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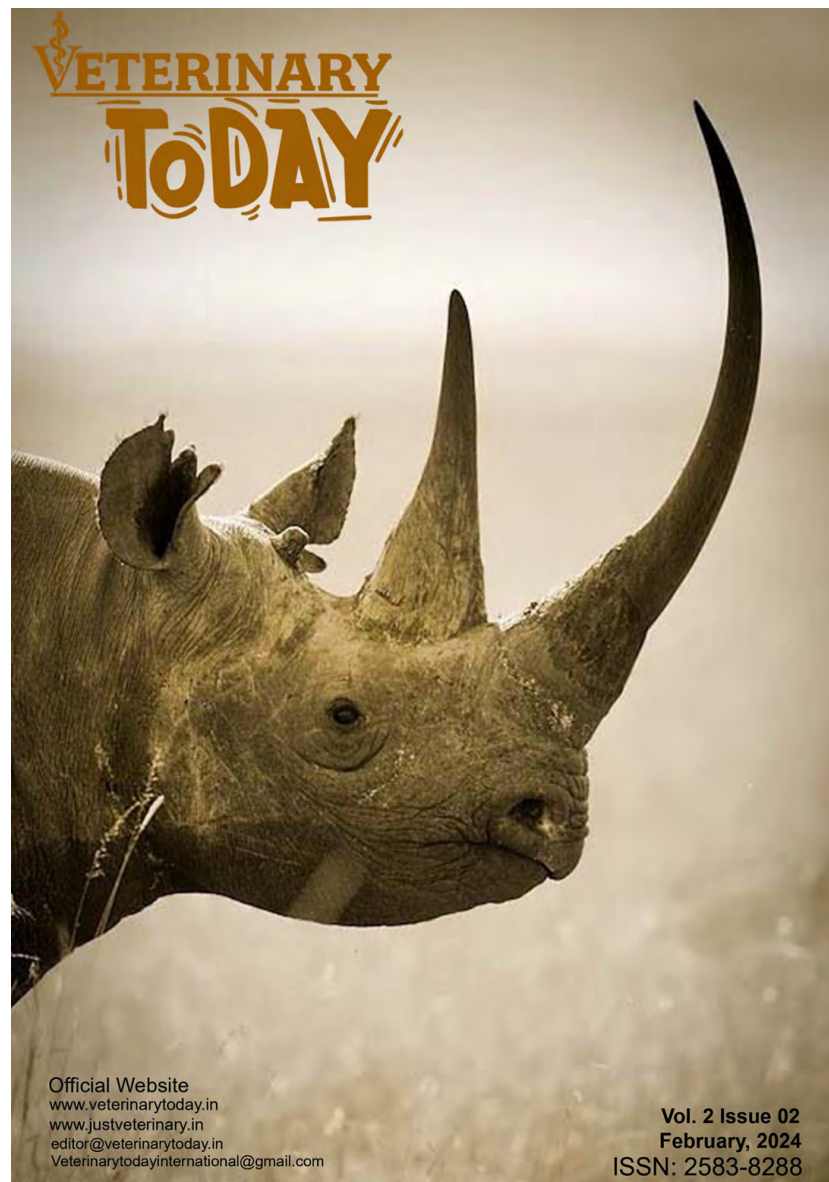


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editor@veterinarytoday.in
veterinarytodayinternational@gmail.com



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Mahatma Gandhi

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J. K. Mahla¹, A.J. Mayani², M.A. Gamit¹, A.K. Patel², M.N. Gelat² & A.S. Bhalodi²

¹ Assistant Professor, ² P.G. Scholar

Department of Veterinary Surgery and Radiology, College of Veterinary Sci. & A.H., Kamdhenu University, Anand -388001. (Gujarat)

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¹M.V.Sc. Scholar, Department of Veterinary Pathology

^{*1}M.V.Sc. Scholar, Department of Livestock Production Management

²M.V.Sc. Scholar, Department of Livestock Products Technology

³Professor & Head, Department of Veterinary Pathology

⁴Assistant Professor, Department of Veterinary Pathology

⁵Professor & Head, Veterinary Clinical Complex

College of Veterinary Science & Animal Husbandry, A.N.D.U.A.T., Kumarganj, Ayodhya, U.P.

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¹Ph.D. Scholar (Wildlife Health Management) SWFH, Jabalpur, N.D.V.S.U. (M.P.)

