rumination or regurgitation of food. In every feed, nutrients are contained in the form of carbohydrates, proteins, fats, minerals and vitamins. Being a trace nutrient component, sometime livestock owner avoids to supplement the animal feed with these substances. Since ruminants possess rumen and ruminal microorganisms are capable of synthesizing water-soluble vitamins and vitamin-K. Therefore, only vitamin-A, D and E are considered to be as critical vitamins and must be furnished in the diet.

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Introduction

Vitamins are defined as 'a group of complex organic compounds, chemically unrelated to each other, present in minute amounts in natural feeds stuff and are essential to normal metabolism & lack of which in the diet causes deficiency symptoms. Vitamins can be grouped into 2 categories i.e., Fat soluble & Water-soluble vitamins. Both these vitamins could be differentiated from each other based on the following points.

Fat Soluble Vitamins	Water Soluble Vitamins
Vitamin- A, D, E, K	Vitamin-C &B complex Vitamins
Stored in body in fat depot and in liver.	Not stored in body except Vitamin B_{12}
Excrete via faeces	Excrete via urine
Made of only C, H and O	Made of C, H and O, whereas some also contain N, S & Cobalt.

Since ruminants has rumen and ruminal microorganisms are capable of synthesizing water-soluble vitamins and vitamin-K. Therefore Vitamin-A, D and E are considered to be as critical vitamins and must be furnished in the diet. In general, most ruminant diets provide adequate amount of vitamin K and the B vitamins, either through natural feedstuffs or synthesis by microbial activity in the rumen. Thus, there are no recommended dietary concentration of these vitamins for ruminants.

Some pertinent fact relative to critical vitamins in ruminants:

1. Vitamin - A

Synonym- Anti-infective vitamins aa
Vitamin A_1= Retinol / Retinal / Retinoic acid
Vitamin A_2= Dehydro-retinol
Functions

- Essential for formation of Rhodopsin i.e., Visual purple (photoreceptor for Vision especially in dim light)
- Involves information& protection of epithelial tissue and mucus membrane
- Essential for carbohydrate metabolism
- Essential for reproduction (in males for spermatogenesis & in females for normal reproductive cycle)
- In bone development for synthesis of mucopolysaccharides (as bone matrix)

Deficiency Symptoms

❖ **Adult cattle**

- A mild deficiency is associated with night blindness, roughened hair, scaly skin.
- Prolonged deficiency – excessive watering (copious lacrimation), softening and cloudiness of the cornea and development of xeropthalmia characterized by a drying of the conjunctiva.
- Constriction of the optic nerve canal in calves
- ROP &Infertility in breeding animals
- Abortion or production of dead, weak or blind calves
- Increased susceptibility to infection-calves (suppressed immunity)

❖ **Ewes**

- Night blindness
- Weak or dead lambs

Requirements – (Source: NRC**)**

Species & Class	Requirement (IU / kg body weight)	Requirements (IU / kg dry diet)
Lactating & dry cattle	**110**	**4400**
Growing heifers	**80**	**2500**
Young calves	-	**9000**
Goat	-	**5000** (Morand-Fehr 1981)

Most Common Cause of Occurrence – Deficiency of vitamin A may occur when pastures are poor or when high cereal rations are used.

2. Vitamin- D

Synonym- Anti-rachitic factor
Vitamin D_2= Ergocalciferol
Vitamin D_3 = Cholecalciferol (Act as Hormone)
Functions-

- Necessary for absorption and metabolism of Ca & P.
- Also necessary for immune cell function

- Stimulates incorporation of P into phospholipid of intestinal mucosa

Deficiency Symptoms-

❖ **Young animals**

- **Rickets** with weak, easily broken bones, bowed legs

❖ **Young cattle**

- Swollen knees and hocks and arching of back

❖ **Older animals**

- **Oesteomalacia** (uncommon) – resorption of bone occur

Requirements

- **Lactating cow**: 30 IU / kg body wt. (this would be supplied by diets with 1000 IU / kg DM)
- **Sheep:** 275 IU / kg in diet (NRC,1987)
- **Goat:** 1400 IU / kg dry diet (Morand-Fehr,1981)

Where,1I.U. of vit D = 0.025 µg of pure crystalline irradiated 7-dehydrocholesterol(D3)

Some Important Facts Related to Vitamin-D:

- Need is greater for pigs & poultry than cattle & sheep
- Vit D_2 and D_3 have same potency for cattle& sheep
- Animals housed indoors may need supplementation.
- More Vit D may be helpful managing milk fever.

3. Vitamin - E

Synonym- Anti-sterility vitamin

Tocopherol (4 forms-Alpha, Beta, Gamma& Delta)

Tocotrienols (4 forms-Alpha, Beta, Gamma & Delta)

Functions-

- Acts as natural antioxidant at the cellular level and play important role in biological redox reactions.
- Protects membranes against oxidative damage by free radicals.
- Interaction with Se containing enzyme glutathione peroxidase (GPx)
- Prevents muscle, liver and blood vessel degeneration.
- Role in development and function of immune system
- Aid in absorption & utilization of Vitamin- A

Deficiency Symptoms

❖ **Farm animals:**

- Muscular degeneration or myopathy also k/a muscular dystrophy associated with low vit E & Se intake in winter pd particularly noted in calves on spring pasture because of high PUFA

❖ **Lambs& Kids:**

- Stiff lamb disease

❖ **Calves:**

- White muscle disease
- Liver necrosis in calves due to loss of plasma proteins
- Reproductive failure in cow and ewes

Requirements: (Source- NRC**)**

Species & Class	Requirement (IU / kg body weight)	Requirements (IU / kg dry diet)
Lactating cattle	**0.8**	**30**
Dry cattle	**1.8**	**90**
Growing bulls	-	**100 (**NRC 1989**)**
Goat	-	**100**(Morand-Fehr 1981)

Conclusion

Since most ruminant diets provide adequate amount of vitamin K and the B vitamins, either through natural feedstuffs or synthesis by microbial activity in the rumen. Thus, there are no recommended dietary concentration of these vitamins for ruminants. But remaining vitamins are needed to be supplemented in the ruminant's ration to avoid any serious implications.

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Cite as

Keshav Gaur, Sheela Choudhary, Monika Karnani, & Manju. (2022). Critical Vitamins for Ruminants. The Science World a Monthly E Magazine, 2(5), 486–489. https://doi.org/10.5281/zenodo.6534887

ÍSSN: 2583-2212
May, 2022; 2(5), 490-495

Popular Article

Lead poisoning in domestic animals

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DOI: https://doi.org/10.5281/zenodo.6581437

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Increased amounts of heavy metal lead in the body produce lead poisoning, which is a type of metal poisoning. Lead disrupts a variety of biological functions and is harmful to a variety of organs and tissues. The brain is the organ that is most vulnerable to lead poisoning. Lead interferes with the neurological system's development, making it harmful to calves, resulting in potentially lasting learning and behavior issues, including aggressiveness. Abdominal pain, confusion, headaches, anaemia, irritability, and, in severe cases, seizures, coma, and death are among the symptoms.

Contaminated air, water, soil, food, and consumer products are all potential sources of lead exposure. Adults are frequently poisoned by lead as a result of occupational exposure. Lead paint, which is found in many homes, especially older ones, is one of the most serious

hazards to calves. As a result, calves in older dwellings with flaking paint or lead dust from mobile window frames with lead paint are more vulnerable.

Classification

Lead poisoning can be acute (from a single, brief exposure) or chronic (from repeated low-level exposure over time), with the latter being far more common.

Lead can be found in a range of compounds and in diverse forms in the environment. The characteristics of poisoning varies depending on whether the agent is an organic (carbon-containing) or inorganic (non-carbon-containing) chemical. Organic lead poisoning is now extremely rare because organic lead compounds are no longer utilized as gasoline additives in most countries, but they are still employed in industrial settings. Organic lead compounds, which are easily absorbed through the skin and respiratory tract, primarily impact the central nervous system.

The peripheral nervous system (particularly motor nerves) and the central nervous system are both affected by lead. Adults are more affected by peripheral nervous system impacts, while young calves are more affected by central nervous system effects. The axons of nerve cells deteriorate and lose their myelin coverings when exposed to lead. Lead exposure in young calves has been linked to learning disabilities.

Animal and human lead poisoning is a big concern around the world. Poisoning in animal populations could act as a sentinel for determining the amount of environmental contamination and lead-related human health issues.

Lead poisoning is most common in dogs and cattle in field conditions. Reduced accessibility, more selective eating habits, or decreased sensitivity restrict lead poisoning in

other animals. When old oil and battery disposal from machinery is handled inappropriately, many occurrences in cattle are related with sowing and harvesting activities. The frequency of lead poisoning cases linked to oil consumption has decreased in recent years, thanks to the removal of tetraethyl lead from gasoline in several nations. Paint, linoleum, grease, lead weights, lead shot, and contaminated flora growing near smelters or along roadsides are all sources of lead. It is critical to determine the source of lead poisoning in order to prevent future cases. Small animals and children are also exposed to lead poisoning in urban surroundings and during the refurbishment of historic houses that have been painted with lead-based paint. Cats have been found to consume lead-contaminated dust when grooming. Non-target scavenger animals may develop toxicoses as a result of improper disposal of lead-poisoned animal carcasses. Scavenging by endangered animals like the condor creates special issues.

Pathogenesis

Lead is absorbed into the bloodstream and soft tissues before being redistributed to the bone. Dietary variables such as calcium and iron levels have an impact on absorption and retention. Particulate lead deposited in the reticulum of ruminants progressively degrades and releases considerable amounts of lead. Sulfhydryl-containing enzymes, erythrocyte thiol concentration, antioxidant defenses, and tissues rich in mitochondria are all affected by lead, as seen by the clinical illness. Lead is irritating, immunosuppressive, gametotoxic, teratogenic, nephrotoxic, and toxic to the hematological system, in addition to the cerebral hemorrhage and edema associated with capillary injury.

Clinical Findings

Young animals are particularly susceptible to acute lead poisoning. The GI and neurological systems are the most significant clinical indications. Ataxia, blindness, salivation, spastic twitching of eyelids, jaw champing, bruxism, muscle tremors, and convulsions are indications that develop in cattle within 24–48 hours after exposure.

Anorexia, rumen stasis, colic, dullness, and temporary constipation are common symptoms of subacute lead poisoning in sheep and older cattle, and are typically followed by diarrhea, blindness, head pushing, bruxism, hyperesthesia, and incoordination.

Calf with lead toxicity showing
blind eyes gazing at sky

At high levels of exposure, inhaling corrosive elemental mercury vapors, which causes severe dyspnea and reduced respiratory function, is frequently lethal. If exposure is not extensive, neurologic symptoms may occur. Because of its corrosive nature, inorganic mercury causes GI symptoms such as colic, anorexia, stomatitis, pharyngitis, vomiting, diarrhea, shock, dyspnea, and dehydration. At high levels of exposure, death generally occurs within hours. Survivors may have dermatitis, keratinization of the skin, anuria, polydipsia, hematuria, or melena.

Chronic lead poisoning in cattle can cause a condition that shares many characteristics with acute or subacute lead poisoning. Chronic exposure can result in neurologic signs such as CNS depression or excitement similar to that seen in organic mercury poisoning. Clinical signs can take days to appear depending on the level of exposure to organic mercury compounds like methylmercury. Aspiration pneumonia is commonly caused by a loss of swallowing reflexes. Infertility can be caused by embryotoxicity and poor semen quality. Organic mercury exposure is highly harmful to the neurological systems of young, developing animals, resulting in cerebellar ataxia and death.

In dogs, GI disorders such as anorexia, colic, emesis, and diarrhea or constipation are the most common symptoms. Anxiety, frantic barking, jaw champing, salivation, blindness, ataxia, muscle spasms, opisthotonos, and convulsions are some of the symptoms that can occur. Some dogs may show CNS depression rather than CNS excitation. Weight loss, depression, weakness, colic, diarrhea, laryngeal or pharyngeal paralysis (roaring), and dysphagia are common symptoms of lead poisoning in horses, and aspiration pneumonia is a common complication.

The most noticeable signs in birds are anorexia, ataxia, loss of condition, wing and leg weakness, and anemia.

Lesions

Acute lead poisoning can leave animals with minimal visible gross lesions. In the GI tract, oil, paint flakes, or battery shards may be visible. Gastroenteritis is caused by the caustic action of lead salts. Edema, cerebral cortex congestion, and cortical gyri flattening can all be found in the neurological system. Endothelial swelling, laminar cortical necrosis, and white matter edema may be visible histologically. The kidneys may show tubular necrosis and degeneration, as well as intranuclear acid-fast inclusion bodies. Lambs have been found to have osteoporosis. Abortion may occur as a result of placentitis and the buildup of lead in the fetus.

Diagnosis

Lead concentrations in different tissues can be used to assess excessive buildup and represent the level or duration of exposure, severity, prognosis, and treatment success. In most species, lead concentrations of 0.35 ppm in the blood, 10 ppm in the liver, or 10 ppm in the kidney cortex are consistent with a diagnosis of lead poisoning. Blood lead values of >0.05–0.10 ppm in food-producing animals are considered a notifiable disease in several countries. Before a cargo for food consumption is allowed, it must be inspected or cleared by a regulation veterinary officer or biosecurity inspector.

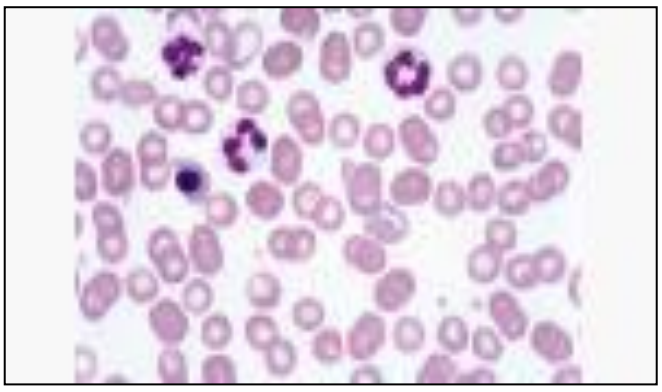

Fig. Basophilic stippling, dog blood smear

Anemia, anisocytosis, poikilocytosis, polychromasia, basophilic stippling, metarubricytosis, and hypochromia are hematologic abnormalities that may be symptomatic but not conclusive of lead poisoning. Levels of -aminolevulinic acid in the blood or urine, as well as free erythrocyte protoporphyrin, are sensitive indicators of lead exposure but may not be accurate indicators of clinical disease. A radiologic examination may be helpful in determining the extent of lead poisoning. Other

disorders that induce neurological or GI issues can be confused with lead poisoning. Polio encephalomalacia, nervous coccidiosis, tetanus, hypovitaminosis A, hypomagnesemic tetany, nervous acetonemia, organochlorine insecticide poisoning, arsenic or mercury poisoning, brain abscess or neoplasia, rabies, listeriosis, and Haemophilus infections are all diseases that can affect cattle. In dogs, rabies, distemper, and hepatitis may appear similar to lead poisoning.

Treatment

Treatment may not be successful if tissue damage is substantial, particularly in the nervous system. Calcium disodium edetate (Ca-EDTA) is given IV or SC (110 mg/kg/day) divided bid for three days in animals, then repeated two days later. In dogs, a comparable dose divided qid in 5 percent dextrose is given SC for 2–5 days. If clinical indications remain after a 1-week rest period, a 5-day therapy may be required. There is presently no commercially marketed veterinary product that contains Ca-EDTA.

Thiamine (2–4 mg/kg/day, SC) decreases lead tissue deposition and alleviates clinical symptoms. The most favorable response appears to be a combination of Ca-EDTA and thiamine therapy.

Dogs can be given 110 mg/kg/day of D-penicillamine by mouth for two weeks. However, this medication has been linked to unpleasant side effects such emesis and anorexia. The use of D-penicillamine in animals is not suggested. Succimer (DMSA, or meso 2,3-dimercaptosuccinic acid) is a chelating drug that has been shown to be effective in dogs (10 mg/kg, PO, tid for 10 days) and birds. DMSA has been linked to fewer negative side effects than Ca-EDTA.

To eliminate lead from the GI tract, cathartics such as magnesium sulphate (400 mg/kg, PO) or a rumenotomy may be used. Surgery to remove particulate lead material from the reticulum after a battery intake is rarely successful in cattle. To control convulsions, barbiturates or tranquillizers may be prescribed. Chelation therapy combined with antioxidant therapy may help to reduce the oxidative damage caused by acute lead poisoning. In addition to DMSA, antioxidants such as n-acetylcysteine (50 mg/kg/day, PO) have been employed.

Lead mobilization at parturition, lead excretion in milk, and long withdrawal durations in food-producing animals have sparked substantial debate about the reasons for treatment from both a public health and an animal management standpoint. Lead in the blood of cattle consuming particle lead has a half-life of more than 9 weeks. Blood lead concentrations should be monitored on a regular basis to estimate withdrawal durations, which might be over a year.

All possibly exposed cattle in a herd of cattle with confirmed instances of lead poisoning should be assessed. A small but considerable percentage of asymptomatic cattle may have lead amounts in tissues that exceed food safety regulations.

Treatment options may be ineffectual since the neurologic and renal damage is irreversible. As a result, the chances of making a full recovery are slim. Significant mercury deposition in edible tissues and dramatic effects on reproduction limit treatment possibilities in food-producing animals. It is advised that euthanasia and disposal be carried out in consultation with regulatory officials. Activated charcoal (1–3 g/kg) and sodium thiosulfate (0.5–1 g/kg) administered orally bind mercury and inhibit absorption. Antioxidants like vitamin E and selenium may help to prevent oxidative damage. If treatment is initiated soon after exposure, before the nephrotoxic effects become severe, chelation therapy may be beneficial. Dimercaprol (3 mg/kg body wt, IM, every 4 hr for 2 days, followed by qid treatment on day 3 and bid treatment for 10 days) is a lipid-soluble chelator that may be useful. 2.3-dimercaptosuccinic acid (10 mg/kg, PO, tid for 10 days) has been shown to help dogs with organic mercury toxicity. Penicillamine (50–100 mg/kg/day, PO, for 2 weeks) may help to diminish clinical symptoms once the GI tract has been decontaminated for mercury.

Cite as
Kamal Sarma1, Jonali Devi, & J.S. Sasan. (2022). Lead poisoning in domestic animals. The Science World a Monthly E Magazine, 2(5), 90–495. https://doi.org/10.5281/zenodo.6581437

THE SCIENCE WORLD
A Monthly e Magazine
ISSN: 2583-2212
May 2022; 2(5), 496-499

Popular Article

Prevention and Control of flies in a dairy farm

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DOI: https://doi.org/10.5281/zenodo.6539787

Introduction

India is the tropical country and flies remain active year-round in warmer climates. In summer population of flies will be very high which adversely affects the animal health and production. Manure, bedding materials are the primary breeding site for flies in the animal houses and these flies are a nuisance, just buzzing around and being annoying, and are major cause for occurrence of disease and economic losses and may also compromise the animal welfare, therefore it is very important to control the flies and mosquitoes in the dairy farm.

Life cycle of fly: life cycle of fly consists of four stages i.e., Egg, larva, Pupa and adult. Adult flies lay eggs on or close to the larval food, the eggs hatch into larvae, and the larvae feed and develop into pupae. Pupa is the non-feeding stage from which adult fly emerges. This whole life cycle may take about 30 days. Under ideal conditions, a house fly can complete its life cycle in 9 to 14 days. In cooler climates it will takes longer period than the warmer climates.

Common flies of dairy farms:

Blood sucking flies:

- Horn flies (Haematobia irritans)
- Stable flies (Stomoxys calcitrans)
- Horse flies (Tabanus sp.)
- Deer flies (Chrysops sp.)

Non-blood sucking flies:

- Face flies (Musca autumnalis)
- House flies (Musca domestica)
- Cattle grubs (Hypoderma lineatum)
- Heel flies (Hypoderma bovis)

Harms caused by flies in dairy animals

1. Blood loss and irritation: The average meal size by a single horn fly is 1.5 mg of blood per feeding.
2. Biting flies transmit diseases like Surra and E fever.
3. Heavy infestations may lead to anaemia and significant loss in productivity
4. Tick and biting flies cause severe discomfort to the animal. May also cause allergic reactions at the biting sites.
5. House flies and stable flies' infestation leads to decrease in milk production
6. Tabanid flies cause loss of weight per day when animal exposed to 66-90 flies. Decreased feed efficiency
7. Mosquitoes reduced the milk quality and milk fat content
8. Face flies can cause tissue damage with their rough spiny mouthparts. Because they are constantly feeding on the fluid, these flies spread diseases of the eye.
9. Horn fly takes up to 40 blood meals a day and is responsible for reduced weight gain, decreased feed efficiency and decreased milk yields.
10. Saliva present in the fly prevents or delays the wound healing and attracts other flies to the site.

First line of defence mechanism of dairy animals to Pest flies

1. Tail flicking
2. Leg stamping
3. Head throwing
4. Ear flicking
5. Skin twitching
6. Kicking and striking
7. Evasive displacement to bunching behavior

Control measures of flies in a dairy farm

1. Environmental management
2. Insecticidal agents
3. Biological control

Environmental management

- Remove the manure from the livestock pen frequently
- Proper manure and urine disposal should be done at a reasonable distance from the dairy shed
- Avoid stagnation of drainage water in and around the shed and provide proper drainage
- Eliminate wet litter, silage seepage areas, manure stacks, old wet hay or straw, and any other organic matter accumulations that may attract flies.
- Thinly spread the manure, this facilitates the drying of larvae and fly eggs to prevent further reproduction. Or else cover the manure heap with black plastic wrap
- Smoking the shed with raw neem leaves during evenings would help reduce the nuisance
- Improve air flow by installing fans to produce a downward and outward air flow that can limit fly activity in barns.

Insecticidal agents

- Natural plant extracts and essential oils have various bioactive compounds like nitrogen compounds (e.g., alkaloids), terpenoids, phenolics, proteinase inhibitors, and growth regulators which have pest repelling activity
- Garlic, Neem have insecticidal, fly and mosquitos' repellent properties
- Lemongrass extract contain the monoterpene citral bioactive agent which have insecticidal activity
- Eucalyptus oil contains various active which are toxic to various flies.
- Castor bean contains ricin which is notably toxic and have fly repellent activity
- Essential oils of Camphor (Cinnamomum camphora), Onion (Allium cepa), Peppermint (Mentha piperita), Chamomile (Matricaria chamomilla) have the fly repellent, larvicidal and pupicidal properties.
- Chemical insecticides like emulsifiable concentrate formulations of dichlorvos, dimethoate, Fenvalerate, methoxychlor, and permethrin can be used as residual sprays.