²Associate professors, (Department of Veterinary Medicine), N.D.V.S.U. (M.P.)

³Professors, (Department of Veterinary Medicine), N.D.V.S.U. (M.P.)

⁴Ph.D. Scholar (Veterinary Medicine) SWFH, (Department of Veterinary Medicine) Jabalpur, N.D.V.S.U. (M.P.)

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* (PhD Scholar), post-graduate institute of Veterinary Education and Research, Jaipur (Department of Animal Genetics and Breeding)

¹ & ³* (PG Scholar) Rajasthan University of Veterinary and Animal Sciences, Bikaner (Department of Livestock Production Management)

²* (PG Scholar) Rajasthan University of Veterinary and Animal Sciences, Bikaner (Department of Veterinary Physiology)

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* Dr. G. Ganesh and Dr N. Rajanna

*Subject Matter Specialist (Aquaculture)

Programme Coordinator & Head

Krishi Vigyan Kendra, P.V. Narsimha Rao Telangana Veterinary University, Mamnoon, Warangal-506 166.

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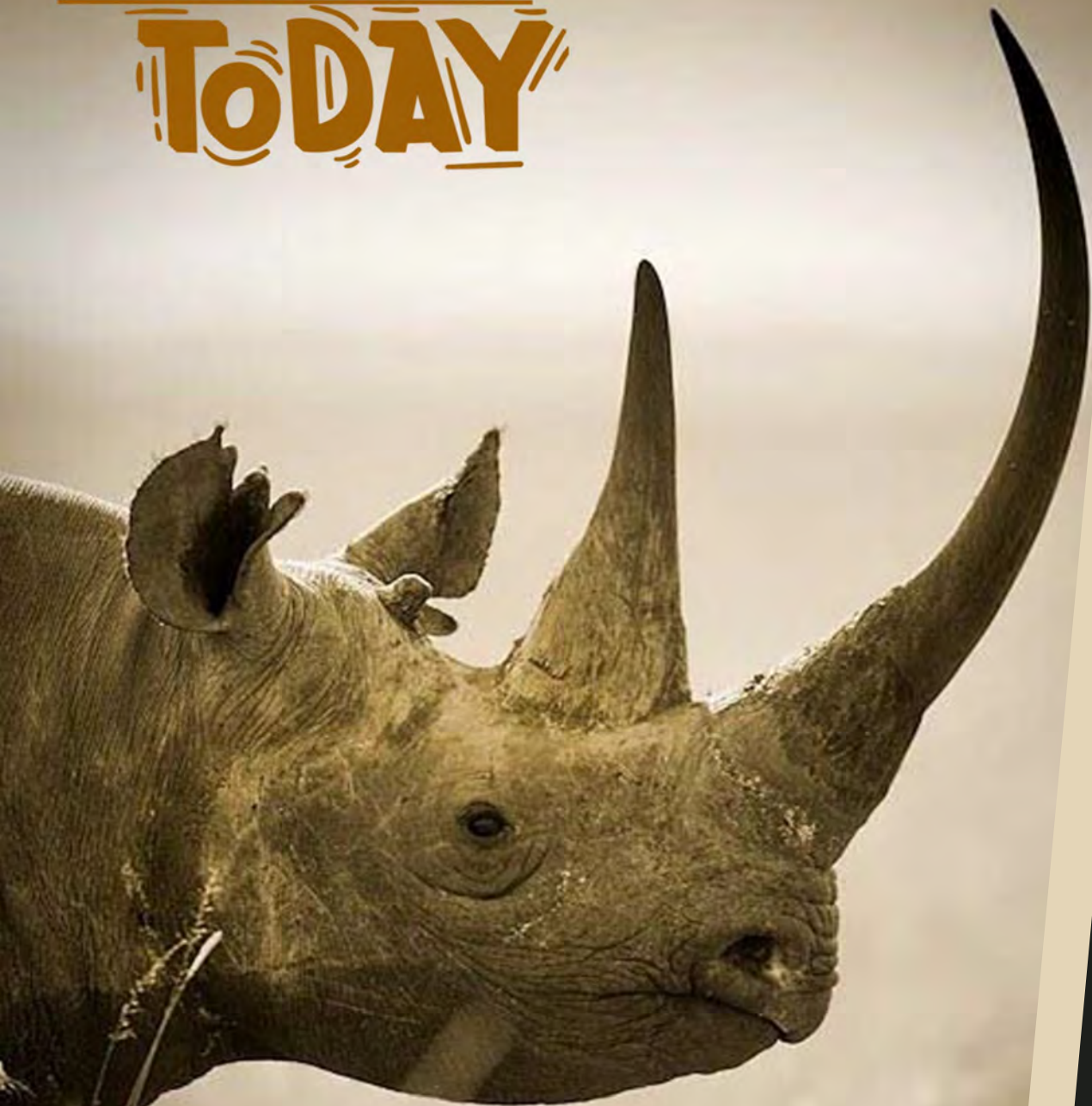
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Surgical management of odontoma in ruminants: A review of 2 cases