- Many synthetic insecticides formulated as dusts, sprays, pour-on, feed additives, and insecticide impregnated ear tag were mostly used as tool against pest flies.

Biological control

- Biological control components are naturally occurring fly enemies like predatory beetles and mites, parasitic wasps, and fly pathogens.
- Sometimes chickens and ducks are also used for fly control on livestock farms.
- Gambusia fish, purple martin, Bats, Dragonfly, frog, ladybird beetles are commonly used.

Other control measures

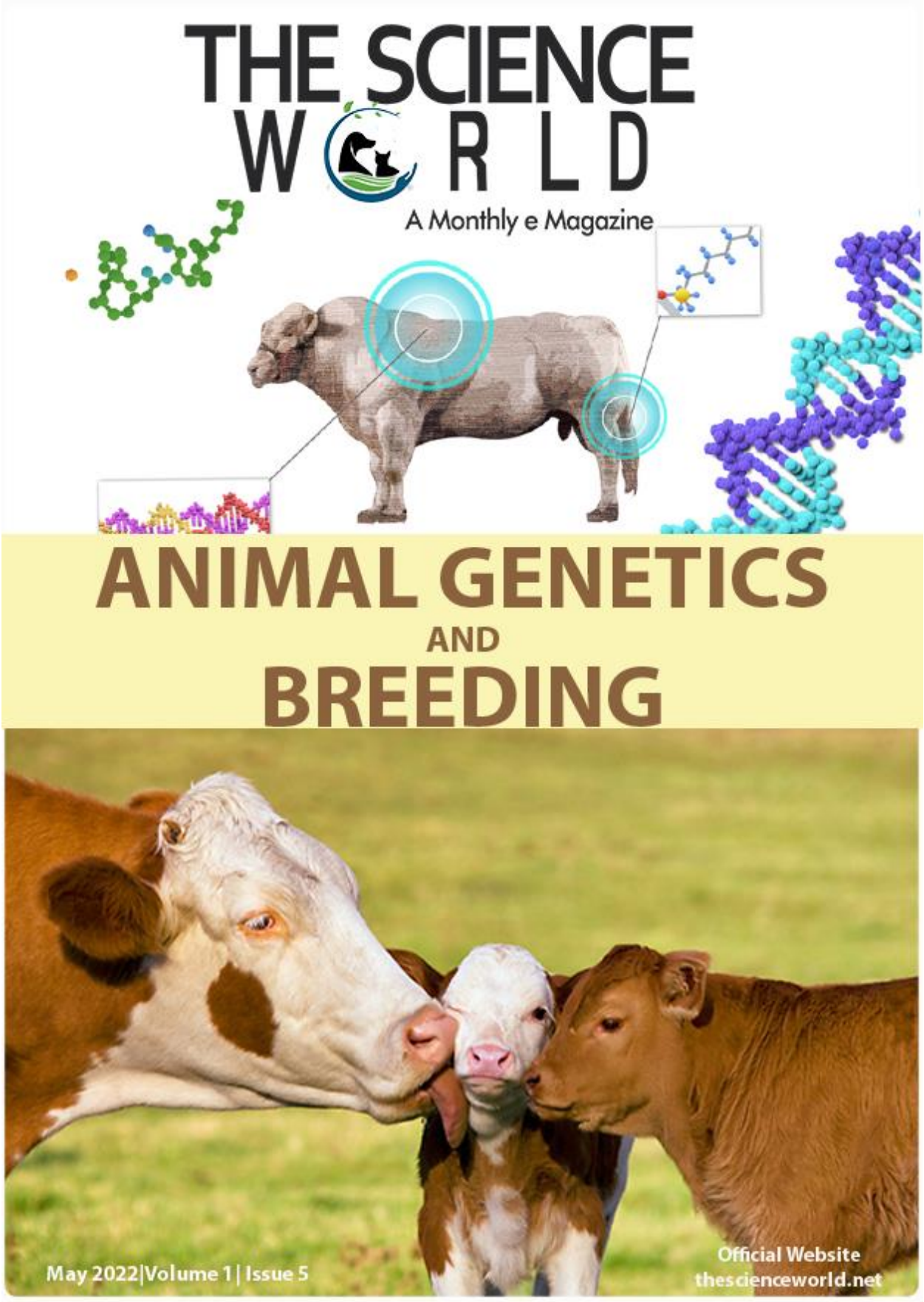
- Provide fly proof net shed for livestock is novel concept for pest control
- Use Deltamethrin treated net fencing around the livestock shed to prevent the flies and mosquitoes
- A simple fly swatters or sticky fly paper inside the shed is beneficial to catch the flies.
- Flies are draw to light; down draught light trap (220 v) equipped with 8-watt black light tube is useful to trap the flies.
- Some jug, bag, and jar traps can be used with bait and water to attract and capture flies.
- For some reason, horse flies are attracted to large black balls so use black ball horse fly traps to catch the flies.

Conclusion

Flies are a nuisance, just buzzing around and being annoying, and are major cause for occurrence of disease in animals and may also compromise the animal welfare, so it is very important to control the flies in livestock farms to increase the productivity and the improve income. By effective environmental management and use of essential oils, natural and chemical insecticides we can effectively control the fly population in the livestock farms.

Cite as

Ratnaprabha M. B, & Karthu Durai. (2022). Prevention and Control of flies in a dairy farm. The Science World a Monthly E Magazine, 2(5), 496–499. https://doi.org/10.5281/zenodo.6539787


THE SCIENCE
WORLD
A Monthly e Magazine
ANIMAL GENETICS
AND
BREEDING
May 2022|Volume 1| Issue 5
Official Website
thescienceworld.net

THE SCIENCE WORLD
A Monthly e Magazine

ÍSSN: 2583-2212
May 2022; 2(5), 500-503

Popular Article

Economic importance of desi chicken breeds for Backyard Farming System in Cuddalore District

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DOI: https://doi.org/10.5281/zenodo.6546777

Abstract

Assessment of improved breeds viz., Gramapriya and TANUVAS Aseel in terms of egg production and feasibility for backyard rearing was conducted as on farm testing (OFT) by Division of Animal Husbandry, Annamalai University, Cuddalore during 2019-2020 to assess its suitability and performance under the backyard farming system. The improved breeds viz., TANUVAS Aseel and Grama priya were assessed for their performance on egg production and body weight with local desi breeds. Among the above breeds, egg production of Gramapriya was higher with annual egg production (175 eggs) when compared to TANUVAS Aseel (143 eggs) and farmers local desi breeds (75 eggs). The Body weight at 20th week was also higher in Gramapriya (1.70 kg) followed by TANUVAS Aseel (1.58 kg) and farmers local desi breeds (1.35kg). The performance of Gramapriya breed was better than TANUVAS Aseel chicken in terms of annual egg production and body weight under backyard system of rearing. The B:C ratio was higher for Gramapriya (4.27) compared to 3.80 for TANUVAS Aseel and 3.34 for local desi breed. The comparative analysis infers that Gramapriya breed is a suitable breed that can be promoted in large scale in the backyard poultry farming in Cuddalore district.

Keywords: TANUVAS Aseel, Grama priya, Egg production, Body weight, Backyard poultry.

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Introduction

Livestock and poultry rearing is an essential factor for improving the livelihood security of the rural people in India. Farmers usually rear desi type chicken having low egg and meat production potential. Most of the backyard poultry production comprises of rearing indigenous birds with poor production performances (Pathak & Nath, 2013; Chakravarthi et al., 2014; Reetha et al., 2016 & Patra & Singh, 2016). Backyard poultry production is an old age profession of rural families of India. It is the most potential source for subsidiary income for landless and poor farmers. It is an enterprise with low initial investment but higher economic returns and can easily be managed by women, children and old aged persons of the households.

The potentiality of desi birds in terms of egg production is only 50 to 60 eggs/ bird/ year and meat production is also very low (Patra & Singh, 2016).

Backyard poultry is a handy and promising enterprise to improve the socio-economic status of farmers in rural areas with low-cost initial investment and high economic return along with guarantee for improving protein deficiency among the poor (Chakrabarti et al., 2014) which needs a breed upgradation with newly varieties of chicken introduced by various Research and Developmental organizations. Gramapriya is a multicolored egg purpose chicken variety developed at Directorate of Poultry Research, Hyderabad for free range and rural backyard rearing. TANUVAS Aseel is a new variety of native chicken developed at Poultry Research Station, TANUVAS, Nandanam, Tamil Nadu. Assessment of improved breeds viz., Gramapriya and TANUVAS Aseel in terms of egg production and feasibility for backyard rearing was conducted as on farm testing (OFT) by Division of Animal Husbandry, Annamalai University, Cuddalore during 2019-2020 to assess its suitability and performance under the backyard farming system.

MATERIALS AND METHODS

The present study was conducted in the Kumaratchi and Keerapalayam blocks of Cuddalore district during 2019-2020. Ten farmers from each block were trained on all scientific Desi bird training techniques like brooding, deworming, Vaccination etc. Each farmer was supported with of 20 unsexed day-old chicks which include 10 Gramapriya chicks, 10 TANUVAS Aseel Chicks. These improved breeds were compared with farmer's the local desi breed in this study. The production parameters viz., Body weight at 12th week and 20th week age (Kg), Average age of first egg laying and Average annual egg production were recorded periodically. The economic parameters viz., Gross cost, Gross return and Benefit cost ratio was calculated based on sale of eggs and live birds. Simple percentage analysis was used to analyze the data.

RESULTS AND DISCUSSION

The results of the trial are presented in Table 1. Grama priya birds attained sexual maturity (age at 1st lay) at an average age of 150 days compared to 160 days for TANUVAS Aseel and 190 days for local desi breeds. The body weight gain at 20th week was higher in Grama priya (1.70 kg) followed by 1.58 kg in TANUVAS Aseel and 1.35 kg in local desi breed. Moreover, Grama priya breed proved to be a dual-purpose bird with its superior egg laying capacity (175eggs/bird/year) compared to the 143 for TANUVAS Aseel and 75 for local breeds.

Table 1: Comparative performance of Gramapriya, TANUVAS Aseel and Local desi breed under backyard farming system

Particulars	Gramapriya	TANUVAS Aseel	Local desi breed
Body weight at 12th week (kg)	1.25	1.10	0.90
Body weight at 20th week (Kg)	1.70	1.58	1.35
Average age at egg laying (Days)	150	165	190
Annual egg production	175	143	75
Average Egg weight at 40th weeks (g)	65	58	55
Color of egg	Brown	Brown	Brown

A comparative economic analysis of rearing poultry during the trial is presented in Table 2.

Table 2: Economics of rearing Gramapriya, TANUVAS Aseel and Local desi in the backyard farming system)

Breed / Breed	Unit size	Mortality	Survival	Gross cost/ Unit (Rs)	Products	Revenue	Gross Return /Unit (Rs	Net Return /Unit (Rs)	BCR
Grama priya	10	1	9	2500	1050 eggs (Av. 175 eggs/hen from 6 hens)	8400 (Rs.8 / egg)	10695	8195	4.27
					15.3 kg live wt. (Av.1.70kg/bird from 9 birds)	2295 (Rs.150/kg)			
TANUVAS Aseel	10	2	8	2000	715 eggs (Av. 143 eggs/hen from 5 hens)	5720 (Rs.8 / egg)	7616	5616	3.80
					12.64 kg live wt. (Av.1.58kg/bird from 8 birds)	1896 (Rs.150/kg)			
Local desi strain	10	3	7	1500	450 eggs (Av. 75 eggs/hen from 6 hens)	3600 (Rs.8 / egg)	5018	3518	3.34
					9.45 kg live wt. (Av.1.35kg/bird from 7 birds)	1418 (Rs.150/kg)			

The economics of rearing Gramapriya poultry was found to be encouraging in terms of income generation as this breed achieved a better benefit-cost (B: C) ratio. In this OFT trail the B: C ratio with Grama Priya was found to be 4.27 compared to 3.80 for TANUVAS Aseel and 3.34 for local desi breed. The gross return from Gramapriya breeds was Rs. 10695/-.comprising the sale of eggs and live birds which infers that the breed is better in terms of investment and returns. Farmers had a net profit of Rs. 8195/- in contrast to the gross return of Rs. 5616/- for TANUVAS Aseel and Rs. 3518/- from local desi breed. This economic analysis infers that Grama priya provides better income to the rural poultry farmers and helps in augmenting the production of nutritious food products from rural poultry sector. Studies from many states of India indicates that the improved breeds had significantly higher achievement than the local chicken in terms of body weight, egg weight, egg production and age at sexual maturity (Vetrivel & Chandrakumarmangalam, 2013; Mohanty & Nayak, 2011; Yadhav & Khan, 2011; Padhi, 2016 & Vinothraj et al., 2019). The comparative analysis infers that Grama priya is a suitable breed and can be promoted in large scale in the backyard poultry farming in Cuddalore district.

Conclusion

From the study, it can be concluded that Gramapriya birds performs better than TANUVAS Aseel in terms of annual egg production and body weight under backyard system of rearing. So, farmers from rural areas of Cuddalore district can rear Gramapriya for their livelihood and nutritional security.

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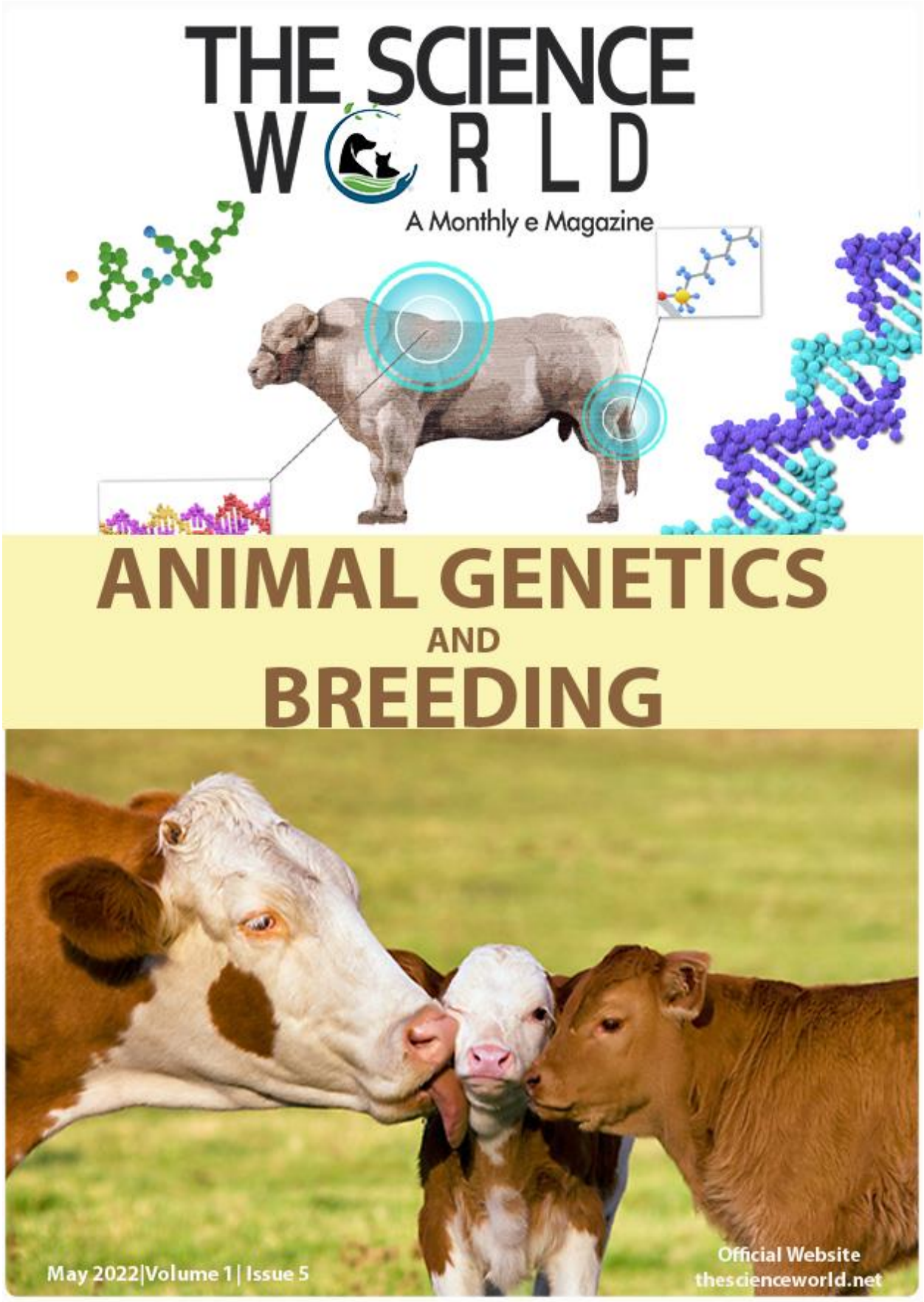
THE SCIENCE WORLD
A Monthly e Magazine
ANIMAL GENETICS AND BREEDING
May 2022|Volume 1| Issue 5
Official Website
thescienceworld.net

THE SCIENCE WORLD
A Monthly e Magazine

ÍSSN: 2583-2212
May 2022; 2(5), 504-506

Popular Article

Sex Sorted Semen in Farm Animals and Its Advantages

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DOI: https://doi.org/10.5281/zenodo.6570610

Introduction

Selection is an important priority area in farm management which helps in improving the productivity. Pedigree breeding accompanied by newer technologies increase the efficiency and improve the productivity to a greater extent. Sex sorted semen is a revolutionary technology in animal breeding. It helps in increasing the efficiency of dairy and beef production thereby increase the profitability of farms. Use of sex sorted semen help in predetermination of sex with about 90% reliability. In cattle X chromosome bearing sperms contain 3.8% more DNA than Y chromosome bearing sperm which is utilized for the identification of X and Y chromosome bearing sperms. Flow cytometry-based techniques are mostly used for this purpose (Garner *et al*.,2013). Other than that, other methods like laser splitting of unwanted X and Y chromosomes also been reported (Faust *et al*.,2016). Flow cytometric separation of two sperm populations was found to be more accurate. In flow cytometry sperms are separated based on the difference in the DNA content for those sperms are labelled with DNA fluorescent dye. After identification and electric charging droplets with single sperm are transferred in to collecting media where it is further processed. Sex sorted semen is mostly used in dairy herds in which traditionally it was limited to heifers. Recent studies have demonstrated that it can be used in heifers and lactating cows (Butler *et al*., 2014).

Need for the usage of sex sorted semen

The primary purpose of mating is to initiate lactation, produce replacement stock as well for meat purpose. Incorporation of sex sorted semen in breeding helps to obtain a desired sex bias in the resulting progeny. Sex of the calf is relatively important for reducing the possibilities of dystocia from male calves as compared to females. It was reported that use of sexed semen has reduced the occurrence of dystocia by 20% (Seidel et al., 2003; Norman et al., 2010).

It can also improve the milk production because reports suggest that gestation of the female calf can increase the milk production especially in the first lactation (Hinde *et al*., 2014). In dairy farms heifer calves is needed for the production of replacement stock and in case of beef herds female calves with high maternal index are required for producing the replacement stock and males with high terminal index achieve greater growth rates and carcass price. Use of sexed semen can help to improve the genetic merit of breeding stock by increasing the rate of selection and reducing the cost of genetic improvement (Hohenboken, 1999). It also helps in minimizing the production of male dairy breed calves thereby help to avoid the welfare issues related with male dairy calves.

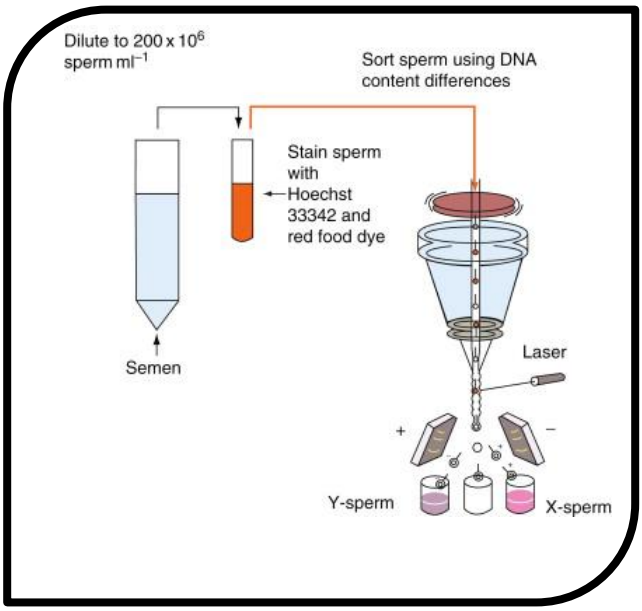
Benefits from sex sorted semen

Use of sex sorted semen help in accelerating the genetic gain. In case of non-sorted semen 90% of genetic gain is from sire selection. Sex sorted semen facilitate concurrent sire and dam selection. Reports suggest that sexed semen can increase the rate of genetic gain by 15% (Weigel *et al*., 2004). Sexed semen also found to improve the fertility performance with an increase in the conception rate especially in the well managed farms. In most of the reports the conception rate in heifers after AI with sex sorted semen ranges between 70 to 90 %. On comparing the effect of sexed semen on heifers and genetically superior cows for the replacement followed by breeding with beef semen in remaining herd with that on conventional semen found that use of sexed semen is more profitable and resulted in faster genetic gain as well as increased the number of female caves (McCullock et al., 2013).

The use of sexed semen in beef herds is limited but I facilitate the generation of female offspring with strong maternal traits as well as male calves with better terminal traits. It can be utilized with different beef production systems like single sexed heifer breeding system and three bred terminal crossbreds. In the first system beef heifers are inseminated with X chromosome bearing sperm and thereby help in producing replacement stock and after first parturition usually sent for slaughter whereas in second system maternal crossbred is produced by using X chromosome bearing semen from a sire with excellent maternal traits and this maternal crossbred is inseminated with Y chromosome bearing semen from a sire with excellent meat production traits. This will help in utilizing the advantages of heterosis as well as utilize complementary traits from different breeds (Hohenboken, 1999).

Embryo transfer using sexed semen can help in producing multiple embryos with desired sex from a specific dam and sire coupling.it can be achieved by two different methods

either by collecting the blastomeres and PCR with Y chromosome specific primers helps in identification of sex or by using sexed semen. Reports suggest that combined use of ovum pick up and IVF with sexed semen can help in high rates of good quality blastocyst development (Matoba et al.,2014).