J. K. Mahla¹, A.J. Mayani², M.A. Gamit¹, A.K. Patel², M.N. Gelat² & A.S. Bhalodi²

¹ Assistant Professor, ² P.G. Scholar

Department of Veterinary Surgery and Radiology, College of Veterinary Sci. & A.H., Kamdhenu University, Anand -388001. (Gujarat)

Abstract: Incidence of odontoma is rare in ruminants, two cases presented with odontoma; where one cow had all four incisor teeth involvement of lower mandible, while one bullock had two middle teeth involvement. Surgical removal of affected mass carried out under bilateral mental nerve block using 2% lignocaine hcl along with xylazine sedation. Comparatively smaller odontoma growth in bullock was recovered after surgery, while bigger odontoma with bony involvement had reoccurrence after 3 months of surgery.

Key words: Odontoma, neoplasm

Introduction

An Odontoma is rarely observed in ruminants, tumors growth around teeth and mainly involves odontogenic epithelium and mesenchymal tissue within the maxillary bone or gingival tissues. Neoplasms are classified based on microscopic pattern of specific cell type (Brown *et al.* 2007 and Cohen & Bhattacharyya, 2004).

Among these rare odontogenic tumors, ameloblastic fibro-odontoma stands out as a benign tumor that emerges from both odontogenic epithelium and mesenchyme, often leading to the formation of enamel and/or dentin. While it is

infrequent across all species, it notably ranks as the most common odontogenic neoplasia in cattle, with documented cases in humans, cats, dogs, horses, sheep, non-human primates, and rats as well (Gardener, 1996 & Head *et al.* 2002). These neoplasms tend to affect young animals, with a range spanning from newborns to approximately 2.5 years old, showing no clear gender predilection (Miller *et al.* 1976).

Case history

Two non-descript cattle were presented in the clinical camp with watermelon size growth involved all four incisor teeth in 9 years old cow, while 8 years old bullock was presented with cricket ball size odontoma involving two middle incisor teeth with 1.5-2 years of clinical history.

Diagnosis and Treatment

The diagnosis of the condition was based on a comprehensive evaluation, including a thorough history, clinical signs and clinical examination. Both animal were sedated with xylazine (0.1 mg/kg I/M) along with bilateral mental nerve blocks were achieved using 2% lignocaine hydrochloride (10 ml on each side) after securing the animal in lateral recumbency. The surgical site was meticulously prepared to maintain aseptic conditions, reducing the risk of infection. A gingival incision was made ventral to the visible margin of the mass, creating a lower flap. Surgical excision of the tumorous growth was then performed, carefully detaching it from the mandible. Osteotomy was conducted using a chisel and hammer to remove affected bone tissue. Haemostasis was achieved through several methods, including digital pressure over sterilized gauze, cauterization, and the administration of inj. Texa bleed to control bleeding effectively.



Case no. 1 Odontoma involved all four incisors before and after surgery



The oral cavity was thoroughly irrigated using a solution of potassium permanganate mixed with normal saline and povidone iodine to ensure cleanliness and minimize the risk of infection. The surgical site was closed by opposing the flaps using interrupted mattress sutures, particularly the lower lip skin, with nylon suture material along with medicinal management with inj. Streptopenicillin (2.5 gm) for five days and Meloxicam (Melonex) at a dosage of 0.2 mg/kg b. wt. for four days. Additionally, restricted feeding was implemented to support recovery with intravenous fluid therapy using 5 liters of 5% Dextrose normal saline for four days post-operatively to meet demand of energy. Sutures were removed after 12 days, and daily wound care involved flushing with a solution of normal saline mixed with povidone iodine for a period of fifteen days to promote optimal healing.