(Adopted from: Encyclopedia of Dairy Sciences (Second Edition) 2011, Pages 631-636)

Damage to sperms during sex sorting

The greatest challenge in sex sorting of sperm by flow cytometry is to maintain its fertilizing ability until it reaches the female reproductive tract. They are subjected to various stress factors during the process of sorting. First stress factor is labelling and incubation with fluorescent dye. It was found that Hoechst 33342 can affect mitochondrial function. Loss of mitochondrial membrane potential was observed in boar semen (Spinaci *et al.*,2016). Dye along with energy released from the UV laser could affect DNA integrity too. DNA damage is not only caused by this it can also be caused by various mechanical shearing forces. During the process of sorting the sperm may get affected by various mechanical forces when they come in contact with various sorting components. Charged droplets with individual sperms are mostly sorted in flow cytometry. Repeated electric charging and electrostatic deflection also can result in reduced life span of the sperms.

Alternatives to Flow cytometry

Development of alternative techniques for the sorting of the sperm also gained importance in the scientific community. In human and animal reproductive medicine microfluidics, nanotechnology and Di electrophoresis are being used as alternative and it was

found to improve the sperm quality enabling the sorting of the sperm population with intact sperm membrane, high DNA integrity and improved motility. Apart from this some studies even focused on the qualitative detection of sex related differences using gold nanoparticles. Sperm gene targeting based on the vital genetic sequence detection using laser generated gold particle bioconjugates also reported (Mancini *et al*.,2015).

Conclusion

Assisted reproduction with sexed semen had increased benefit in the fields of livestock production. Advent of new technologies in sexing of the sperm that do not require expensive equipment and specialized human resources can overcome the present the present challenges in the field of sex sorting.

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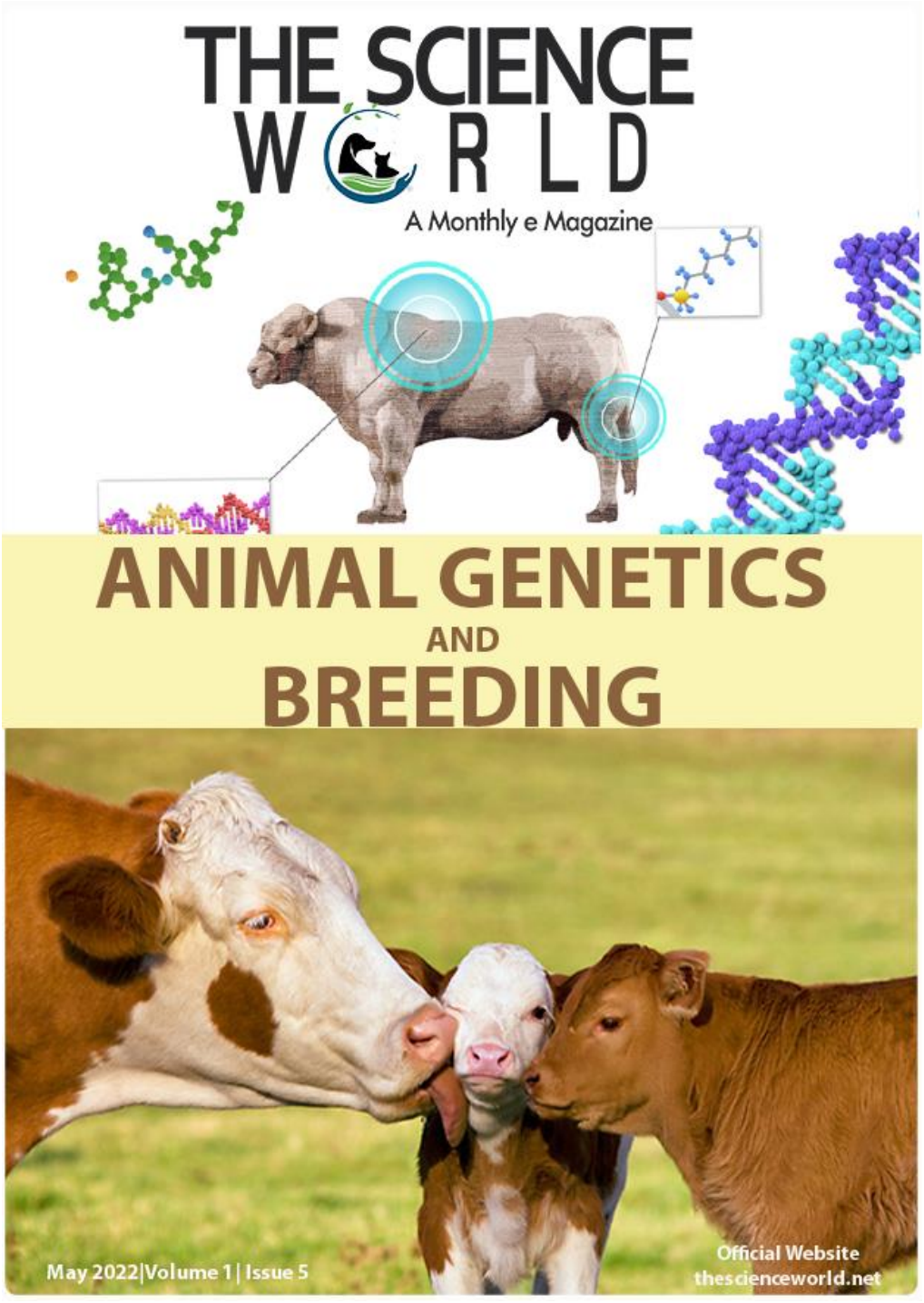

THE SCIENCE WORLD
A Monthly e Magazine

ÍSSN: 2583-2212
May 2022; 2(5), 507-512

Popular Article

Moulting in Layer Birds

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DOI: https://doi.org/10.5281/zenodo.6555684

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Abstract

Moulting is a normal physiological process in which shedding and renewing of feathers occur in both sexes of bird. Generally wild birds moult before the beginning of cold weather and their migratory flight. Birds do not shed all the feathers at a time. Some feathers retain to body to regulate the body temperature. This moulting process is controlled by gonads and thyroid gland associated with drop in estrogen level there by decreasing rate of egg production. During moulting birds have a complete rest from laying. Partial/pre mature moulting is seen due to feed or water shortage, discontinuity of lightening, poor housing condition, improper temperature, disease condition *etc*.

Introduction

Feathers comprise 3-7% of the body weight of the poultry birds. Feathers contain approximately 85% protein. There are three principal kinds of feathers are present *i.e.*, contour, plumules and filoplumules. Contour feathers also known as body feather. They are large in size. Plumules are also called as downy feathers. It is present in chicks and below the body feathers in adult. Filo plumules are hair like appendages *i.e.*, degenerated feathers present after plucking. Moulting of feathers occur in very orderly manner that means head fathers first moult followed by neck, breast, body, wing, tail. The main wing feathers called remiges are divided into the primary and secondary flight feathers separated by the smaller axial feather**.** A poultry bird having ten numbers of primary feathers, one number of axial feather and fourteen numbers of secondary feathers. Primary feathers next to axial feather shed first followed by other primary feathers in sequential manner. After the complete shedding of primary feathers, secondary feathers shed. But this shedding is not a sequential manner. At last axial feather shed. For complete renewing of primary feather, it takes 6 weeks. Renewal of $2/3^{rd}$ portion is completed in 1^{st} three weeks and rest $1/3^{rd}$ during last three weeks. Factors like body weight and physical condition of bird, length of light exposure, nutritional status of bird and environmental temperature and humidity affect the rate of moulting in broiler birds.

Types of moulting

There are two types of moulting *i.e.*, natural moulting and induced moulting

Natural moulting

Usually natural moulting begins from March-April and should be completed by July when the egg production commences. There is no artificial interpretation done. It is slower and more erratic or uneven than induced moulting. It is due to mainly physical exhaustion and fatigue, completion of laying cycle, decrease in day length period.

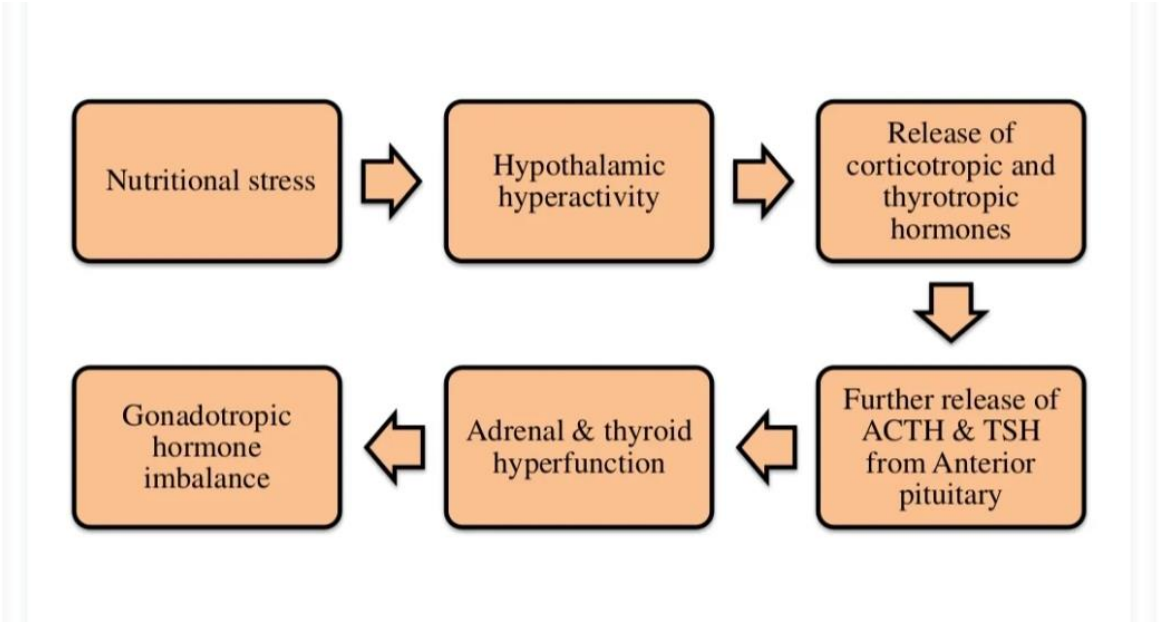
Induced moulting

It is also known as forced moulting. Induced moulting is defined as the moulting process artificially induced by applying certain stress for certain duration in order to attain longer productivity period and some other advantages in commercial layer birds. In other words, it is a practice adopted by commercial layer birds to bring about a rapid moult so that all the birds come back into lay for second time at a certain time, usually in autumn. It is achieved by subjecting a flock to a programmed combination of mild environment and nutritional stress factor causing the birds to cease the laying and consequently moult (Berry, 2003). Entire moulting process completed in 6-8 weeks.

Purpose of moulting

Generally, the layer birds are reared up to 72 weeks and then liquidated. By this time the production of flock goes down and the replacement flock would be ready for housing. At that time there is lack of enough finance to buy a new batch of chick and wait up to sexual maturity and productivity. This happens due to two reasons *i.e.* Price of cull bird are non-remunerative (farm income and expenses do not match) and sudden decrease in egg price at April (due to summer), August and September (due to festival season). Therefore, in order to overcome this situation birds are allowed to undergo a sort of rest for some time by drastic reduction of feed then came back to production again results better production for a longer period. Induced moulting causes all hens in a flock out of production for a period of regression and rejuvenation of reproductive tract accompanied by loss and replacement of feathers. On the other hand, domestic chicken meant for high egg production do not enter through a complete moult until the laying period is prolonged. Thus, to speed up the process, a programme of forced moulting can be used. In some countries, rather than being slaughtered after completion of laying, the hens are force moulted to re-enter second and subsequent laying phase.

Mechanism of induced moulting



Advantages of induced moulting

- To minimize the cost to bring the flock into production.
- Recycling of hen for another period of production.
- Effective management of tool for extending flock performance and production.
- To obtain heavier, high quality and marketable eggs.
- Improves the liveability of the flock.
- When the current egg prices are low then losses will be fulfilled by higher price obtained during post moult.
- Increases the profitability of flock in their subsequent laying phase.
- Cash outlay for induced moulting of the flock is less than buying and growing a fresh batch.
- Moulted birds are more resistant to disease.
- Availability of empty houses.
- To avoid annual cost of replacing, pullets, vaccines, medicines and feed *etc.*
- Round the year egg production.

Types of induced moulting

Two cycle moulting programme

Involves one moulting and two egg production cycle. Hen moults for the 1st time at 10 months of egg production. Then birds back to production and sold at 24 months. It is most

commonly practiced in field condition.

Multiple cycles moulting programme

It involves two or more moulting and three or more egg production cycle. Hen moults for the 1st time at nine months of egg production. Then birds back to production and sold at 30 month and more. It is least common in field condition.

Factors of induced moulting

There are mainly three factors for induced moulting

Initiating moulting process

Moulting process can be initiated by fasting/starvation, limiting the critical nutrients like protein, Ca and Na, artificial light turned off or provide not more than 8 hour. As a result gradually egg production decreases and reaches to zero.

Resting the flock

Once the flock is out of production, this stage is maintained for 4-5 weeks by providing low protein and Ca.

Returning the flock into production

Providing layer diet and normal lightening the flock return into production. Usually 50% laying was reached within 2-3 week after removing forced moulting.

Methods of induced moulting

1. Conventional induced moulting (On again, off again programme)
2. Washington induced moulting programme (Low feed intake)
3. California induced moulting programme (No water restriction).
4. Chemical induced moulting programme (By feeding of chemicals like Zn, Low Ca).
5. Use of drug and other compounds.

1. Conventional induced moulting programme

It is an old and most popular method due to ease application, low cost and agreeable post moult performance. During experiment, first grade the birds and cull the weak and lame birds. One week prior to this programme deworm the flock. Four days after deworming vaccinate the flock against Newcastle disease and infectious bursal disease. Give three days 24 hrs. light before starting the programme. Weigh the selected birds on day 1 morning and record it. On day 10, weigh birds and check for the body weight reduction if it is not reduced a desired level then continue fasting. Body weight was reduced 23-25% during feed restriction. Most flock will reach zero

production by 6th or 7th day after feed restriction. Flock will back in production 5 weeks after restriction and up to 50% production in 7th week and peak at 9th week. Repeat lasota vaccine after the birds are back on full feed condition. The normal management practices are presented in Table 1.

Table 1. Normal management practices during conventional induced moulting programme

Days	Feed	Water	Light
1.	None	None	8 hr
2.	None	None	8 hr
3.	45g/hen	Water	8 hr
4.	None	None	8 hr
5.	45g/hen	Water	8 hr
6.	None	None	8 hr
7.	45g/hen	Water	8 hr
8.	None	None	8 hr
9.	45g/hen	Water	8 hr
10 -60 day	Restricted feeding about 75% of full feed intake	Water	8 hr
61 days onward	Full fed layer ration	Water	14-16 hr

2. Washington induced moulting programme

Fasting methods is not practised in most of countries because of the welfare of the flock. This fasting/starvation are banned in India now. In such cases, the producer must follow a feeding programme in which egg production drops to zero without following starvation or fasting method. This method includes full or limited feeding of low protein or low nutrient diet, low calcium and phosphorus level in the diet.

3. Chemical induced moulting programme

In this method, about 20 g zinc per kg in layer diet (25 kg of zinc oxide per ton feed) is

used for a period of 5 days along with reduced photoperiod. Then the birds are provided 50 mg Zn/kg layer feed and increased light period upto 14 hours. During this programme, hens will consume < 10% normal amount of feed and will lose from 250 to 340 g of their original weight within the first 7 to10 days (Mosaad *et al.,* 2016).On 5th day of this programme egg production reaches to zero. When this Zn programme is withdrawn automatically birds will come back into production within 7 days.

4. Use of drugs and other compounds

Compounds like methalibure, enheptin, progesterone, chloromadidone, aluminium and iodine show moulting effect when fed to birds at a particular concentration (Biggs *et al,* 2005).

Nutritional strategies for induced moulting in layers

- Induce moult by providing low density diet (Grape pomace, soyabean hulls and whole grain barley).
- Feeding of low nutrient rations such as alfalfa in combination with 10%-layer ration can be effective substitute for feed removal with increased profitability.
- Wheat middlings is also used to induce moulting.
- Inclusion of 20% guar meal in layer ration successfully induces moulting and increases the resistance of hens against *Salmonella* infection.
- When excess zinc and aluminium salt contents in diet are given moulting induces.

Conclusion

Induced moulting not only judges and selects the superior bird but also improves the productivity and performance of the layer birds.

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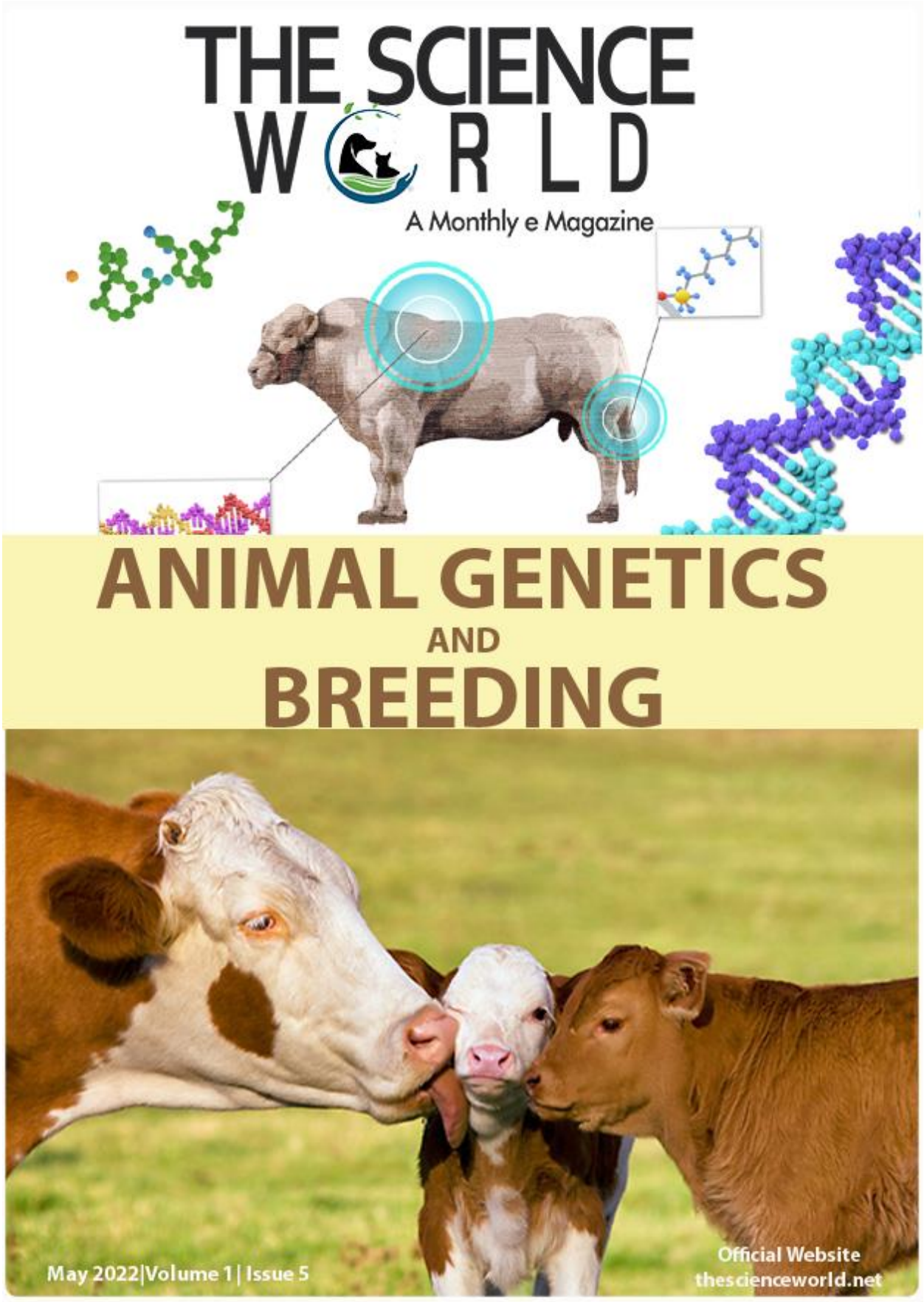
THE SCIENCE WORLD
A Monthly e Magazine
ANIMAL GENETICS AND BREEDING
May 2022|Volume 1| Issue 5
Official Website
thescienceworld.net

THE SCIENCE WORLD
A Monthly e Magazine

ÍSSN: 2583-2212
May 2022; 2(5), 513-515

Popular Article

Biopesticide: An Eco-friendly Approach to the Aquaculture Practice

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Introduction

Biopesticide is one type of eco-friendly pesticide which is mainly derived from natural material such as animals, plants and microbes. Nematodes, plants (e.g. Chrysanthemum, Azadiracthaindica), microbes (e.g. Bacillus thuringiensis, Tricoderma, Nucleopolyhedrosis virus) which are the parental material of biopesticides

Three major classes of biopesticides

- Microbial Biopesticides
- Plant incorporated Biopesticides
- Biochemical Biopesticides

Table 1: summarized 3 types of biopesticides

Microbial biopesticides	Plant incorporated biopesticides	Bio-chemical biopesticides
Products which consist of microorganisms as active ingredients. Mainly utilized fungi, bacteria and virus. Ex. *Bacillus thurinngiensis*	Here, genes inserted into the plant tissue and pesticides produce inside its own. Ex. Bt canola, Bt cotton, Bt potato etc.	Naturally occurring substance that control pests by non-toxic mechanisms. Ex. Azadiractin from Neem tree.

As a biopesticide extraction of Neemazadiractin is one of the most versatile and well known which contains at least 35 biologically active compounds such as antiviral, antibacterial, antifungal and insecticidal properties (Murussiet al., 2015).

Earlier to remove the predatory fish from aquaculture pond different types of synthetic pesticides were used. These pesticides have long term persistency in the water and also contaminate the aquatic environment. Therefore, in the present situation, biopesticides are replaced with those harmful synthetic pesticides (Saravana et al., 2010). Biopesticides are gained much more attention due to its non-persistency and low bioavailability in the environment.

Azadiractin has been successfully used in aquaculture to control the predator fish and different pest (Saravana et al., 2010). Sometimes, it also prevents bacterial and viral infections in aquaculture farms. The dose of these biopesticides is most important because a high dose of biopesticides is slightly toxic towards the non-targeted organisms (Murussi et al., 2015 and Saravana et al., 2010). Magnolia officinalis extract can be used as anti-protozoan activity, which is used to inhibit or causes mortality of *Ichthyophthirius multifiliis* (holotrichous ciliate) that affect the fresh water fish farming.

Significance

- Biopesticide is a systematic pesticide mainly acts upon target organism and closely related organisms (Saravanaet al., 2010).
- These are decomposed very quickly and bioavailability is very low.
- It is an integrated approach to ensure ecosystem and conserve biodiversity.
- It is replaced the synthetic pesticides and reduce the contamination in aquaculture farm and enhances the ecosystem-based aquaculture for sustainability (Murussiet al., 2015).
- Biopesticides are also prevented bacterial, fungal and parasitic infections in fish culture (Kumar et al., 2013).
- Inhibit the growth of weeds.
- More effective than chemical pesticides in the long term.

Hindrances

- High levels of these substances are slightly toxic to the non-targeted organisms (Saravanaet al., 2010).
- Sometimes the speed of action of these pesticides is very low.

- Biopesticides are highly specific, mainly act upon the targeted species.

Future prospect and Conclusion

Biopesticides are eco-friendly to the environment. In the present situation, acceptances of these substances are increased among the farmer due to its low marketable value and environmental safety. Due to the use of biopesticides revolution occurs in aquaculture practice. In the future, much more research is required to standardize the optimal dose of different biopesticides for non-targeted organisms.

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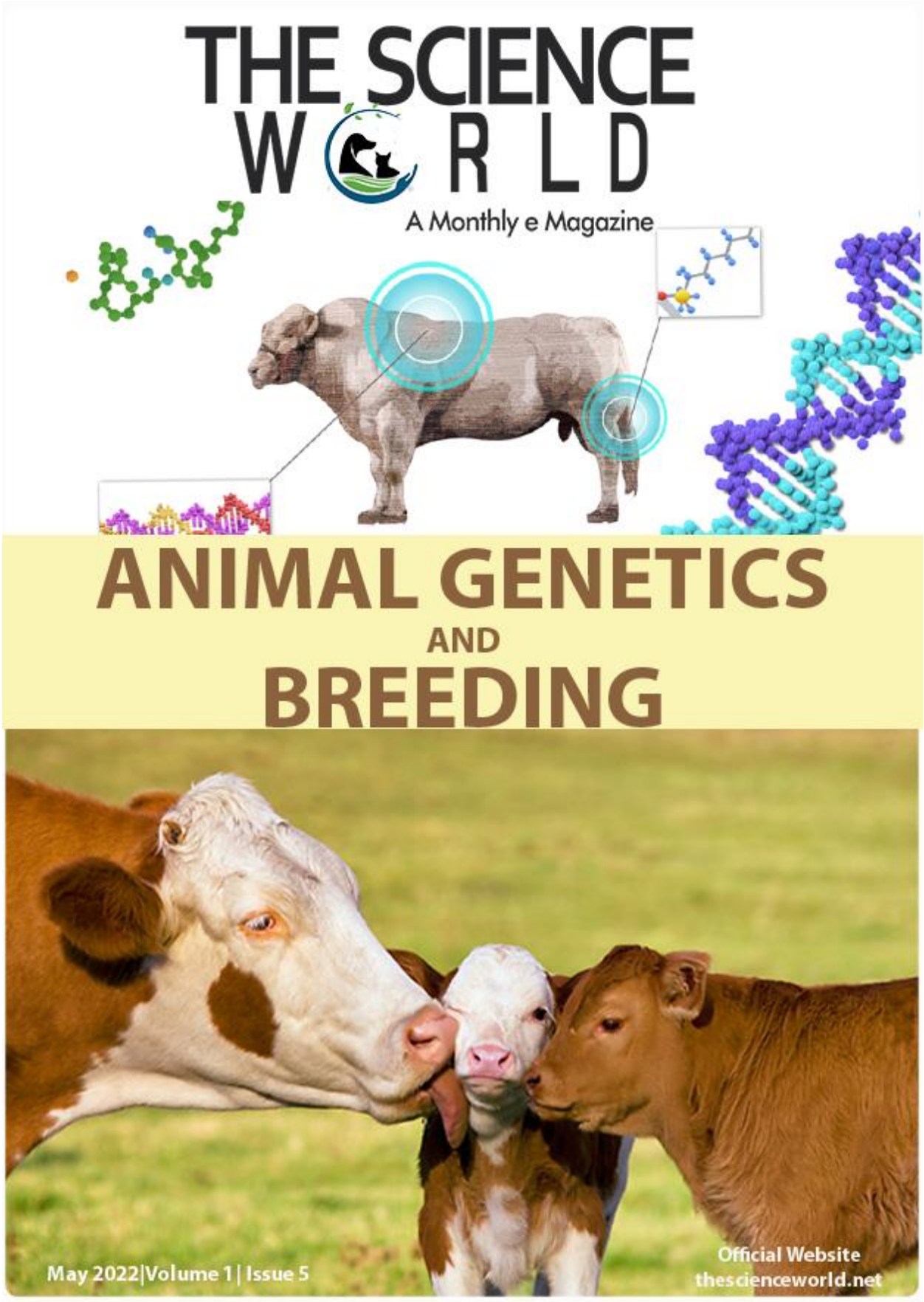
THE SCIENCE WORLD
A Monthly e Magazine
ANIMAL GENETICS AND BREEDING
May 2022|Volume 1| Issue 5
Official Website
thescienceworld.net

THE SCIENCE WORLD
A Monthly e Magazine

ÍSSN: 2583-2212
May 2022; 2(5), 516-518

Popular Article

Parturition Behavior in Horses

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Introduction

Parturition is the process of giving birth to a young one and expulsion of the placenta. It is the phase between labours to offspring's birth. In horses' parturition takes place after 11months. About 80% of mares foal at night and in the open (Rossdale and Short, 1967). Parturition is also usual at night in stabled horses. The peak foaling hour in stabled mares is prior to mid night. In free-ranging mares' birth is often in the dark hours of early morning. This gives the mare and foals all day to establish a bond and allows the myopic foal to travel in daylight. Parturition is very quick in horses, often only minutes from any sign of discomfort until the foal is born. Parturition consists of three distinct stages of labour:

Stage I (Dilation of the cervix)

Stage I, normally lasting 1 to 4 hours, reflects the initial uterine contractions and final positioning of the foal for delivery. These contractions will make the mare appear nervous and uncomfortable. Typically, the mare will exhibit the following behaviour.

Appear restless, indicated by frequent interruptions in eating. She may stop chewing feed.

Paw the bedding of ground in different places.
Get up and down frequently.
Sweat in the flanks.
Urinate frequently.

These indicators are far from infallible and in some mares, the appearance of the water bag (the outer membranes surrounding the foal) may be the first signs of parturition observed. During this stage, the mare can be prepared for foaling, if desired. This could include washing the mare's vulva and udder with warm water and wrapping her tail with a clean bandage.

Stage II (Expulsion of the fetus)

Stage II is the most critical time, as this is when the foal actually appears. This second stage, hard labour and foal delivery is usually completed in 10 to 30 minutes. Close observation, without interference unless absolutely necessary, is important throughout this stage. Some mares object to assistance during this time.

The mares will experience heavy abdominal contractions and lie flat on their side. The water bag will appear and should break on its own during the first part of stage II. In a normal presentation, both front feet with heels down will appear first and usually one foot will be slightly ahead of the other. The feet are followed by the nose and head resting between the knees; the back of the foal is toward the back of the mare.

Following birth, the mare may rest, allowing the foals hind legs to remain in the birth canal for a period of time before they are pushed out. The mare immediately attends the foal with licking that clears the birth membranes and appears to stimulate the foal. The mare sniffs and may perform the flehmen response to the expelled fetal membranes. Stage II ends, as the mare stands and the umbilical cord is broken.

Stage III (Expulsion of fetal membranes)

The final stage of parturition, Stage III, is the delivery of the placenta (afterbirth). This membrane should be expelled 3 to 4 hours after delivery. Typically, the mare will stand with the placenta partially expelled while the foal struggles to stand and nurse. The foal's nursing stimulates uterine contractions, aiding in placenta release. During the first week postpartum, a reddish-brown discharge may be present which is normal uterine discharge containing uterine debris and tissues.

Pre-Partum Behaviour

The first noticeable change is in the mammary gland, which begins to enlarge 2 to 6 weeks prior to term. Some mares may develop a large amount of edema around the udder before the gland itself becomes enlarged. Mammary gland development will be much more pronounced in mares that have previously had foals than in maiden mares. The teats or nipples will remain relatively flat until the last few days prior to foaling, at which time they will fill with milk. The secretion by the mammary gland changes from a clear straw-colour fluid to a more turbid milk-like substance as the due date draws near.

The mammary secretion becomes thick and honey-like as colostrum develops within the last day or two prior to foaling. Thick, waxy exudates are often observed to accumulate at the ends

of the teats 24 to 48 hours prior to foaling. 'Waxing' of the teat ends is a classic sign that foaling is imminent.

In the last 2 to 3 weeks of pregnancy, the abdominal muscles relax causing a pronounced 'dropping' of the abdomen, which is especially noticeable in older mares. During the last week prior to foaling, the ligaments, muscles and other structures surrounding the mare's pelvis and perineum soften in preparation for birth. The vulva becomes relaxed, elongated and oedematous in the hours immediately prior to foaling. The behaviour of the mare often changes during the last few days or hours preceding foaling. Mares near term may tend to isolate themselves, go off feed and pass small amounts of manure or urine frequently (Broom and Fraser, 2007).

Clinical signs of impeding foaling (Patrick, 2016)

Sign	Time frame relative to foaling
Mammary gland development	Begins 2- 6 weeks prior to foaling
Perineal relaxation	1-3 weeks prior to foaling
Engorgement of teat ends with colostrum	7-10 days prior to foaling
Waxing of teats ends	48-72 hours prior to foaling
Elongation and swelling of vulva	0-24 hours prior to foaling
Dripping milk from udder	12-24 hours prior to foaling

At Post-Partum Stage

Following birth, the mare may rest, allowing the foals hind legs to remain in the birth canal for a period of time before they are pushed out. The mare immediately attends the foal with licking that clears the birth membranes and appears to stimulate the foal. The mare will stand with the placenta partially expelled while the foal struggles to stand and nurse. (McDonell, 2000)

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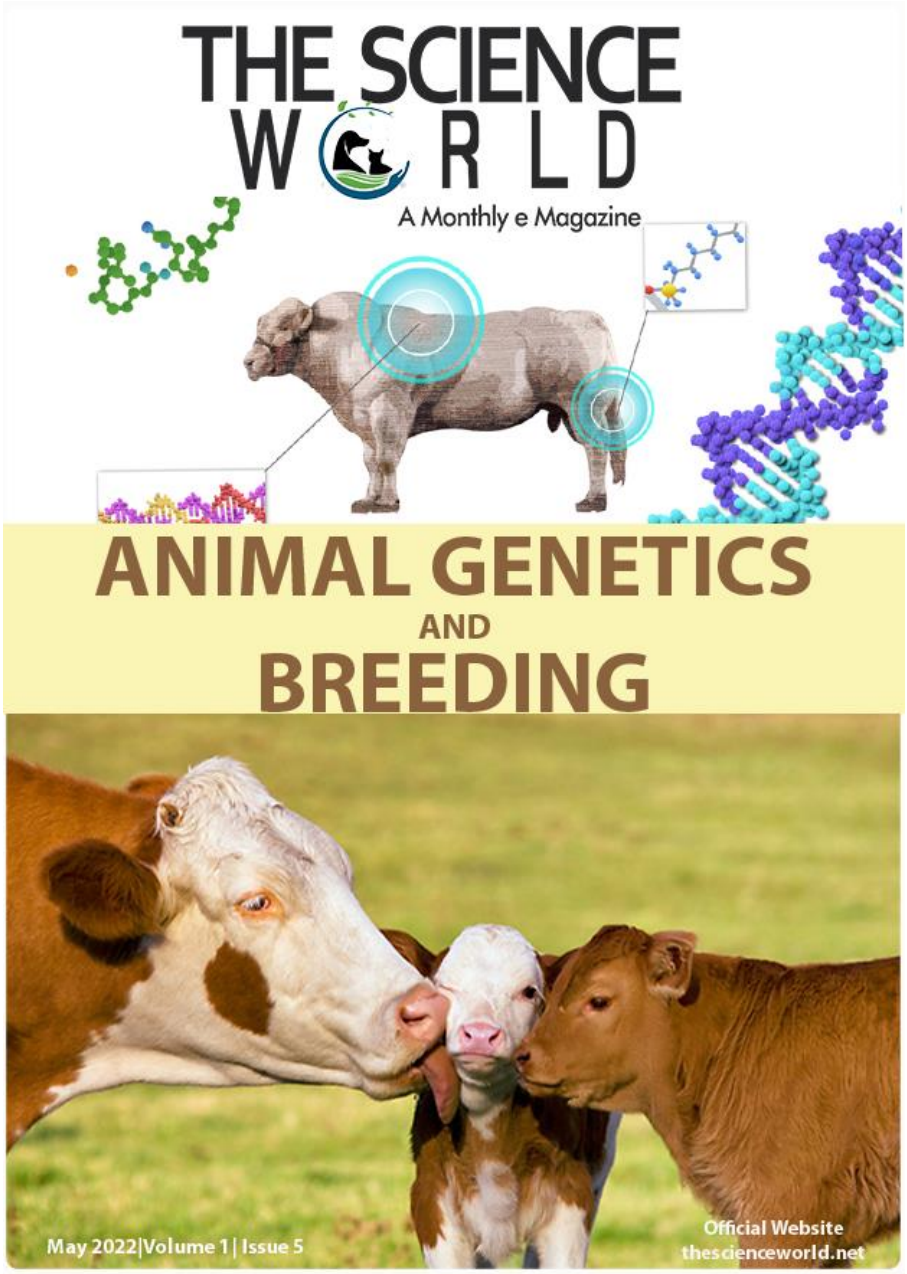

THE SCIENCE WORLD
A Monthly e Magazine
ISSN: 2583-2212
May 2022; 2(5), 519-522

Case Study

Successful Clinical Management of Hypokalemic Downer Cow: A Case Report

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DOI: https://doi.org/10.5281/zenodo.6570085

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Abstract

A Jersey crossbred cow had a history of normal appetite, diarrhoea, sternal recumbency, and inability to stand for the previous two days. All physiological parameters were normal throughout the evaluation. The animal attempted to rise but was unable to do so, resulting in sternal recumbency. Serum calcium, phosphorus, potassium, glucose, and sodium were measured in the serum biochemical examination. All serum biochemical values were within normal limits except for low potassium. The animal was given symptomatic treatment as well as potassium chloride (0.4 gm/kg body weight) orally. The animal was helped to stand using a hip sling twice a day. Paddy straw was used to massage the animal's four limbs with hot water. After three days of adequate treatment, the animal was able to get up and recover completely.

Keywords: Downer cow, sternal recumbency, hypokalemia, potassium chloride, hip sling

Introduction

Downer cow syndrome is a condition in which an animal is active and alert yet unable to stand. It occurs often as a result of hypocalcaemia, hypophosphatemia, and sternal recumbency for more than 24-36 hours, even after two doses of calcium. Downer syndrome can also be caused by a combination of muscle and nerve injuries, prolonged hypocalcaemia, hypokalaemia, hypophosphatemia, myocarditis, hepatitis, and other surgical variables including fracture, bone dislocation, and so on (Raghavendran et al., 2020). The potential contributory factors to the development of clinically significant hypokalaemia in the chronically ketotic cow include reduced potassium intake, intracellular shifting of potassium subsequent to metabolic alkalosis and hyperglycaemia and increased potassium loss from the mineralocorticoid effects of exogenously administered corticosteroid (Peek et al., 1998). Hypokalaemia in cattle usually develop secondary to other conditions such as inappetence, altered renal functions, diarrhoea or iatrogenic alteration of normal electrolyte homeostasis. Rarely does hypokalaemia become so severe that notable weakness or recumbency result (Sielman et al., 1997) Oral potassium administration has been recommended for the treatment of hypokalaemia cows. The recommendations on the amount and application frequency for oral potassium treatment range widely between 60 to 300 gm of potassium per day (Wittek et al., 2019).

Case history and observation

A Jersey crossbred dry cow was presented at Teaching Veterinary Clinical Complex, Veterinary College and Research Institute, Namakkal with history of normal appetite, diarrhoea, sternal recumbency and unable to stand (Fig.1). All the physiological parameters were in normal range, such as pink and moist conjunctival mucus membrane, 38.5^{o}c rectal temperature, 80 beats per min. Heart rate, 24 per min. Respiration rate and palpable pre scapular lymph node. However, the animal had tried to get up on its own but not able to stand up. The pinprick test was also carried out in all the four limbs to rule out the limb's sensitivity and nerve functions. The test revealed that the animal was not having any nerve injury. Blood sample was analysed for serum calcium, phosphorus, glucose and potassium level. Serum biochemistry revealed all the values in normal range except serum potassium that was 2.3 mmol/L.

Diagnosis and treatment

A provisional diagnosis of hypokalemic downer cow was made on the basis of history, clinical examination and serum biochemical findings and treated accordingly. A symptomatic treatment was given by administering injection Normal saline, injection Ringer lactate, injection Enrofloxacin, injection Meloxicam, injection B- complex and injection Meta ways intravenously. Same treatment follows up for three subsequent days with Potassium supplementation orally by rumen infusion pump (fig. 3) (0.4 gm/ kg body weight). After potassium supplementation the animal was put to Hip sling twice in a day and allowed to stand in its support for one hours after standing by hip sling (fig.2). The animal was massage for all limbs with paddy straw soaked in hot water. As the three days advanced the animal was recovered and stand up by its own without any support (fig.4).

Fig. 1 sternal recumbency (before treatment)

Fig. 2 Animal assisted by Hip sling

Fig. 3 Potassium administration by rumen infusion pump

Fig.4 completely recovered animal

Discussion

The downer animal responded well to calcium, sodium and potassium supplementation. One of the most common causes of downer is hypocalcaemia. The recumbent downer animal was to be checked for hypophosphatemia and hypokalaemia along with hypocalcaemia. To prevention from the ischemic necrosis, the position of the animal should be changed frequently. This can be done by placing soft bedding material under the animal.

Conclusion

A downer cow can be successfully treated by early diagnosis and proper treatment. In this case the serum potassium level was low. So, the animal showed good response after potassium administration for three days consecutively. Hip sling will be better lifting devices for alert downer cows. Hence hypokalaemia should also be considered as differential diagnosis while treating the downer cows.

Acknowledgements

The authors are thankful to the Dean, Veterinary College and Research Institute, Namakkal, for the facilities provided to carry out the work.

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Cite as

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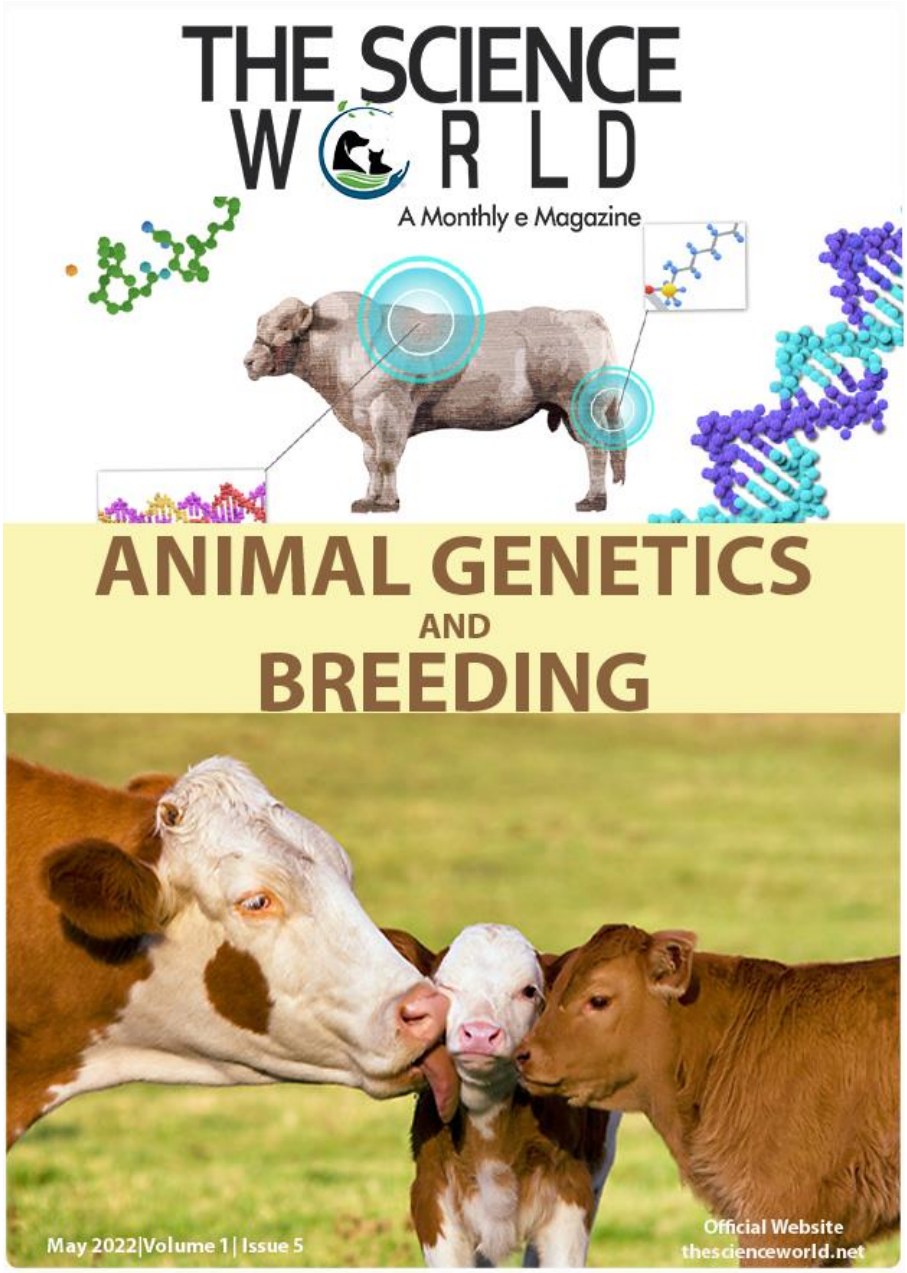

THE SCIENCE WORLD
A Monthly e Magazine
ISSN: 2583-2212
May 2022; 2(5), 523-525

Popular Article

Role Of Bio-Stimulation in Small Ruminant Productivity

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DOI: https://doi.org/10.5281/zenodo.6570063

Introduction

Sheep and goats play a vital role in India's agro economy. Scientists have turned their attention on the enormous importance of sheep and goats in rural India. Meat, wool, and hair contribute to the farmer's income, and animal excrement fertilizes the soil. Food is in ever-increasing demand due to the growing global population of human and animal. Proteins are in particularly high demand. It is widely acknowledged that there is a significant and growing gap between available animal protein sources and demand. Improving productivity is a significant and difficult endeavor. Recently, the focus of production has shifted from dual-purpose lamb/kid and wool production to solely meat production. On the other hand, there is no need to emphasize the demand for and production of animal protein to meet the pressing needs of an ever-increasing human population today. The demand for animal protein will not only continue but will grow as the human population grows and their purchasing power grows.