Result and Discussion

Odontogenic tumors in animals remain a relatively limited and occasionally perplexing aspect of veterinary pathology. Notably, odontomas, such as the cases observed here, typically originate from odontogenic epithelial remnants, frequently occurring in the incisor region of the mandible. These neoplasms often manifest as cystic formations and can lead to the resorption of adjacent teeth roots (Gardner, 1992; Theilen and Madewell, 1979). Surgical excision emerges as an effective method for controlling this condition, involving the removal of the tumor growth and diligent closure of the cavity to minimize complications (Singh et al., 1993). In our cases, the surgical procedure successfully eliminated the calcified masses, along with associated fluid and hard fibrous covering.

Case no.2 recovered uneventfully, while case no.1 had bigger growth with bony involvement and despite of partial bone ablation reoccurrence was observed after 3 months.

Conclusion

Surgical removal of tumorous mass is the best treatment for odontoma; while surgical removal at early stage had least complication and good recovery.

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Pyoderma In Dogs: It's Treatment & preventive Strategies

Arunima Singh¹, Surya Kant^{*1}, Nandita Chandra², D. Niyogi³, K. K. Tripathi⁴ and Sonu Jaiswal⁵

¹M.V.Sc. Scholar, Department of Veterinary Pathology

^{*1}M.V.Sc. Scholar, Department of Livestock Production Management

²M.V.Sc. Scholar, Department of Livestock Products Technology

³Professor & Head, Department of Veterinary Pathology

⁴Assistant Professor, Department of Veterinary Pathology

⁵Professor & Head, Veterinary Clinical Complex

College of Veterinary Science & Animal Husbandry, A.N.D.U.A.T., Kumarganj,
Ayodhya, U.P.

Introduction

A specific definition of pyoderma is a bacterial skin disorders. Impetigo is a substitute for pyoderma, particularly in puppies of any age. As a trustworthy canine owner, one's work constantly to ensure the healthiest possible lifestyle for the furry companion. Although comparable to human beings, canines can have a variety of skin disorders, with pyoderma being a prevalent dermatological disorders. A bacterial dermatological disorder known as "pyoderma" in dogs can be quite uncomfortable and unpleasant for your beloved companion. It is very important to be familiar with the disorder and a recovery plan for it with the goal to safeguard the dog's well-being and avoid consequences.

The term "pyoderma" originates from the Greek "pyo" which means "pus" and "derma" which means "skin". It is a prevalent dermatological disorder in canines that is characterized by a proliferation of red bumps on the skin's surface identified as pustules or papules as a result of a bacterial infection. There are several types of pyoderma, such as deep pyoderma which affects the more dense layers of the skin and superficial pyoderma which affects the skin's outermost layers.

The majority of instances are caused by bacterial infections, which are frequently a side effect of other illnesses including allergies or parasites. In susceptible areas, hair loss results in

very little bald patches. Redness and welts may appear at the edges of the hair loss; however shorthaired breeds frequently lack these symptoms. Dogs with severe pyoderma may exhibit pain, crusting, foul smell, pus and blood discharges.

There are 2 types of Pyodermas in Dogs:

- ✓ **Superficial Pyoderma** - In dogs, superficial pyoderma is a skin disorder which leads to red, irritated skin and shallow, pus-filled lesions. The bacterial infection responsible for the condition is typically Staphylococcus spp. like *S. aureus* and *S. pseudintermedius*. Hair loss, itching, alopecia and pustules are typical manifestations. Moderate infections can be managed at one's residence with antibiotics either topical or systemic depending on severity and area cleansing. Common antibiotics include cephalexin, amoxicillin-clavulanate, or topical mupirocin. For a precise diagnosis and course of care, however, communicating with a veterinarian is critically important. Timely and appropriate management can assist the dog bounce back completely and keep their disease from becoming worse or expanding into a chronic one. It's extremely important to take care of any underlying illnesses and successfully complete every dosage of antibiotics as recommended.