In terms of our country's socioeconomic status, the meat business is in good shape, and there appears to be plenty of room for growth. Meat productivity is directly influenced by fertility rate, litter size, growth rate, and development. The degree of meat output is determined by "growth and development." Prior to attempting to improve the output of meat from sheep and goats, it is necessary to have a thorough understanding of the complex elements that influence lamb growth and development. Numerous studies have employed various growth-promoting bio stimulants, which differ terms of their source, origin, dosage, method of action, species specificity, and ability to promote growth. Aside from efficiency, safety and cost, possibly the most important factors in selecting an acceptable growth stimulant for large-scale use.

What are bio stimulants?

Bio stimulants have yet to be given a legal definition. The European Bio stimulants Industry Council, on the other hand, defines them as "substances and/or microorganisms that, when applied to plants or the rhizosphere, stimulate natural processes to benefit nutrient uptake, nutrient use efficiency, abiotic stress tolerance, and/or crop quality, regardless of nutrient content."

These are preparations made from animal, plant, or microbial live tissue. They are normally manufactured using particular methods from various organs, preferably the spleen, and are injected, implanted subcutaneously, or fed in small amounts on a regular basis with the purpose of promoting development and increasing performance of a variety of farm animal economic features.

Effect On Growth Rate and Feed Efficiency

Cinpav *et al.* (1963) achieved a 2kg average live weight increase advantage over controls when wethers of 33kg average live weight were injected s/c with 5 to 10ml of spleen extract at 10-day intervals during a 45-day fattening phase. In another experiment conducted by Sevyrev et al. (1962), treated ewes gained more weight than the control group. Ten s/c injections were given to treated ewes every five days during a 58-day trial. On the other hand, Bakuaskii (1966) found a 0.6 kg reduction in live weight in cross-bred withers treated with 2-, 3-, and 4-ml injections of excised parenchymatous organs compared to controls.

Biostimulator using spleen extracts from diverse species and in merino lambs increased weight gains by 9-15 percent, according to Safarov.

Effect On Physical and Chemical Composition of Carcasses

Cinapav reported that after the lambs were given the biostimulator, the average dressing % increased by 1.26 percent. The effects of placental suspension on 4-5-month-old male lambs' growth and development, as well as carcass features was analysed. Apart from the control group, two test groups were kept. In one series, test group one received fifteen injections and test group two received six injections. The interval between tests is 5.5 months. The average weight before slaughter of the test groups 1 and 2 was 14.2 and 11.5 percent higher than the control group, indicating a significant increase in growth rate attributable to bio stimulation (Anonymous).

Effect of on Wool Production

Vanenkov investigated the impact of tissue pre-treatment on sheep wool output. 500 wethers were given four injections of 5ml Filatov's extract of cow spleen at seven-day intervals on a farm, with the treatment group yielding 182 gramme more wool on average than the control

group. "Fine" and "coarse" wool sheep on a communal farm got a total of seven injections of spleen extract and skin tissue extract. Treated fine wool and treated coarse wool yielded 137 grammes and 157 grammes more wool on average than untreated controls, respectively.

Effect On Reproduction

Supplementing bio stimulants to ram sperm enhanced motility length by 1-2 days, conception rate by 9-15 percent, and the sex ratio was changed to 89:41 in favour of more female lambs according to Volosevic.

Abdunazarow found that extracts from six 1-day old fowl embryos refrigerated at 0 to 4 degrees Celsius, when added to glucose citrate semen extender, had a better effect on spermatozoa activity and survival than untreated semen dilutor. Due to the inclusion of bio stimulatory preparation, sperm survival was enhanced to eight days.

Conclusion

Bio stimulation can exert profound effects on reproductive activity via the hypothalamic system that generates pulses of gonadotropin-releasing hormone. Both male and female production can be affected by bio stimulation. The bio stimulation technique could be a valuable and practical way to improve animal reproductive efficiency. For higher production, the exact nature of the cues and the significance of bio stimulation in livestock species, particularly pigs, sheep, goats, and cattle, deserve more consideration. As a result, research into the bioassay and behavioural aspects of these pheromonic chemicals in farm animals is required.

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Cite as

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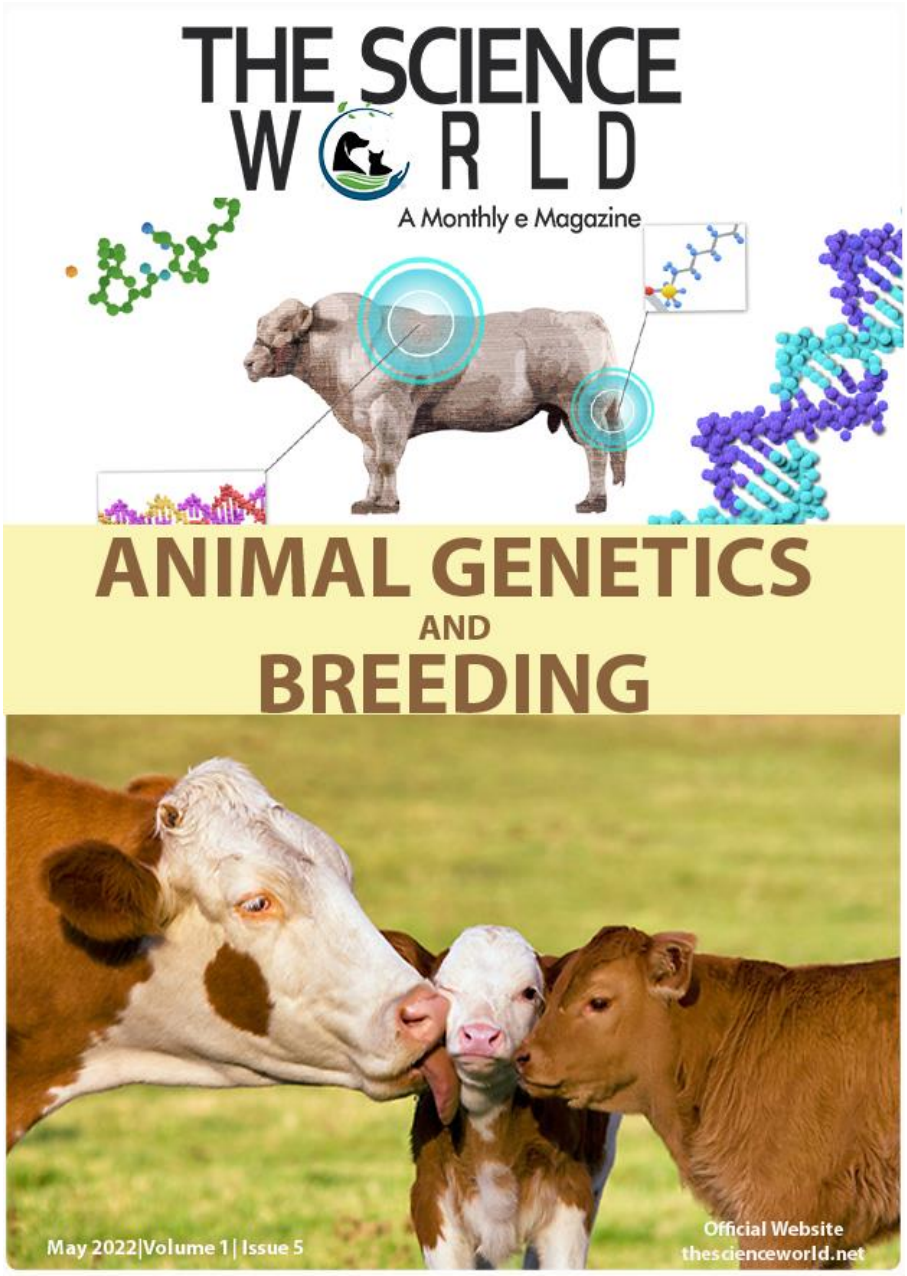
The Science World a Monthly e- Magazine, **May, 2022; 2(5), 523-525**



THE SCIENCE WORLD
A Monthly e Magazine
ISSN: 2583-2212
May 2022; 2(5), 526-529

Popular Article

Bio floc Fish Culture

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DOI: https://doi.org/10.5281/zenodo.6570079

Introduction

The global population is expected to reach 9.6 billion by 2050, and with the demand for animal protein increasing year after year, it is a challenge to provide high-quality protein while protecting natural resources for future. In this context, aquaculture plays an important role in promoting health by providing animal protein even while creating huge employment opportunities. Bio floc Technology (BFT) is regarded as a new "blue revolution" because nutrients can be repeatedly reused and recycled in the growth media while benefiting from low or no water exchange. BFT is a low-impact aquaculture technique that relies on in-situ microorganism production.

Bio floc is the suspended growth in ponds/tanks that consists of aggregates of living and dead particulate organic matter, phytoplankton, bacteria, and bacterial grazers. It is the use of microbial processes within the pond/tank to provide food source for cultured organisms while also acting as a water purification solution. As a consequence, this system is known as active suspension ponds, heterotrophic ponds, or green soup ponds.

How BFT works?

The bio floc system is a wastewater treatment system that has grown in importance as an aquaculture technique.

The method works on the basis of maintaining a relatively high C-N ratio by adding carbohydrate sources, while improving water quality through the production of high-quality single cell microbial protein.

In such conditions, heterotrophic microbial growth occurs, which assimilates nitrogenous waste that can be used as a feed by cultured species while also acting as a bioreactor controlling water quality.

The growth rate and microbial production per unit substrate of heterotrophs are ten times greater than that of autotrophic nitrifying bacteria, toxic nitrogen species are immobilised more quickly in bio floc.

This technology is based on the principle of system flocculation.

The Science World a Monthly e Magazine, May, 2022; 2(5), 526-529

Composition and Nutritional Value of Bio floc

Bio floc is a diverse aggregate of suspended particles and micro - organisms linked by extracellular polymeric substances. It is made up of microorganisms like bacteria, algae, fungi, invertebrates, and detritus etc.

It is a protein rich live feed formed as a result of conversion of unused feed and excreta into a natural food in a culture system on exposure to sunlight and vigorous aeration.

Each floc is held together by a loose mucus matrix secreted by bacteria and held together by filamentous microorganisms or electrostatic attraction. Although large flocs can be seen with the naked eye, the vast majority are microscopic. Floc sizes range from 50 to 200 microns.

Biofloc has a high nutritional value. The dry weight protein ranges from 25–50%, while the fat ranges from 0.5–15%. It is high in vitamins and minerals, especially phosphorus. It has a similar effect to probiotics. Dried biofloc is proposed as a feed ingredient to replace fishmeal or soybean meal.

Advantage of BFT

I. It is an eco-friendly culture system that reduces the environmental impact.
II. Judicial land and water use
III. System with limited or no water exchange
IV. Increased productivity (It enhances survival rate, growth performance, better feed conversion in the culture systems of fish).
V. Increased biosecurity.
VI. Reduces water pollution and the risk of pathogen introduction and spread
VII. It lowers the utilisation of protein-rich feed and the cost of standard feed.
VIII. It relieves pressure on capture fisheries by utilising less expensive food fish and trash fish for fish feed formulation.

Species suitable for Bio floc Culture

Major cultivable fish species in BFT

A basic factor in designing a bio floc system is the species to be cultured. Bio floc system works best with species that are able to derive some nutritional benefits from the direct consumption of floc. Bio floc system is most suitable for species that can tolerate high solids concentration in water and are generally tolerant of poor water quality. Some of the species that are suitable for BFT are:

- Air breathing fish like Singhi (Heteropneustes fossilis), Magur (Clarias batrachus), Pabda (Ompok pabda), Anabas/Koi (Anabas testudineus), Pangasius (Pangasianodan hypophthalmus)
- Non air-breathing fishes like Common Carp (Cyprinus carpio), Rohu (Labeo rohita), Tilapia (Oreochromis niloticus), Milkfish (Chanos chanos)
- Shellfishes like Vannamei (Litopenaeus vannamei) and Tiger Shrimp (Penaeus monodon)

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How to Prepare the Inoculum?

Method 1:

For 15000 Litres of fresh water 150 Litres of inoculum is required for the floc development

Step 1

Take clean tub/can with 150 Litres of water and continue vigorous aeration

Step 2

Add 3 Kg of pond soil + 1.5 gm of Ammonium sulphate /Urea + 30 gm of carbon source (Jagerry /Wheat flour /Tapioca flour)

Step 3

Mix it well with water in tub and provide adequate aeration

Step 4

The inoculum will be ready after 24-48 hrs and it can be transferred to main tank 5

- Daily addition of carbon source is required for the development of floc. For every 1 kg of feed given (with 25 % of crude protein), 600 gm of carbon source is to be added to the system to maintain C: N of 10:1.
- Once the floc volume reaches 15-20ml further addition of carbon source is not required

Conclusion

Bio-floc technology doubles the farmer's income with efficient use of available resources. In this system adding supplementary feed is reduced to half as the culture species mostly feed upon the floc biomass in water thus the input feed cost is minimized. Unlike the conventional fish farming, frequent exchange of water is minimum or zero in this system; this reduces the labour cost, saves time, prevents the entry of pathogens and also environmental degradation caused due to aquaculture effluents can be controlled by using the bio-floc culture system

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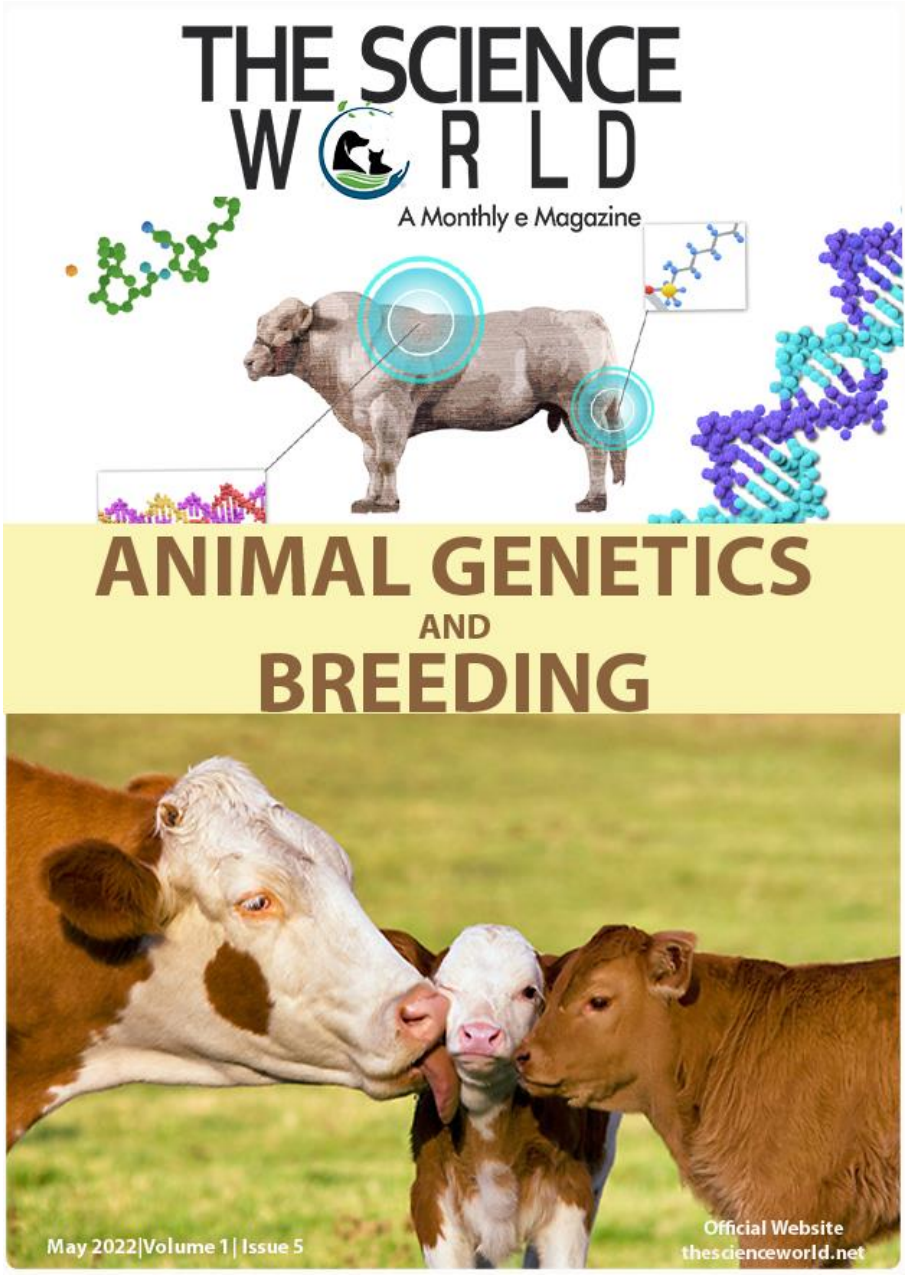
R. Mahesh Kumar1, A. Chandrasekhara Rao, P. Anana Prasad, Ravi Gugulothu, & Lakoju Nischal. (2022). Bio floc Fish Culture. The Science World a Monthly E Magazine, 2(5), 526–529. https://doi.org/10.5281/zenodo.6570079



THE SCIENCE WORLD
A Monthly e Magazine

ISSN: 2583-2212

May 2022; 2(5), 530-538

Popular Article

Management practices for production of qualitative food animal including poultry in Covid 19 Pandemic situation

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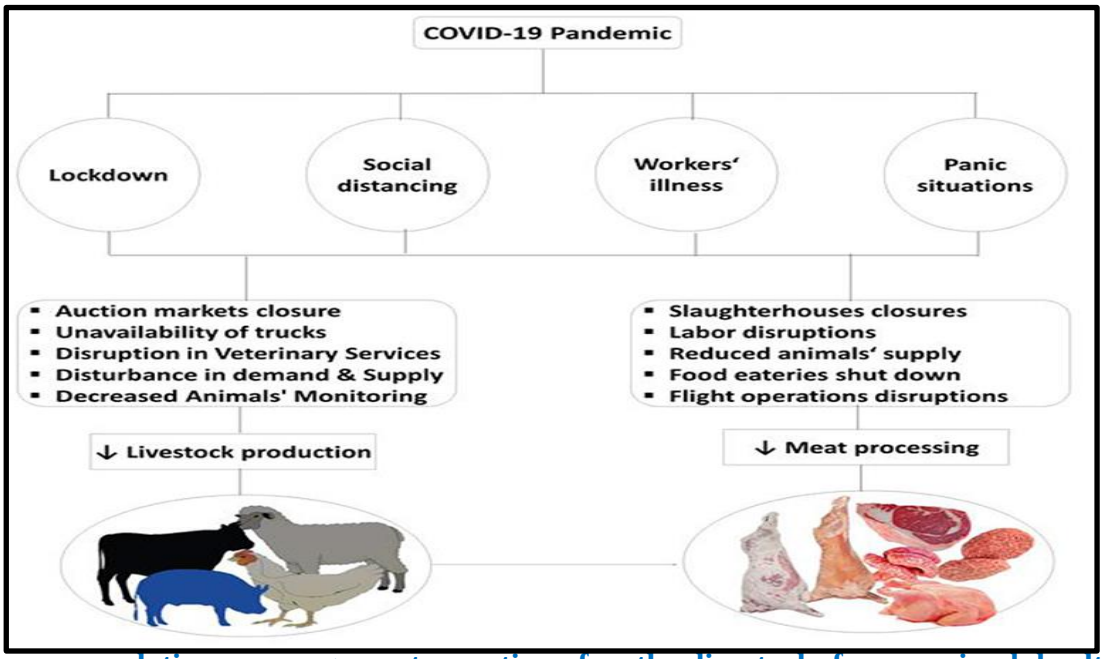
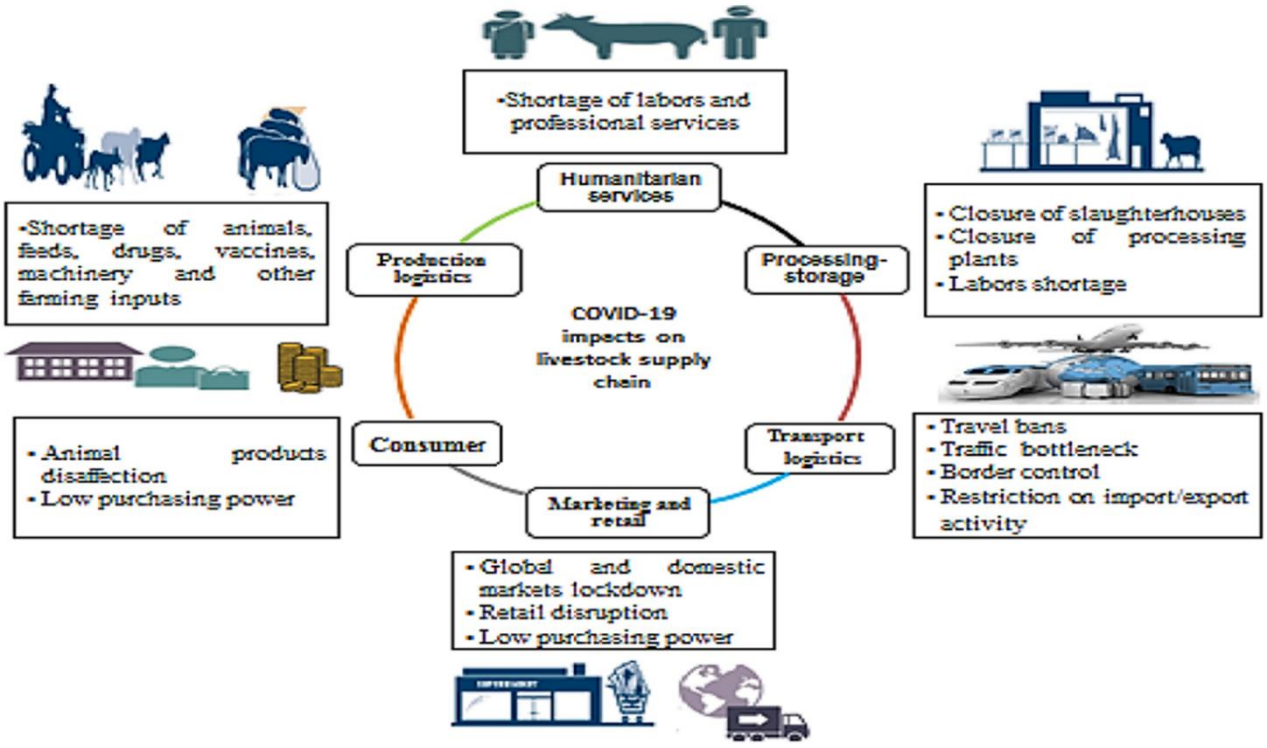
Introduction

Food Animal: Food animal means any mammalian, poultry, fowl, fish, or other animal that is raised primarily for human food consumption



Recommendations management practices for the livestock farm, animal health to produce qualitative food animals under covid -19 situation:

To reduce the impact of COVID-19 and ensure continuity of the livestock supply chain and animal health activities, practical recommendations and precautionary measures are given below. These are for livestock farmers, actors along value chains, animal health professionals and policy makers – aiming to protect people and animals, and to minimize the disruption of services.