Image credit:

<https://www.msdevetmanual.com/multimedia/image/superficial-pyoderma-dog>

- ✓ **Deep Pyoderma** - Pyoderma gangrenosum, or deep pyoderma in dogs, is a rare and severe form of skin disorder. It affects the skin's deeper layers causing abscesses or cellulitis, which might end up in painful open sores or ulcers. The main contributory factor is bacterial infection, specifically associated with *Staphylococcus intermedius*. Red, painful nodules or pus-filled abscesses, frequently on the legs, trunk, or neck, constitute some of the warning signs. The skin underlying lesions could be sensitive and inflamed. Dogs who suffer from allergies, immune system abnormalities, or underlying ailments tend to be particularly vulnerable. Poor hygiene practices, wounds to the skin, underlying health conditions like diabetes, immunosuppression, or history of taking steroids are risk factors. It is more prevalent in older and middle-aged adults. Deep pyoderma can be challenging to treat and has to be examined by a veterinarian as quickly as possible. Antibiotics, systemic prescription drugs, and occasionally surgical procedures for getting rid of contaminated material are all possible forms of intervention. In order to minimize challenges and encourage recovery, early diagnosis and appropriate treatment are critically important.

greater risk to develop pyoderma.

- ✓ **Skin Traumatic injuries:** Bite marks, cuts, and scrapes can provide an opportunity for bacteria to penetrate the skin.
- ✓ **Impaired Immunity:** Dogs may be more susceptible to pyoderma if they have conditions such as hormone imbalances or particular medications (immunosuppressive drugs and higher doses of steroids) that negatively impact their defenses against infection.
- ✓ Parasitic skin infections, such as *Demodex* or *Sarcoptes* mites, and endocrine disorders, such as Cushing's disease or hypothyroidism.

Recognizing Dog's Pyoderma -

The most prevalent clinical manifestations of pyoderma are skin lesions referred to as papules or pustules. These lesions often look like human pimples. The majority of the times, lesions have a raised, red center filled with white pus. Circular crusts, dry or flaky skin areas, hair loss, and itching are additional manifestations. Short-haired breeds may have patches of hair loss that cause their hair to stick up or protrude, resembling hives, or their coats may have a mottled appearance. A damp layer or a musty smell, especially in the



Image credit: <https://stock.adobe.com/in/images/deep-pyoderma-in-dog-dog-sores-caused-by-bacterial-infection/450992262>

Factors that Influence Pyoderma in Dogs -

- ✓ **Hypersensitive reactions:** Dogs that have allergic reactions to certain foods or substances in the environment can experience pyoderma-causing irritation to their skin.
- ✓ **Skin Wrinkles:** As moisture and debris accumulate in these parts resulting in a favorable environment for bacterial growth, breeds with wrinkles in their skin are at

spaces between toes or skin folds, may be prevalent under certain cases.

It is crucial to identify the signs and symptoms of canine pyoderma in order to diagnose the condition early and initiate medication. Common manifestations include the following:

- ✓ **Draining Passages:** In extreme situations, deep pyoderma might develop draining passages that might secrete pus or fluids.
- ✓ **Hair fall:** Patches of hairless skin may result from

a loss of hairs on skin that is infected.

- ✓ **Red bumps**, also known as **pustules**, are frequently seen on the skin's surface, particularly in the groin area, arm pits, paws, and abdomen.

Intervention of Pyoderma in Dogs -

When medical treatment at home is ineffective at resolving the condition of more severe forms of pyoderma, professional veterinary therapy becomes mandatory. The veterinarian will figure out the degree and kind of pyoderma and prescribe the appropriate remedies and medications. Typical veterinarian strategies include the following:

- ✓ **Cleansing and Proper drainage:** Under anesthesia, the veterinarian might be required to clean and drain the affected regions in cases of severe deep pyoderma involving abscesses or draining passages.
- ✓ **The topical substance:** To treat the infection locally, a veterinarian may recommend topical medications such as medicated shampoos, sprays, or lotions in along with oral antibiotics.
- ✓ **Oral antibiotics** are frequently prescribed by veterinarians for the management of bacterial infections. It's critical that one adhere to the recommended dosage and finish the entire course of medication.
- ✓ **Steroids** may be recommended by the veterinarian for the relief of deep pyoderma prospects who have severe inflammation in order to lessen pain and swelling.
- ✓ To identify the specific bacteria and figure out the most effective antibiotic, a **Culture and Sensitivity Test** may be performed in cases of pyoderma that are chronic or recurrent.
- ✓ **Monitoring Existing Disorders:** As part of the treatment strategy, the veterinarian will take care of any allergies or additional health problems that may be contributing to or intensifying the pyoderma.

Household Remedies for Pyoderma in Dogs -

In order to alleviate your dog's discomfort and aid in the healing process, parents can try several home remedies for mild forms of superficial pyoderma. Consult a veterinarian as soon as possible though, if the disorder worsens or if there is no improvement after a few days. One can implement the following kinds of home care strategies:

- ✓ Dog-specific over-the-counter topical antibiotics have the potential to inhibit bacterial growth and facilitate healing.
- ✓ Warm, wet compresses can be employed to the affected area in order to assist with inflammation reduction and to promote pustule drainage.
- ✓ Apply a mild antiseptic or medicated shampoo formulated specifically for dogs to gently cleanse the affected region. Stay away of strong chemicals that might render skin irritations worse.
- ✓ To prevent the dog from irritating the area further, consider using an Elizabethan collar, which is also known as an E-collar, if they tend to lick or scratch it frequently.
- ✓ Food allergies may occasionally be a factor in pyoderma. In order to find out if a diet modification is required, consult with the veterinarian.

General Guidelines -

A topical antibacterial shampoo and an oral antibiotic are usually prescribed in the treatment of superficial pyoderma in dogs. It's important to pay attention to the veterinarian's recommendations about the course of antibiotic treatment. As a general guideline, oral antibiotics should be used for seven to ten days after clinical indications have resolved. This frequently means that, for a surface infection, you will be administering oral antibiotics for an average of three to six weeks. It can take eight to twelve weeks for deep infections to recover. Some of the most often prescribed antibiotics for managing canine pyoderma are cephalexin, cefpodoxime, and clindamycin.

As the dog's infection reappears after stopping antibiotics, the veterinarian might want to do more tests or treatments to identify the infection's underlying cause. Allergies of various kinds are frequently the cause of recurring skin infections. In addition to being incredibly itchy, dogs with allergies can also get ear infections frequently. Your pooch might need to be provided with long-term allergy medical treatments like Cytopoint or Apoquel if the veterinarian suspect's allergies are the cause of your dog's pyoderma. Supplementing your dog with fatty acid supplements may also help lessen the dog's itching experience from allergies.

The veterinarian could recommend a food trial utilizing a low allergen dog food if they

believe that a food allergy is the root cause of the pyoderma. Dog allergies to proteins, such as those found in chicken and beef, are the most prevalent. It's a frequent misconception that carbohydrates trigger allergies in dogs. Veterinarian prescription diets have a special protein or minimal allergen levels. Hill's Prescription Diet, Royal Canin Hydrolyzed Protein, and Vet-Pro (Drools) Veterinarians recommend hypoallergenic meals, which are generally the best available in the market, for dogs that have allergies to food.

Prophylactic Approaches -

It is extremely important for dogs' overall well-being in order to avoid pyoderma. Although certain dogs may be more vulnerable to skin infections as a result of underlying illnesses or allergies, there are a number of considerations you may take to minimize this uncertainty -

- ✓ **Dietary Supplements:** To maintain a healthy immune system and skin, offer your pooch a balanced, nutritious diet.
- ✓ **Periodic Grooming:** Brush and groom your four-legged friend on a regular basis to get rid of waste and loose hair, which can encourage the formation of bacteria.
- ✓ **Getting clean:** Use a shampoo that has been suggested by a veterinarian, but don't bath the pet too often as this can deprive the skin of its natural oils.
- ✓ **Manage Skin Wrinkles:** For breeds like Bulldogs or Pugs who have folded skin, keep those folds dry and clean to avoid bacterial overgrowth.
- ✓ **Sensitivities:** If the dog continues to have allergies, visit with your vet in order to identify and manage the triggers for those allergies.
- ✓ **Elimination of Ticks and Fleas:** To minimize the risk of skin illnesses carried on by these parasites, regularly employ tick and flea preventive procedures.
- ✓ **Practice good hygiene:** Keeping dogs that have been prone to pyodermas, sanitary is important, particularly in the areas surrounding skin folds. Make sure your pet is completely dry around and between skin folds after bathing or swimming.
- ✓ **Clean and dry bedding:** Attempt to wash your dog's bedding every week to every two weeks, and let it air dry completely before letting your pet curl up in it once more. If you have an inquisitive dog

that enjoys exploring muddy puddles, or if you have a small puppy still learning the ropes of toilet training, bedding may need to be washed more frequently.

- ✓ **Boost gut health with probiotics:** If left untreated, scratching and itching might result in pyoderma. A probiotic for dogs may be beneficial in minimizing illness. Probiotics can aid in the immune system's ability to function more efficiently by balancing the good and bad bacteria in the gut. This helps avoid mild skin irritations from becoming more serious.