Recommendations for livestock farmers:

1) Communicate with suppliers (e.g., feed, consumables) and professional service providers (e.g. veterinarians, mechanics, milk collectors) to find solutions to secure supplies, inputs and services.

2) Communicate through producer cooperatives or farmers associations – to reach out to decision makers regarding assistance, as well as obtaining necessary exemptions for mobilization of animals, products and personnel.

3) Explore alternative sales channels. These include online sales, e-commerce and direct sales using point-to-point transportation to deliver livestock and their products to buyers instead of via retailers or markets.

4) Obtain the latest information on the evolving COVID-19 situation from trusted sources

e.g., official news releases, radio programmes provided by local governments, field livestock/veterinary officers, livestock market officers, livestock NGOs, veterinary pharmacies and farmers associations.

5) Implement practical biosafety and biosecurity measures to prevent human contamination with COVID-19 on the farm:

a. Install footbaths in between different areas if possible, and change the disinfectant frequently.

b. Maintain a designated area for all external visitors and restrict visitor interactions with farm

workers and operations to essential activities only.

c. Limit visitors to minimum essential (e.g., animal health workers, feed truck drivers, milk collectors) and keep records. Ensure that visitors follow physical distancing and other hygiene recommendations.

d. Anyone (including farmers and farm workers) with fever and other symptoms of COVID-19 (whether confirmed or suspected), people who have tested positive for SARS-CoV-2 (including asymptomatic or recovering persons), and people in an isolation period due to close contact history with COVID-19 patients, should avoid or minimize close contact/work with animals, until recovered and cleared by medical providers.

e. Routinely clean and disinfect common areas e.g., resting areas, kitchens, changing rooms, bathrooms, sleeping quarters.

f. Control interactions/socialization of people inside the farm, e.g., around the TV or resting areas, to ensure physical distancing and other recommendations are followed.

g. Disinfect equipment and other materials as they come onto the farm and at periodic intervals. Limit the introduction of personal items to the farm.

h. Change clothes and footwear between livestock areas and living areas, or at least put on work wear (e.g., coveralls) and change footwear to reduce cross contamination.

i. Maintain general hygiene of the premises where the animals are kept (e.g., prevent rodents and vermin) to avoid contamination.

j. Consult with animal health professionals to improve biosecurity and biosafety on the farm.

6) Adjust management measures on the farm:

a. Raise awareness among farm workers about how COVID-19 spreads and how to prevent getting infected, and routinely remind them about biosafety and biosecurity measures against COVID-19 on the farm.

7)Maintain animal disease prevention at farm level:

a. Maintain good animal husbandry and production practices as much as possible (e.g. milking hygiene).

b. Make best efforts to ensure continuation of sanitary programmes for the farm animals as planned, including vaccination, vector control and deworming.

c. Implement good biosecurity practices, including routinely cleaning and disinfecting barns, pens, rooms, and other facilities to reduce the pathogen loads.

d. Seek advice from veterinarians and livestock husbandry specialists when needed.

Recommendations for animal health professionals (veterinarians, veterinary

technicians and veterinary paraprofessionals)

1) Secure supplies, inputs and services:

a. Contact suppliers (of veterinary drugs and consumables) and professional services (diagnostic laboratories) regarding availability and possible delay in delivery.

b. Where lockdown or curfew is in place, apply for the exemption for essential businesses (many countries include animal health activities in the essential business category).

c. Manage the essential consumables you have in stock, including syringes, tubes, disinfectants and PPE. Be familiar with the correct disinfection procedure of reusable veterinary equipment such as needles, syringes and surgical instruments to help with limited supply.

d. Consider reviewing and refreshing existing management, preventive and diagnostic techniques, in order to substitute current practices that cannot be maintained due to the lack of supplies and/or reagents (Centers for Disease Control and Prevention. 2020; OIE, 2020).

2) Keep up to date with reliable information and sensitize farmers on required behavior changes.

a. Help farmers to review and adjust production management with the supplies, equipment and personnel available to them.

b. Help farmers to review and adjust biosecurity practices, such as cleaning and disinfection, based on the need and the availability of resources.

c. Help farmers to identify the most relevant priorities and functions regarding prevention of diseases, that can be performed with minimum personnel.

3) Implement personal biosafety and biosecurity measures (along with general hygiene practices for COVID-19 recommended by WHO):

a. Do not visit farms, herds, markets or animal product processing facilities if you have any symptoms of COVID-19, or if you are confirmed positive and have not yet recovered/been cleared by medical providers following the isolation period.

b. Carry soap, alcohol-based hand sanitizer, disinfectant and PPE when visiting farms and other livestock related facilities without relying on availability at the farm.

c. Make sure you and the farms are using disinfectants that are known to be effective against SARS-CoV-2.

d. Maintain physical distancing with farmers and workers when you interact with them and follow other hygiene recommendations.

4) Assist animal disease prevention and control at field level:

a. Maintain open communication with livestock farmers and live animal markets (if the markets are

open).

b. Request farmers and markets to continue reporting disease outbreaks and animal deaths of unknown reason to veterinary offices even when lockdown or curfew is in place.

c. Advise farmers on good livestock husbandry practices to mitigate the risk of disease outbreaks on farms.

d. Assist in contingency planning for livestock production, livestock markets and processing facilities.

5) Have a contingency plan:

a. Maintain an inventory of medicines, drugs, disinfectants, PPE, diagnostic tests, supplies and equipment.

b. Ensure information and communication technology (ICT) is in place for giving animal health advice: e.g., telephone and messaging services.

c. Familiarise yourself with the latest laws and regulations regarding online veterinary consultation or telemedicine during the COVID-19 pandemic.

Recommendations for animal product processing plants, live animal markets and related supply chains

1)Secure supplies, inputs and services

2)Keep updated with reliable information.

3)Implement biosafety and biosecurity measures against COVID-19 to protect people working at the facility, including increasing air ventilation.

4)Following the measures for food processing facility workers, food delivery and transport, and food retail premises as detailed in the FAO and WHO Interim Guidance, COVID-19 and food safety: guidance for food businesses (FAO/WHO, 7 April 2020).

5)Follow biosafety and biosecurity measures to prevent contamination of the environment by COVID-19:

a. Disinfect reusable PPE items after every use using appropriate disinfectant

b. Maintain general cleanliness of the premises and periodically disinfect the facilities.

c. Limit visitors to the processing environment.

D. Keep records of movement of people including workers, visitors and suppliers.

6)Adjust management measures to decrease the risk of introduction and spread of COVID-19 in the facilities:

a. Stagger workers entering or leaving the premises.

b. Stagger mealtimes and break times to avoid large gatherings in break rooms and dining rooms.

c. Consider screening individual temperatures and typical COVID-19 symptoms before entering the facilities. When possible, provide access to medical personnel (e.g. nurse) for the workers.

d. Provide guidance to clean and disinfect the work environment before and after shifts, including shared spaces, employee break rooms, dining rooms, sleeping quarters, bathrooms and company transportation services.

e. Prepare for shortages in the workforce. Develop an alternative plan to manage the facility with fewer workers – adjusting work arrangements in case some of the workers become infected or are isolating due to COVID-19. Implement cross-training as much as possible.

f., if possible, review and adjust the sick leave policy of employees and encourage self-reporting of illness.

7) Recommended actions for animal disease prevention at live animal markets and by traders:

a. Keep market area clean and regularly disinfected

b. Try not to let animals stay overnight in live markets in the case that lockdown or curfew is imposed.

8)Have a contingency plan:

a. Identify alternative suppliers or inputs in case the main supply-chain is disrupted.

b. If possible, seek exemption of movement restrictions to contribute to ensuring stable basic food supply for national food security and nutrition.

c. Review and adjust waste and litter management plans.

d. Strengthen control of movement of people including workers, visitors and suppliers.

Recommendations for policy makers at national level

1) Develop, endorse and implement policies to mitigate impact of COVID-19 on livestock production and value chains:

a. Ensure availability and flow of the normal inputs and outputs for livestock production, for example by releasing a list of exemptions to movement restrictions.

b., if possible, review and adapt existing biosafety and biosecurity measures to the COVID-19 situation and provide these as a checklist for farms, livestock product processing facilities, live animal markets, slaughterhouses and related value chains.

c. Include veterinary services as essential businesses.

d. Ensure a functioning supply chain of livestock and animal products:

•Governments may release and broadly publicize a list of exemptions to movement restrictions to ensure the flow of food materials and production related services.

2) Review, revise, endorse, and implement policies on animal disease prevention and control.

3) Develop and disseminate information materials and collaborate with partners to organize outreach activities, in order to sensitize livestock production and animal health stakeholders, including relevant recommendations in this document.

Food Safety

Food safety means assurance that food will not cause any harm to the consumers. An understanding of food safety is improved by defining two other concepts - toxicity and hazard.

Toxicity is the capacity of a substance to produce harm or injury of any kind under any conditions.

Hazard is the relative probability that harm or injury will result when substance is not used in a prescribed manner and quantity.

Hazards can be physical, chemical and biological causing harmful / adverse effects on the health of consumers.

- Food safety is used as a scientific discipline describing handling ,preparation, and storage of food in ways that prevent food-borne illness.

Five Keys to Safe Food are:

(1) keep clean;

(2) separate raw and cooked;

(3) cook thoroughly;

(4) keep food at safe temperatures;

and (5) use safe water and raw materials.

Quality evaluation of meat and meat products based on:

- Physical tests
- Chemical…protein, fat, carbohydrate and interaction products
- Microbiological… organisms and toxins
- Sensory
- Authenticity
- Contaminants …. antibiotic, pesticides, heavy metals
- Traceability
- Label declarations

Food Standards

Effective food standards and control systems are required to integrate quality into every aspect of food production and service, to ensure the supply of hygienic, wholesome food as well as to facilitate trade within and between nations. There are four levels of standards which are well

coordinated.

- Company Standards: These are prepared by a Company for its own use. Normally, they are copies of National Standards.

- National Standards: These are issued by the national standards body.
- Regional Standards: Regional groups with similar geographical, climate, etc. have legislation standardization bodies.
- International Standards: The International Organization for Standardization (ISO) and Codex Alimentarius Commission (CAC) publish international standards.

➢ Food Safety and Standards Act (FSSA), 2006

➢ Food Safety Management System (FSMS): ISO 22000, also known as food safety Management system and is an international auditable standard.

The food consumption pattern in India is gradually getting diversified to high value commodities. The livestock products, especially meat and meat products are of paramount importance in this diversified menu. Meat is the most valuable livestock product which requires proper attention right from animal slaughtering to its human consumption. Meat is a highly demanded food item due to presence of plentiful proteins, minerals and all the B complex vitamins with excellent digestibility and well-balanced composition of essential amino acids. Because of being nutritionally rich and highly perishable in nature, meat and poultry products are at high risk of contamination and spoilage. The unorganized meat sector functioning under minimal facilities is usually more prone to safety and hygiene concerns which may include the following:

- Microbiological contamination
- Chemical contamination
- Physical contamination
- Cross contamination
- Adulteration/substitution of meat for financial gains
- Unauthorized practices for fetching better prices for meat

Tips for consumers:

Consumers as smart buyers should keep in mind following basic points while purchasing meat and meat products:

- Freshness of meat, visual appearance (color, texture, fat content) and odor;

- When purchasing meat and poultry, it's important to use your senses of touch, smell and sight.
- Always make sure the meat is firm to the touch, have no discolorations, stickiness/sliminess and off-odors;
- Also keep in mind the hygienic condition of the meat outlet and personal hygiene of the retailer;
- Buy meat from licensed/registered shops that have refrigerators;
- Never buy the meat that is wrapped in newspaper or any ordinary paper;
- Look out for very dark bits on the edges of the meat which indicate poor storage and refrigeration.
- Colored plastic bags should be avoided for carrying meat.
- If carrying meat in such plastic bags always make sure that there should be no visible colour migration.
- For packaged meat or poultry products, always closely examine the labeling with respect to its ingredients, use by date or expiry date whichever has been mentioned;
- Check that packaging doesn't have any tears, holes or excessive amounts of liquid.
- Never choose meat or poultry in packaging that is torn or leaking.

Reference:

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Cite as

Jessy Bagh. (2022). Management practices for production of qualitative food animal including poultry in Covid 19 Pandemic situation. The Science World a Monthly E Magazine, 2(5), 530–538. https://doi.org/10.5281/zenodo.6572897

THE SCIENCE WORLD
A Monthly e Magazine
ISSN: 2583-2212

May 2022; 2(5), 539-542

Popular Article

Care And Management of Puppies

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DOI: https://doi.org/10.5281/zenodo.6587629

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Abstract

The aim of the manuscript is to give vision and guidance to the pet parents and breeder regarding the neonatal care, foods and feeding pattern, skin and coat management, bathing pattern, oral hygiene, deworming and vaccination schedule. Do and don't during care and management of neonates.

Introduction

Puppies are young ones of the dogs, they born as eyes closed, less hair and tiny in size. The birth weight of the puppies varies from 60 to 760 grams (Amélie et. al. 2020). The neonatal mortality is major concern in canine breeding. Neonatal mortality in first two months of age is around 15% to the litter size. So, care and management play important role in canine breeding and economic impact to the dog breeders. With this background the manuscript describes the care and management of puppies.

Neonatal care

The pups are born with water bag and soiled, the water bag can be cut and pups are removed, cleaned with dry clean cloth and check for vital parameters including respiration, heart rate, respond to external stimuli and producing sounds. If not, should be done to secure the life of the young ones. Holding upside down to remove the mucus/fluid present in the nasal and oral cavity with gentle tapping of the both side of the thorax and blow the air through the nostrils and mouth. Umbilical cord should be tied leaving 1-2 inches away from the body using a cotton thread; the remaining part should be cut and removed. The umbilical cord should be touched with tincture iodine to prevent sepsis. Most of the times, the mother, herself will cut and remove the water bag and save the pup from aspiration. Allow the pups to the mother for licking will create a bond which helps for milk synthesis in the mother and then pups are allowed to suckle the colostrum. Colostrum feeding plays an important role in the young ones this will give passive immunity to the pups which prevent from different diseases.

Two parameters play vital role in the neonatal life. The body and environmental temperature play a vital role for the survivability of the pups. During cooler climate and night, the pups should be kept under the heat or light source to give sufficient warmth to young ones. This will prevent from subnormal temperature and early neonatal mortality. The energy to the young ones by feeding the dams milk at different interval of sufficient quantity. If the dam is unable give milk or decline synthesis of milk may lead to starvation in the young ones. The pups may allow to suckle milk from some other dam which is recently whelped or artificial milk powder are available, which can be reconstituted with warm clean water and given to pups at different interval to avoid energy depletion and starvation. Pups should be kept in the basket or box to avoid stamping by the dam. The pups with lower birth weight should be given additional care in feeding and caring.

Deworming pattern

At 14 days, or less the young start opening the eyes, at this age the pups and dam should be dewormed with suitable dewormer. The pups should be dewormed once in 15 days for next 3 months and once in a month for next 6 months and every 3 months for till one year of age. The dewormer should be in suspension form for easy administration and later it can be converted into tablet form once it reaches body weight 10 kilograms and above. This will prevent the worm burden and also improve the growth rate and immunity in pups.

Feeding pattern

At this stage, the pups may be started with cow milk or some commercial foods similar to milk powder or small grains, which can be soaked with warm water or milk and give it as semisolid food at different intervals. The pups should be feed at least 7 to 10 times per day of smaller quantities and once during the night. Over feeding may lead to indigestion or acidity or vomiting and diarrhea in young ones. Using commercial foods for feeding, the different quantity for different breeds/ body weight at different age group is given in the pack which can be divided into 7 to 10 parts and fed to the pups. At two months of age the pups can be started with solid commercial or homemade food as per owners wish. If the dogs are kept in commercial food, it’s a balanced food with protein, fat, carbohydrate, fiber, vitamins and minerals. The pups maintained in home food should be made into balanced one as per requirements of the pups, vitamins and minerals should be supplemented separately to support the bone growth and skin & coat. Lack in nutrients may lead to susceptible to poor immunity, bone deformities (rickets), dry & scaly coat.

General care & management

The pups should be kept in hard or rough floor to avoid slipping or deviation of the legs and joints. At regular interval the pups should be wiped with towel soaked in warm water, will prevent the disturbance from flies and ants. Readily available wipes for cleaning the young ones which are pH balanced and sterile. The stools and urine should be regularly cleaned to avoid soiling and contamination. The pups are provided with mats or paper to train for toilet. Whenever the young ones are expressing for urge, they should be put on the mat to pass the urine. This repeated activity may lead to train the pups to pass the urine on the mat. Slowly remove the mat from inside home to outside; pups also will follow to pass the bowel on outside the home. The pups should be taken for toilet, immediately after sleep and feeding. The nail in the pups will be very sharp and hurts the pet parents. To blend the sharpness of the nails it may rasped with nail clipper or allow the pups in the rough floor for playing will blend the nails. Avoid clipping the nails at young age may lead to severe bleeding.

Skin and Coat management

Pups have baby hair pattern during birth and a month so which is puffy and thin in nature, later the baby hair coat will be replace with adult hair coat. Changing coat/molding is common in dogs, the coat will change/ replaced twice a year. Generalized hair coat change is normal physiology but patchy hair loss, severe scratching, wound and redness of skin should be considered as serious issues. During summer the coat shade will lighter to reflect the heat and during the winter the shade will be darker to prevent the heat dissipation. The dogs are lack of sweat glands in the skin, they expel the heat by panting. The normal pH of the dog skin 7-7.4 whereas human skin pH is 5-5.5, so don't use human soap or shampoo for bathing the animals. The bathing should be done, on day time with luke warm water with mild puppy shampoo. The pups should be soak with warm water, the shampoo should be mixed with little amount of water, make lather and apply all over body, massage well and then wash with water than pad dry with clean towel. The dogs should be bath once in a week or two weeks once to prevent drying of the skin or complete removal of the sebum or oil secreted by the glands in the skin. Sebum will nourish, protect and gives immunity to skin. The pups should be comb twice daily when they took for walking or jacking or playing, this prevents shedding inside the home. The combing should be done in opposite direction will remove the dead hair from the coat, and gentle combing at same hair flow direction will give massage to the skin, increase blood circulation to the skin and result in decline shedding.

Oral care

Teething is a month process, they start erupt at age of 2 weeks to 8 months are called as milk teeth are white in colour, small size and sharp in nature. These teeth will be replaced with permanent teeth, so the biting nature and damaging the objects are very common. The rasp the teeth of the pups should be done by fed with chew sticks. Tooth falling, gum bleeding and regrowth of teeth are common finding occur during the early stage of pups. By the month of 7-8 months the pups should have all permanent teeth of total 42 teeth. Brushing the teeth should be started within a month.

Vaccination schedule

The pups should be vaccinated with core and noncore vaccines. If the dam is not vaccinated or orphan pups or insufficient colostrum feeding, the young ones should be vaccinated at early as 20 to 30 days against Canine Parvo and Canine Distemper vaccine. The ideal age for first dose of multiantigen vaccine (core vaccine) is at 45 days and two boosters should be given at 21 days interval. Antirabies vaccine (corevaccine) should be given at the age of 90 days and single booster may be given after 21 days. For both multiantigen vaccine and ARV should be repeated after a year for every year to save from the deadly diseases. The multiantigen vaccine contains Distemper, Hepatitis, Parvo, Parainflunza and Letospirosis. The noncore vaccine includes Corona vaccine and Kennel Cough vaccine, will be given at 2 months of age (Horzinek et.al. 2016). The vaccine card should be maintained for further reference.

Conclusion

Neonates are highly susceptible for hypothermia and depletion of energy. The young ones should be regularly dewormed, vaccinate to improve the growth rate and prevent from deadly diseases. Oral hygiene, skin and coat management and feeding pattern play vital role in the appearance of the pups.

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Cite as

N. Devadevi, K. Rajkumar, A. Abiramy Prabavathy, P.Vijayalakshmi and P. Sree Krishna Sai. (2022). Care And Management of Puppies. The Science World a Monthly E Magazine, 2(5), 539–542. https://doi.org/10.5281/zenodo.6587629

THE SCIENCE WORLD
A Monthly e Magazine
ISSN: 2583-2212

May 2022; 2(5), 543-546

Popular Article

Star War of Blood in Covid-19

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DOI: https://doi.org/10.5281/zenodo.6587583

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Introduction

The marvelous ocean plays a massive part in the medicinal field every day. Now a days Horseshoe crabs play an essential role in saving millions of people's life with the help of blood. It is one of the living fossils with more miracle creations in the world because it plays a significant part in the result of Covid-19 injections. Horseshoe crab blood is a bright color blue shade with remarkable antibacterial properties. The critical ingredient of the pharmaceutical industry is millions of "HORSESHOE CRAB BLOOD". Crab blood contains LIMULUS AMEBOCYTE LYSATE (LAL), which is used to test vaccines, drugs and medical devices to confirm whether they are contaminated with dangerous bacterial toxins ENDOTOXINS. Millions of horseshoe crabs are captured and extracting milky blue blood every year. But now, the conservation organizations are taking steps and efforts to save the crabs. In the 1990s, the University of Singapore prepared a synthetic version of LAL called Recombinant Factor (RFC). More than 55 countries have approved RFC for commercial use also. Nowadays, most people say that "Synthetic are effective compared to LAL". In upcoming days, we have to live with more and more pathogens, so we should take lethal toxin tests due to endotoxin contamination. The level of contamination is based on the presence of LAL blood clots in the surrounding area of Endotoxins. Under Atlantic State Marine Fisheries Commission, the biomedical industry takes 500000 horseshoe crabs per year. According to the Mid Atlantic Sea,30% of crabs are exploited in the ocean due to blood extraction. In 2002, 334000 population of crabs and in 2019, approximately 725000 nos. In the present context, Asian Horseshoe crabs Tachpleustridentatus are disappearing, so that's why it is under IUCN RED LIST. The crab, as mentioned earlier, demand is so high because it contains a strain with more antimicrobial properties, which is an FDA approved strain.

An Element of Divine Blood That Functions with In Blessed Human Body……

During the Covid-19 period, scarcity of medical products at that time pharmaceutical companies shifted to the rFC strain of horseshoe crab for vaccines. So that crab related creatures are in the worst condition due to less diversity of crabs. Crab blood is used to find infections like Gram-negative bacteria that are E.coli, and LAL is the only substance to detect gram-negative bacteria in the medical field.

The Bleeding of Crabs Leads to Endangered Species

Medical Testing Laboratories are not saying, "How many crabs are used to sample their blood through bleeding?" Mostly one third of the blood is drained from the crabs and again leave it in the Ocean water to alive.

Alive Condition Crabs Suffer More Than in Dead Condition

We have been exploiting more horseshoe crabs for decades by doing our experiments, but it has a high-value part in the biotech economy. They are only extracting the blood using that crab, but it has no economic value. According to the National Oceanic and Atmospheric Administration, horseshoe crab blood price is almost 15000 dollars per quart.

Don't Empty Horseshoe Crabs for The Treasure of Marvel Blood

The half-Billion-year-old creature makes a central turning point, especially regarding the covid-19 vaccine. When we are getting a new vaccine from the crab blood, their life spans depend on our beneficial needs for Medical testing because the Potential crab contains antibacterial,anti-viral, and anti-cancer agents. LAL reagent is produced from white blood cells of Atlantic horseshoe crab (*Limulus polyphemus)*, necessary approval by the Food and Drug Association. In India, it is distributed on the North East Coast of India like Sunderbans (estuarine mangroves of Ganges), north of West Bengal (WB) coast, coasts of Orissa and northern Andhra Pradesh (AP) in the south of the Bay of Bengal.

How Is the Milky Blue Blood Coming?

Copper is the primary pigment in crabs' blood because it has powerful Antioxidant traits for safeguarding cells from oxidative damage by toxins and harmful free radicals. Mostly the iron-based oxygen-carrying hemoglobin molecules in our blood give red color. But copper-based Hemocyanin molecules give MILKY BLUE COLOUR in horseshoe crabs.

Spawning Of Horseshoe Crab on Multi-Million Biomedical Business

Natural Adaptability

Nowadays, everyone thinks about modern medicine means the highlighted point is chemicals are synthesized and given as drugs and tablets. But most very rarely, they will use natural sources as medicine, which is easily adapted to everyone, especially horseshoe crabs. It is highly used in modern medicine because of its more bacterial and viral properties in blood.

How It Is Used Against Infections

Crabs are not easily harvested. But for the Endotoxin test, the crab blood is taken because it contains more antibodies to fight against the pathogens. It is mainly used in testing new modern medicines, vaccines, and drugs. Every year Atlantic horseshoe crab (Limulus polyphemus) comes for spawning and is utilized in industrial endotoxin. Some behavioral changes are too risky for crabs after bleeding blood from crabs and returning to the ocean water.

How to Reduce the Need for Wild Crabs?

In the new endotoxin test, we can use a supplement of LAL strain. For example, In the Recombinant factor test.

The cloned rfc reagent extracted from the DNA of Singapore horseshoe crab reduces the need for repeated bleeding. (Ding et al.,1995). In the LAL test, rfc test triggers a pathway to coagulation when endotoxins come into contact with factor C. The rfc molecule has multiple potential endotoxin binding sites, and the rfc assay has more sensitive and specific than the LAL test (Thorne et al.,2010).rfc test is called an Alternative Assay test.

Menace Of Crab Lifetime

- **Humans catch on spawning ground grounding after spawning**
- **Loss of environment due to erosion**

A Venturous Journey: -

I. Using a Trawl net or hand harvest Fisherman collects the crab from water resources and puts them into the fish hold chamber in the boat.
II. After reaching near shore, the crab catch should be placed into the container truck, and it is transported to the bleeding facility or into the Diagnostic Lab.
III. Over some time, the crab container should be kept aside almost a night before they are bled.
IV. The crabs are placed in a rack in an upside-down position and injected with a 14-gauge needle, and approximately 30% of blood is extracted.
V. After blood extraction, the crabs are transferred into the same container almost overnight before returning to the water.
VI. After collecting the blood, it should be stored in a storage bottle under suitable conditions.

VII. Crabs stay out of the water for about 24-72 hours during the bleeding process. at that time, crabs are get easily dehydrated and prone to death. to maintain in alive conditions, we should not expose to the heat and atmospheric conditions.

COVID-19 pandemic time, the need for LAL is increased for more endotoxin tests, especially for vaccine production. After Conversion and adapting to rfc , 90% demand is reduced for LAL because due to bleeding of crabs and more mortality happening every year, it is now reduced by 100000 horseshoe crabs annually. They follow the 3R framework (Bolden and smith,2017) derived LAL with Rfc for endotoxin test (**Replacement, Reduction, Refinement)**, leading to the sustainable use of animals for testing.

Conclusion

Well, developed healthy horseshoe crabs play a significant role in restoring and maintaining the environment and ecosystem. For over 40 years, the LAL Industry /Manufacturing Company have been distributed on the East Coast. Still, only the need for reagents is high due to millions of LAL tests producing COVID-19 vaccines per year. It is making a golden sign to save millions and billions of people through the LAL BET supply chain. Based on scientific facts, pros and cons are there about LAL industry, but if they balance both People's life and habitat in optimistic approach. Create a tremendous sustainable aquatic environment without tearing down the precious horseshoe creature. Efforts should be made by creating public awareness, educating fisher folks, providing alternative sites for boat building and repairing, and, if required, enacting laws to protect these precious guests from the brink of extinction from our coast.

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https://doi.org/10.5281/zenodo.6587583

THE SCIENCE WORLD
A Monthly e Magazine
ISSN: 2583-2212

May 2022; 2(5), 547-550

Popular Article

Care and Management of pregnant animals for successful dairy farming

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DOI: https://doi.org/10.5281/zenodo.6587676

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Introduction

Proper care and management of pregnant animal is must for production of viable young ones, adequate growth, good lactation yield and to prevent disease and abortion. Birth weight of the calves always depends on care and management of dam during pregnancy. Efficient raising of parent stock is must for successful dairy farming. This efficient raising involves making their micro environment comfortable by providing proper housing, feeding, watering, hygienic and sanitary conditions.

Housing

Proper housing of advance pregnant animal not only helps in protection from adverse climate, predators, theft etc. but also help in prevention of untoward incidents like fight and abortions etc. Animal shed should be constructed on dry and properly raised ground. Try to avoid water-logging, marshy and heavy rainfall areas as it may help in propagation of disease. The heights of the sheds at eves and center should be 1.5 to 2 meters and 3-4 meters high respectively. Roof should be either asbestos sheet or galvanized iron sheet. The floor should be pucca/ hard, even non-slippery impervious, well sloped (3 cm per meter) and properly drained to remain dry and clean. The floors shall be of moorum, brick on edge or cement paved. Now a day even rubber matted floors have become popular particularly in heavy sized high yielding animals. Maintain sanitary condition around shed using common disinfectants.

Pregnant cows are to be transferred into calving boxes two weeks before the expected date of parturition. Calving box should be constructed very close to attendant house for proper supervision. Here animal always let loose. Most of the time calving takes place either in the early morning or late night, thus presence of attendant mandatory. Do not allow them to mix with other animals that have aborted or that are suffering from or carriers of diseases like brucellosis.

Management practices during summer and winter season

It has been observed that animals eat less during summer to reduce the internal heat production, because of which their milk production goes down in summer. Similarly, heat stress is said to be the main cause of embryonic mortality, abortion and other complications. In order to keep animals comfortable and healthy, intervention needs to be made to reduce the temperature of micro-climate. Besides the provision of cool drinking water, fans and coolers can also be provided to animals. If this is not possible at least green shield by trees and shrubs can be made available around animal shed to reduce the temperature of micro-environment. Provide feed and fodder during the cooler parts of the day and protect pregnant animals from heat and direct solar radiation. Asbestos or galvanized roof can be painted with black inside and white outside to reduce the passage of solar radiation. Sometime, making thin thatch roof over the existing roof will also reduce thermo-conductivity to a great extent. Direct sprinkling water on animals or by sprinkles also helps to improve summer stress. Similarly, during peak winter, animal spend lot of nutrients to maintain the thermoregulation method. It is therefore, covering of window and doors with plastic sheet, provision of proper bedding material like paddy straw, 200-watt bulbs or blowers is very much essential. If pregnant animals are less, one can think of gunny bag jackets also.

Feeding

The feeding of dairy cattle is very important aspect in milk production, as feed costs about 60-70% of total costs of milk production. A pregnant heifer few days prior to calving must be fed liberally (steaming up). For steaming up heifers must be given 1.5 kg concentrate mixture. However, one must carefully watch the animal and increase or decrease the ration depending on whether the animal is becoming lean or fat. Provide adequate and clean water during day and time. A well balance ration is very much required for growth of fetus, for production of colostrum when she calves next and forming sufficient reserves of nutrients in the body of the cow for ensuring the next lactation. From 7 ½ months to 10 months of lactation cow may be fed 1 to 2 kg concentrate feed in addition to their nutrient requirements for the maintenance (1kg) and milk production, to

replenish the condition they lost during early lactation. Just a week or two before calving, one should start feeding the cows with high milk production potential, increasing quantity of concentrate to 'challenge' them to produce at the maximum level. This 'challenge feeding' will condition her digestive system for the increased amount of concentrate of early lactation and provide enough nutrients to initiate lactation on higher plane. There should be practice of feeding mineral mixture one month before the expected date of calving.

Care and management during calving:

Improper care and management during calving may lead to dystocia or retention of placenta. Calving consists of pre-calving, calving and post calving stages. Necessary care should be taken in all the three stages for successful calving.

Care and management before calving:

Minimum dry period of 50-60 days should be provided to all cows to ensure sufficient rest to the udder. Prior to calving (at least 7-10 days before calving) all advanced pregnant cows should be housed in calving pens for better managemental care and to ensure safe calving. The calving pens should be clean, dry, hygienic and spacious for safe and easy calving. The udder and teats of the high yielding cows become large, distended and tense just before calving. In acute conditions it is necessary to milk the udder before calving to provide relief to the cows.

Care and management after calving:

Equal attention after calving is required as it has direct impact on post-partum reproductive performance. Proper care and vigilance are necessary to ensure normal calving. Proper vigilance to common signs of parturition like increase in the size of belly especially on the right flank, stiff udder and teats, red and swollen vulva is important. Normally calving occurs within an hour after appearance of water bag. In case of delay, immediate veterinary assistance should be provided for safe calving. The average time taken for calving process is about 7-8 hours. It is generally observed that placenta is expelled naturally within 10-12 hours of normal calving. If the placenta does not expel within 12-18 hours of calving, external help is generally required for removal of placenta. In case of external manipulation, sufficient antibiotics coverage should be given.

Breeding

In any organized dairy farm efforts will be made to get calf in every 12-13 months. The involution of uterus in normal calvers is generally completed by 30-35 days after calving. So breeding can be resumed by 45 days post-partum in normal calvers to reduce the calving interval. If the cow does not show heat symptoms by 45-60 days after calving, she should be examined by veterinarians for necessary treatments. Careful and systematic heat detection is an important tool for better reproductive management. Fertility rate is maximum during the last eight hours of estrus. To achieve maximum conception rate, A.I. should be done preferably between 8-18 hours of estrus period. Use high quality semen preferably frozen semen of proven sires/bulls This increases conception rate.

Conclusion

Successful dairy unit is characterized by having a calf in every 12-13 months. This depends upon care and management of pregnant animals before, during and after calving. This includes their housing, feeding, hygiene – sanitation and their reduction of stress during winter and summer season. By following these management practices, we ensure good health and welfare of not only dams but also of their calves which is equally important for getting good profits and to get their full production potential.

Cite as

Garima Kansal1*, Hitesh Jangra2. (2022). Care and Management of pregnant animals for successful dairy farming. The Science World a Monthly E Magazine, 2(5), 547–550. https://doi.org/10.5281/zenodo.6587676

THE SCIENCE WORLD
A Monthly e Magazine
ISSN: 2583-2212
May 2022; 2(5), 551-555

Popular Article

Monkeypox: an evolving public health threat

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DOI: https://doi.org/10.5281/zenodo.6589992

Abstract

Human Monkeypox is a rare viral zoonosis endemic to central and western Africa that has recently emerged outside endemic regions. It is a zoonotic Orthopoxvirus with a presentation similar to smallpox. A clear understanding of the virulence and transmissibility of human Monkeypox has been limited by inconsistencies in epidemiological investigations. There are no licensed therapies for human Monkeypox; however, the smallpox vaccine can protect against the disease. Effective prevention relies on limiting the contact with infected patients or animals and limiting the respiratory exposure to infected patients.

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Introduction

Monkeypox is a viral zoonoses having symptoms similar to smallpox although it is clinically less severe. After the eradication of smallpox in 1980, the smallpox vaccination had been ceased which gave birth to the Monkeypox, the most important orthopoxvirus of public health. The disease is characterized by fever, intense headache, myalgia, lymphadenopathy, skin eruptions (within 1-3 days), etc. The virus is named Monkeypox as it was first reported in the monkeys kept for experimental/ laboratory purposes in 1958. The first human case of Monkeypox was recorded in 1970 in the Democratic Republic of Congo during the campaign for the smallpox eradication. It primarily occurs in central and west Africa, in the proximity of the tropical rainforests. Animal hosts include a range of rodents and non-human primates.

Etiology

The etiology of Monkeypox disease is the Monkeypox virus, a double-stranded DNA that belongs to the genus Orthopoxvirus of the Poxviridae family. There are two distinct clades of the virus named the central African (Congo Basin) clade and the West African clade. The central African clade is more severe.

Natural host and reservoir

A number of rodents and non-human primates are found to be the natural host of the virus including squirrels (rope and tree), Gambian pouched rats, dormice, etc. The natural reservoir of the Monkeypox has not yet been identified, though rodents are the most likely.

Epidemiology

The first human case was reported in 1970 in the Democratic Republic of the Congo in a 9-year-old boy in recent smallpox eradicated region. Since then, most cases have been reported from rural, rainforest regions across central and West Africa. Since 1970, human cases of Monkeypox have been reported in 11 African countries. In 2003, the first Monkeypox outbreak outside of Africa was reported in the USA and was linked to infected pet dogs. From 2018- to 2021, the disease had been reported in the travelers from Nigeria to Israel, the U.K., Singapore, and the USA. Monkeypox endemic countries are Benin, Cameroon, the Central African Republic, the Democratic Republic of the Congo, Gabon, Ghana (identified in animals only), Ivory Coast, Liberia, Nigeria, the Republic of the Congo, Sierra Leone, and South Sudan. Recently, since 13 May 2022, cases of Monkeypox have been reported to WHO from 12 Member States that are not endemic to the Monkeypox virus. Epidemiological investigations for these cases are ongoing; however, reported cases thus far have no established travel links to endemic areas.

Transmission

Humans got the infection from host animals via direct contact with the blood, body fluids, and cutaneous or mucosal lesions of the infected animals. Eating inadequately cooked meat and other infected animal products is also a risk factor. Human to human transmission occurs through direct contact with respiratory secretions, skin lesions of the infected person, or recently contaminated objects. The droplet transmission in close contact with the infected persons is also reported. The transmission also occurs via the placenta from mother to fetus (congenital Monkeypox). The sexual transmission route is not established yet.

In Africa, serologic evidence of monkey pox infection has been observed in a wide variety of mammals, including non-human primates, rodents, and squirrels. The role of that or any other

particular species as a reservoir has not been established. The route of transmission from animal to animal may occur through respiratory droplets, inhalation of aerosolized virus or organic matter containing virus particles, skin abrasions, the eye, or through the ingestion of infected animal tissue.

Signs and symptoms

The incubation period of the Monkeypox varies from 5 to 21 days, usually 6 to 13 days. The infection is divided into two periods-

a) **Invasion period**: It usually lasts between 0-5 days and is characterized by fever, intense headache, lymphadenopathy, back pain, myalgia, and intense asthenia. Lymphadenopathy is a distinctive feature of Monkeypox compared to other diseases (Weinstein R. A. *et al*., 2005).

Fig.1: Cervical lymphadenopathy in a human patient with active Monkeypox infection (McCollum A. M. *et al*., 2014).

b) **Skin lesions period**: The skin eruption usually begins within 1-3 days of the appearance of fever. The skin lesions (rash) usually tend to be more concentrated on the face (95% of cases) and extremities (75% of cases) compared to the trunk (Fig.1). However, skin/mucosal lesions were also reported in oral mucous membranes, genitalia, conjunctivae as well as the cornea (Huhn G.D. *et al*., 2005).

c) Usually, the Monkeypox is a self-limiting disease (2-4 weeks). Severe cases occur more commonly among children. The case fatality rate of Monkeypox varies from 0-11% with a higher side among children, but, recently, it has been around 3-6%.

Fig.2: The Monkeypox skin lesions on extremities (WHO).

Diagnosis

The clinical differential diagnosis that must be considered includes other rash illnesses, such as chickenpox, measles, bacterial skin infections, scabies, syphilis, and medication-associated allergies. Lymphadenopathy during the prodromal stage of illness can be a clinical feature to distinguish Monkeypox from chickenpox or smallpox.

The diagnosis has been carried out by skin lesions, and other symptoms followed by confirmation by PCR. Real-time PCR is the preferred laboratory test. The sample of choice includes the roof or fluid from vesicles, pustules, and dry crusts.

Therapeutics

The clinical care has been provided symptomatically such as optimum fluids and food, and antibiotics to combat secondary bacterial infections. An antiviral agent named tecovirimat is also found to be effective but not yet widely available.

Vaccination

The smallpox vaccine was found to be 85% effective in preventing Monkeypox, but at present times, the smallpox vaccine is no longer available to the general public. So, a novel vaccine, *i.e.*, modified attenuated vaccinia virus(Ankara strain) has been approved. It is a two-dose vaccine, but its availability is also limited.

Prevention

- Raising awareness regarding risk factors is the main prevention strategy for the Monkeypox.
- For the prevention of human-to-human transmission, surveillance and rapid identification of new cases are critical.

- Avoid close contact with the infected persons, as it is the most significant risk factor for monkeypox.
- Proper isolation and treatment of the diagnosed human cases.
- For prevention of zoonotic transmission, avoid unprotected contact with wild animals, especially infected ones.
- Avoid the consumption of raw and improperly cooked meat.
- Avoid unprotected contact with the laboratory rodents and non-human primates.

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Cite as

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THE SCIENCE WORLD
A Monthly e Magazine
ISSN: 2583-2212

May 2022; 2(5), 556-559

Popular Article

Coccidiosis In Small Ruminants

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DOI: https://doi.org/10.5281/zenodo.6591124

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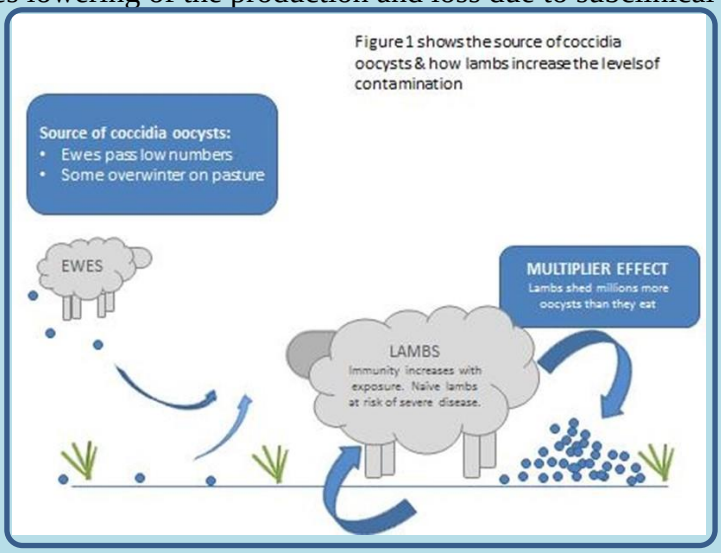
Introduction

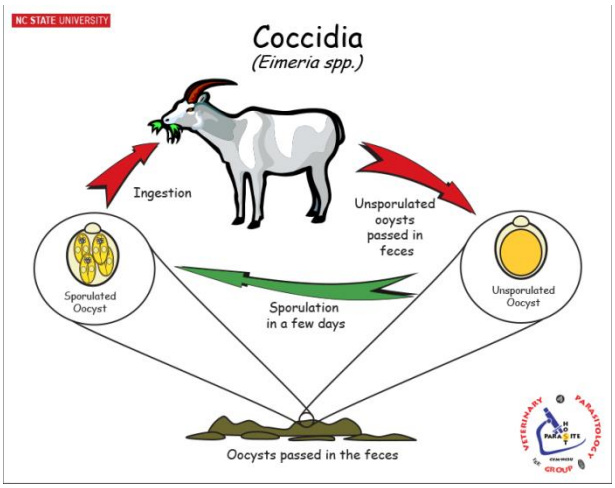
Coccidiosis is a common protozoan parasitic disease causing severe economic loss to the livestock sector. It is caused by a coccidian parasite of the genus *Eimeria.* There are several species of Eimeria found to affect sheep and goat, among them *E.ovinodalis* and *E.ahsata* are highly pathogenic in sheep whereas *E.arlongi*, *E.christenseni* and *E.ninakohlykimove* are found to be more pathogenic in goat. Most of the species of Eimeria are reported to be host specific with no cross infection between sheep and goat (Engidow *et al*.,2015). It is considered as an intracellular parasite with more affinity towards epithelial cells of the intestine. During their lifecycle they undergo a series of asexual reproductive stages followed by sexual stage resulting in oocyst formation. The infected animal passed out oocyst and result in contamination of feed, water and soil. The patent period for coccidiosis is 3 to 10 days but it depends on the host species, species, infective dose of the oocyst, condition and age of the host and other factors. Coccidiosis is an economically important because it causes lowering of the production and loss due to subclinical diseases.



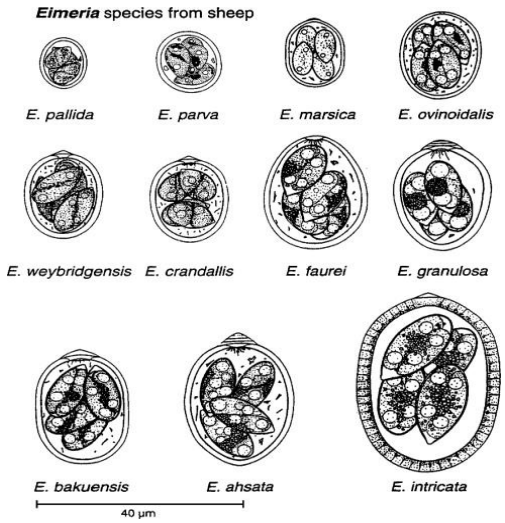
(Source: https://www.nadis.org.uk/disease-a-z/sheep)

Lifecycle

The lifecycle of coccidia consist of two phases: exogenous phase and endogenous phase. The un-sporulated oocyst passed out through the faeces undergo sporulation in the environment. Endogenous phase starts with the ingestion of the sporulated oocyst which will then undergoes excystation in the intestine and form sporozoites. Sporozoites enter in to the intestinal epithelial cells where they form trophozoites and then to schizonts. The schizonts consist of many merozoites which will enter in to the neighboring epithelial cells and produce secondary schizonts. These schizonts produce second generation merozoites. These merozoites penetrate the large intestinal epithelial cells and form micro and macrogamonts which initiate the sexual development. Fusion of micro and macrogamete result in zygote formation and it forms a wall around that and leads to oocyst formation. Oocyst will be released in the lumen and passed out through the faeces (Lefevre, 2010).



(Adopted from North Carolina State University, Veterinary Parasitology)



(Courtesy: Small Ruminant Research Journal, https://doi.org/10.1016/j.smallrumres.2011.10.022)

Clinical signs

The infected animals exhibit signs like fever, depression, loss of appetite, yellow to dark watery diarrhea sometimes with clumps of mucus, progressive dehydration and emaciation and anemia.

Hematological studies reported reduction in RBC count and Hemoglobin count as well as increase in leukocyte count. Reduction in glucose and alkaline phosphatase level observed in biochemical studies (Singh *et al*.,2016).

Gross and histopathology of coccidiosis in small ruminants

The lesions were predominantly noticed in jejunum and ileum and sometimes in caecum also**.** Macroscopically, there will be white to yellow colored raised pinpoint to larger nodular lesions may be evident in the mucosal layer. Other than that, there will be oedema, and congestion of serosa and mucosa (Sathish *et al*.,2015). In advanced cases the entire affected mucosa might be thickened due to mucosal hypertrophy and adenomatous like changes, cerebriform or gyrate pattern of projections and depressions could be evident in the serosal surface of the intestine (Khodakaram Tafti *et al*.,2008).

In Histopathology, the affected villi and crypts could be distended with developing stages of *Eimeria* and due to inflammatory reaction. The various developmental stages of Eimeria like micro and macrogametocytes, young and first generation schizonts with stage of blastophore formation, early stage of compartmentalization, advanced stage of compartmentalization, early and mature second generation with merozoites and immature oocyst can be observed in the affected portions. The large schizonts with numerous merozoites arranged in whorl pattern can also be seen (Khodakaram Tafti *et al*.,2008; Sathish et al.,2015). Local hypertrophy, hyperplasia of the villi, villous blunting, inflammatory cell infiltration in the lamina propria also reported (Sayin *et al*.,1980).

Sever non hemorrhagic typhlocolitis is a characteristic lesion in *E. ninakohlykimove* with a mortality rate of 30% in kids (Koudela and Bakowa,1998).

Treatment

Supportive care should be given to animals in acute cases. Broad spectrum antibiotics are advised to prevent secondary bacterial septicemia. Drugs commonly used for the treatment include sulfonamide, nitrofurans and quinolones (Engidow *et al*., 2015).

Diarrhoea and staining with fresh blood is highly suggestive of coccidiosis (Source: https://www.nadis.org.uk/disease-a-z/sheep)

Control measures

Good management techniques should be followed to prevent outbreaks of coccidiosis and minimize the effects of sub-clinical coccidiosis. Management should be aimed at reducing the fecal-to-oral transmission of the pathogen. Good sanitation and hygiene are essential. Maternity areas should be kept clean and dry. Lambing and kidding jugs

should be cleaned between litters. Pens should not be overcrowded. They should be kept dry and well-bedded. No feed should be fed on the ground or the floor of a pen. Feeders should be elevated or located on the outside of the pen. Water receptacles should be kept clean and free from fecal matter. Control measures include avoid overcrowding, provide clean bedding materials, ensure proper colostrum intake.

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Cite as

M.Thangapandiyan, P. Krishnaveni and T.Rama. (2022). Coccidiosis In Small Ruminants. The Science World a Monthly E Magazine, 2(5), 556–559. https://doi.org/10.5281/zenodo.6591124

THE SCIENCE WORLD
A Monthly e Magazine
ISSN: 2583-2212

May 2022; 2(5), 560-565

Popular Article

Clinical Nutrition and Therapeutics Diet in Animals

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Abstract

The science of animal nutrition gets increasingly involved with questions on how to supply nutrients that guarantee adequate physiological development, good health and reproduction. Clinical Nutrition provides clinically relevant nutritional advice for optimum health and welfare of farm animals without compromising the production output. Environmental (climate, microbes, fauna, parasites, toxicants, electric current, and threat of injury) stimulus that initiates an adaptive change or stress response in the animal alters its normal physiological metabolism and hence the system is in need of therapeutic support, viz. therapeutic treatment and supportive diets. The therapeutic diets is an adjunct to balanced diets for supporting optimum production as well as for enhancing immunity and minimizing deterioration in health and production of animals during illness caused by inflammatory etiologies.

Introduction

Veterinary clinical nutrition" is recognized as one of the advancing new fields of application in 'animal nutrition' research that addresses the intrinsic issues of optimal health, production and welfare of livestock and pet animals.

Clinical nutrition aims to understand and puts in practice the current knowledge of nutritional principles to the promotion of health of livestock through prevention of diet related diseases for the benefit of healthy and unhealthy alike. It can be defined as dietary management of clinically ill animals that is aimed at correction of nutritional deficiencies or excesses, replacement of nutrients to ameliorate a disease or disorder which does not have a nutritional cause and feeding of drugs or nutrients to aid in the inhibition of diseases. The primary objective is to optimize nutrient intake, minimize catabolism and utilization of body nutrient stores, and maximize recovery process and immune competence in a sick animal.

Therapeutic diet is qualitative/quantitative modified version of normal regular diet. It is usually modified by changing nutritional needs of individual and is used to improve the specific health /disease condition. It involves nutrition of clinically ill animals, supportive nutrition for the convalescent animals and preventive nutrition to fight against occurrence clinical illness. Disease and nutrition are closely interlinked and dietary modification forms an important part of the veterinary management of the case aided with right formulation of 'Therapeutic diets' that provides optimal health, production and welfare of animal.

Common Metabolic Disorders of Farm Animals

The transition period for the farm animals refers to the three weeks before calving to three weeks after calving. During this period, the cow experiences many physiological changes in preparation for calving and the upcoming lactation. Associated with these changes is a depression in feed intake.

The reduction in feed intake and the substantial increase in nutrient requirement for fetal growth and mammary gland development may contribute to an increased incidence of metabolic disorders. During the transition from lactating to dry, and from dry to period of lactation, the dairy cow is under enormous stress both physically & metabolically. Excessive stress during these transition periods, especially just prior to calving, is associated with increased- susceptibility to metabolic disorders.

Common metabolic disorders of farm animals are:

- **Ketosis**
- **Milk Fever**
- **Lactation Tetany**
- **Fatty Liver Syndrome**
- **Downer Cow Syndrome**
- **Ruminal Acidosis**

Ketosis

Ketosis is a metabolic disease that occurs when the cow is in severe negative energy balance and cannot efficiently use mobilized body fat for energy. It is characterised by partial anorexia and depression with ketonemia, ketonuria, hypoglycaemia with poor liver glycogen content.

Supportive Clinical Tests

Ketone levels can be checked on individual animals. It is recommended to check milk ketone levels rather than urine ketone levels. The urine test is somewhat overly sensitive for diagnosis.

Nutritional Therapy

- Nutritional therapy aimed at re-establishing normo-glycemia and reducing serum ketone body concentration.
- Intravenous administration of 500-800ml of 50% dextrose solution for 3 days.
- Provide 250 ml propylene glycol mixed with equal amount of water orally per day for several days in cattle and 100 ml (twice day) in sheep / goat.
- Administer orally 12g of niacin daily for 1-2 weeks.
- Provide 1-6 mg of vitamin B_{12}.

Nutritional Prevention

- Cows should not be starved or overfat at calving.
- Feed balanced ration with respect to energy, protein, minerals and vitamins throughout the lactation period.
- Feed 6-8g/cow /day niacin orally starting 20days prior to expected calving and continuing for 3 months postpartum with balanced diet.

- The supply of sodium propionate (100g daily for 6 weeks) at calving may be included in problematic herds.
- Highly fermentable feeds such as molasses help to check the ketosis.
- Avoid bad silage or mouldy or dusty hay as they increase the level of butyrate.

Milk Fever

It occurs due to high calcium demand and low blood calcium after calving. Symptoms of milk fever pass through 3 stages: Begins with anorexia then sternal recumbency and finally lateral recumbency and coma.

Supportive Clinical Tests

It is recommended to sample blood from four to seven dry cows and any clinical cases prior to treatment. Important parameters to include in the profile are serum minerals, packed cell volume, white blood cell count (plus differential) and blood urea nitrogen. It is important to determine if milk fever is being complicated by a low magnesium status. In typical milk fevers, magnesium is elevated.

Nutritional Therapy

- Cow with milk fever should be given an injection of Ca usually CBG solution @300-600 ml of 40% solution.
- In case of complicated type, where chances of milk fever other than Ca, composite solution containing Ca, Mg, P, and glucose may be recommended.
- For recumbent cows not responding to treatment, give drench of 900g of Epsom salt. This will help removing toxins from GIT and enable cows to stand within 2-4 hrs.

Nutritional Prevention

- Oral drenching around calving with a supplement of easily absorbed Ca salts such as calcium chloride, providing 40-50g of Ca per dose as bolus, gel, paste or as liquid.
- The feeding of acidifying rations by anionic salt (ammonium chloride) during the last week of pregnancy.
- Feeding of low Ca rations during the last week of pregnancy.
- Prepartum administration of vitamin D 2-8 days before calving may be useful.
- Adequate Mg supplementation is vital for prevention of milk fever as it plays an important role in Ca metabolism.

Lactation Tetany

Also known as grass tetany or wheat pasture poisoning. It occurs due to grazing lush grasses, low Mg, high K, nitrogen interferes with absorption in digestive tract.

Supportive Clinical Tests

- A blood profile should include serum minerals. If sudden deaths occur, selenium and vitamin E should be added.

- Check for white muscle disease and multiple leg fractures in downer young stock if an animal is necropsied.

Nutritional Therapy

- In case of cows, administration of 200ml saturated solution of 50% magnesium sulphate S/C increase blood level of Mg within 15 minutes.
- The animal should be removed from the affected pasture and feed 50-60g MgO daily for 7-10 days.
- In case of calf's S/C injection of 10g of magnesium sulphate dissolved in sterile water followed by oral administration of 10-15g of MgO.

Nutritional Prevention

- Lactation tetany is easily preventable. Proper mineral intake, avoiding deficiencies and excesses, should be maintained on Ca, P, Mg, K, Cu and common salt.
- Cattle grazing on grass fields fertilized heavily with nitrogen should be carefully monitored & supplemented with 60 g of MgO daily during this period.
- MgO can be mixed with salt (75:25) and fed directly to cattle ad libitum. Salt increases the palatability of MgO as well as increases the Na level in the blood.

Fatty Liver Syndrome

Fatty liver disease is a disorder of highly productive dairy cows resulting from an excessive negative energy balance at the onset of lactation. Mobilization of large amount of body fat reserves in response to insufficient dietary energy supply results in transfer of fatty acids to the liver. The condition is associated with pronounced ketosis, feed intake depression & decreased productivity; severe cases lead to liver failure and a fatal outcome.

Supportive Clinical Tests

- Most commonly done indirectly by assessing severity and duration of negative energy balance**.**
- Liver biopsy is a minimally invasive procedure that is the only direct and most reliable method to determine severity of fatty liver in dairy cattle.

Nutritional Therapy

- Repeated I/V administration of 500 ml of 50% glucose/dextrose in commonly used in dairy practice.
- Oral administration of 250ml propylene glycol twice a day.
- Administer orally 12g of niacin daily for 1-2 weeks.
- 1-6 mg of vitamin B12- parentally.

Nutritional Prevention

- Reducing severity and duration of negative energy balance is crucial in prevention of fatty liver.
- Avoid over conditioning cattle, rapid diet changes, unpalatable feeds, periparturient diseases and environmental stress.

- Feed balanced ration with respect to energy, protein, vitamins, &minerals to the dairy cattle's.
- Oral administration of 500 ml of propylene glycol per day during the final week prepartum has been effective in reducing plasma NEFA and severity of fatty liver at calving.
- Supply of sodium propionate (100g daily for 6 weeks) at calving may be included in problematic herds.

Downer Cow Syndrome

Any cow that remains in sternal recumbency for more than 24 hours after initial recumbency, it may develop secondary recumbency from pressure damage to muscles & nerves, often termed downer cow. Causes of disease are metabolic or non-metabolic. Among metabolic causes hypocalcaemia, hypomagnesemia, hypophosphatemia, hypokalaemia, fatty liver disease and starvation. Non metabolic causes- traumatic, infectious, degenerative and toxic disorders.

Supportive Clinical Tests

Serum samples for estimation of (electrolytes, like sodium, potassium and chloride), calcium, phosphorus, magnesium and potassium. Serum inorganic phosphorous is not a good indicator hence total blood phosphorus is a better test.

Nutritional Therapy

- Downer cows are often hypocalcaemic. If hypocalcaemic cow does not respond to calcium therapy, potassium, phosphorus and magnesium should be given as additional treatment.
- Monitoring of blood mineral status.

Nutritional Prevention

- Effective strategies to prevent milk fever is important to decrease downer cow syndrome.
- Prophylactic administration of calcium to all cows, beginning with cows entering their 2nd or later lactation.
- Prompt treatment of milk fever to avoid prolonged recumbency and monitor treated cows closely for 24-48 hrs. Post treatment.
- Provide balanced feed with respect to energy, protein, minerals and vitamins.

Ruminal Acidosis

Rumen lactic acidosis develops in sheep & cattle that have ingested large number of unaccustomed feeds rich in ruminally fermentable carbohydrate. The resulting production of large quantities of VFAs & lactic acid decreases rumen pH to non-physiological level, simultaneously weakening the buffer capacity of the rumen and reduces the efficiency of rumen flora and fermentation.

Supportive Clinical Test

Diagnosed by measurement of ruminal or blood acidity.

Nutritional Therapy

- In case of mild acidosis, withhold concentrates and feed roughage to stimulate saliva flow.

- Drench oral antacids such as sodium bicarbonate @1g/kg body wt., magnesium hydroxide, magnesium oxide to alkalinize the rumen & oral electrolyte solutions.

Nutritional Prevention

- Proper management and feeding is key to prevent acidosis in animals (proper balance of fibre & non fibre diet).
- Feeding excessive quantities of concentrate & insufficient forage results in fibre deficient diet likely to cause ruminal acidosis.
- Diet should be formulated to provide adequate buffering (increase rumen buffering capacity). Buffer used in dairy industry are sodium bicarbonate, potassium bicarbonate, magnesium carbonate, calcium carbonate.
- Supplementation of diet with microbial feed additives to control excessive accumulation of acids in rumen: Megasphaera, Selenomonas ruminantium Lactobacilli & Enterococci**.**

Conclusion

The interaction between illness, health, and nutritional status is multifactorial and complex. Nutrition of animal is ranked as one of the major areas of importance amongst the acquired characteristics in relation to disease resistance. Besides focusing on PEB and prepartum energy intake, the effects of dietary protein level, protein type, essential amino acids (e.g. methionine), or individual FA on the success of the cows transition through calving need renewed attention. There is a need of multidisciplinary approach to develop nutritional strategies that would allow farm animals to become more resilient to the environmental and physiological challenges that they will have to endure during their productive career.

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THE SCIENCE WORLD
A Monthly e Magazine
ISSN: 2583-2212
May 2022; 2(5), 566-570

Popular Article

Potential of Plant-Derived Products to Control Arthropods in Animals

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Abstract

Plant-derived products tend to have a lot of potential for veterinary pest control. They are alluring pesticide candidates because of their low mammalian toxicity and short environmental persistence. There are various potentially pesticidal plant-derived products available. The article focuses on the pesticidal, developmental and repellent potential of plant-derived products and their emerging and future potential in treatment and prevention of veterinary ectoparasites.

Keywords: Animal; Control; Extract; Parasite; Pest; Product

Introduction

Synthetic pesticides are becoming particularly troublesome in the treatment of veterinary pests. Pest resistance, product residues, active ingredient removal, undesirable environmental persistence, and unacceptable threats to non-target species are just a few of the issues that are driving research into alternative approaches. One strategy makes use of plant-derived products' repellent, harmful, or bioactive properties. These products are appealing as pesticide candidates because of their low mammalian toxicity, short environmental persistence, and, in many cases, complex chemistries that should restrict pest resistance growth (Miresmailli *et al.*, 2006). The article focuses on the pesticidal, developmental and repellent potential of plant-derived products and their emerging and future potential in treatment and prevention of veterinary ecto-parasitoses.

Pesticidal potential

In modern pest control, many pesticides based on plant-derived products are already available, and in some cases widely used (Isman, 2006; George *et al.*, 2008). The pesticidal potential of pyrethrum was apparently recognized in the 17th Century, though verification is reported to have occurred later in 1840 (Katsuda, 2012).

Use of pyrethrum to treat pests of veterinary significance greatly pre-dates the advent of synthetic 'second generation' pesticides (Casida, 1980), to which pyrethroids belong. Pyrethrum is still widely used today, with its primary application to veterinary pest control being in the treatment of premise pests such as cockroaches and flies, which can act as disease vectors. Neem seed extract is known to display activity to a vast range of pest invertebrates (Singh *et al.*, 1999), including against a multitude of pests of veterinary significance (Mulla and Su, 1999; Schmahl *et al.*, 2010).

Many neem-based commercial products are available which are typical examples resulting from the prior research (Schmahl *et al.*, 2010), which are used against a range of veterinary pests including dust mites, ticks, ectoparasitic mites (including *D. gallinae*) and scabies mites (*Sarcoptes scabiei*). Such products are reported to be highly efficacious and more effective against *D. gallinae* than the synthetic organophosphate phoxim (Abdel-Ghaffar *et al.*, 2009). Studies in livestock have now confirmed in vivo tick potential (Kiss *et al.*, 2012), with topical application proving successful in cattle (Benavides *et al.*, 2001; Srivastava *et al.*, 2008) and oral administration in lambs suggesting future potential for administration in feed (Landau *et al.*, 2009). The seed extract had the highest acaricidal impact in cattle trials, with a substantial reduction in egg laying ability in ticks that survived care. In comparison to the synthetic pyrethroid, cypremethrin, neem seed extract was found to be comparable in terms of reducing oviposition, despite having a longer period to knockdown (Srivastava *et al.*, 2008). Oral administration to lambs was found not to result in lethality to *Dermacentor vairiabilis* ticks, though based on a significant reduction in tick weight the authors concluded that the presence of azadirachtin in the host's blood interfered with tick feeding (Landau *et al.*, 2009). Essential oils have piqued the interest of scientists looking for novel and natural alternatives to synthetic pesticides in a variety of fields, including agriculture, veterinary medicine, and apiculture, due to their high chemical diversity and thus potential for bioactivity (Isman, 2006; George *et al.*, 2008). George *et al.* (2008) reviewed the potential of both essential oils and extracts to a range of ectoparasites of veterinary significance, citing examples of their use against pests of livestock, poultry and domestic animals. In a study employing extracts from indigenous Indian plants, Zahir *et al.* (2009) similarly showed that products could be of use in targeting multiple ectoparasites of veterinary and medical significance, in this case *Rhipicephalus microplus* ticks and the larvae of *Anopheles subpictus* and *Culex tritaeniorhynchus*. There were also cases of ectoparasitic mites infesting honeybees, as well as the active use of some commercial plant-based products to target fleas, ticks, and mange mites in cats and dogs (George *et al.*, 2008).

Repellent potential

Essential oils and their bioactive constituents are often the subject of studies looking into

plant-derived repellents, owing to their high volatility, which lends itself well to such research. Several plant-derived products are now commonly used as insect repellents, despite the fact that they need reapplication on a regular basis. Neem-based preparations have been found to offer protection from mosquito species for a period of 2-4 hours but with reduced efficacy at a rate of 2 g/person (Bracmachari, 2004). In contrast, 100% DEET (N,N-Diethyl-meta-toluamide) may provide reliable protection for 10 hrs or more, depending upon the formulation used and environmental variables experienced post-application. DEET may not be readily accessible to inhabitants of poorer communities, however, and in these instances identifying locally available plants with repellent properties against a range of mosquito species has obvious advantages (Dekker *et al.*, 2011). The US Environmental Protection Agency has registered citronella, lemon and eucalyptus essential oils as insect repellent ingredients for topical use (Nerio *et al.*, 2010). Many more examples of the use of essential oils and their chemical constituents as repellents against mosquitoes are provided in recent reviews by Maia and Moore (2011) and Nerio *et al.* (2010). In the latter work examples are also provided for numerous other pest orders of veterinary, medical and agricultural interest, particularly beetles. Most work on plant-derived products as repellents for pests of veterinary significance has centred on ticks, often with encouraging results (Bissinger and Roe, 2010). The livestock brown ear tick, *Rhipicephalus appendiculatus*, for example, was repelled just as effectively by *Gynandropsis gyandra* essential oil at high dose as by DEET when tested using the tick climbing assay (Lwande *et al.*, 1999).

Emerging and future potential

There is a long list of potentially pesticidal plant-derived products on the market, and it will continue to expand in the future. However, there are many avenues that need to be explored further in order to fully exploit the potential of these products, especially in terms of their modes of action, active ingredients, and metabolic pathways. With a better understanding of detoxification processes and the enzymes involved, it would be possible to take a more targeted approach to the use of plant-derived products, opening up new possibilities. The ability for plant-derived products to be used as synergists or co-administered substances, rather than directly as toxic compounds, is a significant future potential. In this case, the inhibition of detoxification enzymes is the most interesting activity.

Conclusions:

Plant-derived products tend to have a lot of potential for veterinary pest control. Several plant-derived products are already commonly used for this purpose, with the efficacy of pyrethrum and neem products in particular well supported by a history of successful use against a variety of

pests in a variety of industries. More "novel" plant-derived products, such as essential oils and their various chemical components, may hold similar promise to more developed products in the ongoing quest for alternatives to synthetic active ingredients, and have been shown to target pests in a variety of ways. For several of these items, further research is required to validate effectiveness, protection, and modes of action, as well as to resolve limitations like minimal residual activity, which can be addressed with advancements in fields like slow-release technology. Molecular research focused on identifying targets and detoxification pathways/enzymes could greatly aid in ensuring product protection and efficacy, enabling plant-derived products with novel arthropod-specific modes of action to be prioritized over those with more general activity that target similar pathways to existing synthetics.

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THE SCIENCE WORLD

A Monthly e Magazine

Special Issue

World Environment Day

Vol 2 Issue 6
June, 2022

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