Conclusion -

Dog pyoderma treatment can be upsetting, but with timely and effective care, the majority of dogs are able to achieve a full recovery. Pyoderma must be diagnosed and treated as soon as possible to prevent consequences, which can range from moderate cases that can be managed at home to more severe cases require professional treatment. Pyodermas shouldn't be managed at home. In order to prevent deep pyodermas, which are extremely painful and dangerous to the dog's health, this ailment must be treated immediately and effectively.



Hypomagnesemia Tetani in Bovine

Diksha Lade¹, Amita Tiwari², Devendra Gupta³, Salil Kumar Pathak⁴, Aditya Pratap⁴

¹Ph.D. Scholar (Wildlife Health Management) SWFH, Jabalpur, N.D.V.S.U. (M.P.)

²Associate professors, (Department of Veterinary Medicine), N.D.V.S.U. (M.P.)

³Professors, (Department of Veterinary Medicine), N.D.V.S.U. (M.P.)

⁴Ph.D. Scholar (Veterinary Medicine) SWFH, (Department of Veterinary Medicine) Jabalpur, N.D.V.S.U. (M.P.)

Grass tetany, also known as hypomagnesemia or grass staggers, is a serious condition that can be fatal to cattle. It is a metabolic disease that develops when the amount of magnesium in diet drops below what is needed for maintenance (3 mg/kg body weight) and lactation (120 mg/kg milk).

Etiology

When intakes of potassium and nitrogen are high and intakes of sodium and phosphorus are low, absorption from the rumen may be reduced. Hypomagnesaemic tetany is more common in soils that are naturally high in potassium and in soils that have been fertilised with potash and nitrogen, such as chicken dung. occurs in older cows as well as in cows having their first and second calving.

Incidence

- Species incidence-cattle rarely in sheep
- Age incidence -7-10-year-old (5-8 lactation)
- Time incidence-2-4 months after parturition
- Absorption from the rumen may be decreased when potassium and nitrogen intakes are high and sodium and phosphorus intakes are low.

Occurrence

- Highly potassium spring lush pastures and green cereal crop which decreases magnesium absorption
- Fed diet intoxicated with potassium fertilizer or urea

- This can arise after a decrease in food intake during inclement weather, during transport, or when cows graze short-grass dominant pastures containing < 0.2% Mg on a dry-matter basis.
- Liveweight losses occur during lactation when there is inadequate magnesium available in the plasma due to body tissues being mobilised during liveweight loss, which is insufficient to maintain lactation. This is caused by low herbage availability (< 1,000 kg dry matter/hectare).

Predisposing factor

- Starvation
- Diarrhea
- Cold weather stress
- Long transport

Clinical sign

Acute form- Sudden onset of hypoesthesia and muscle twitching, staggering in followed by fall down with tetany and convulsion, during episode (attack), opithotonus (back –head) pricking of ear, nystagmus, retraction of eye lids, champing of jaw, frothing at from mouth. Between episodes animals lie quiet but any noise or touch starting other attack Pulse and respiration accelerated, temperature moderately elevated (due to muscular spas) death from respiratory failure. **Subacute form-** Onset gradual and course longer and **Chronic-** form-have low serum magnesium but shows no symptoms



Diagnosis

- On the basis of History and clinical sign
- Laboratory diagnosis consist- Serum magnesium level commonly between (1-2mg%) (normal 2.5-3 mg%), low urine magnesium level and low CSF magnesium level
- Bone biopsy from ribs commonly revealed disturbed Ca: Mg. ratio.
- **Differential diagnosis**-The disease must be differentiated from other causes of nervous manifestation such as BSE, Rabies, Encephalomyelitis and poisoning

Treatment

- Safe therapy to use combined calcium-magnesium preparation as follow
- Calcium broguconate 15% (I/V 500 ml)
- Followed by magnesium lactate 15% (s/c 250ml)
- Magnesium sulphate (oral 125gram)
- Contraindicated to use Mg compounds alone may also cause cardiac arrest

Prevention and control

- Magnesium supplementation of diet with crude magnesium 60gm/head which can be mixed with molasses.
- Magnesium bullets placed in reticulum for slow liberation of constant traces of magnesium daily for long period as long as several months or even years.



Feed Additives and Their Use in Animal Nutrition

Dr. Arjit Anil

M.V.Sc., Animal Nutrition

Introduction

Feed additives are commonly described as non-nutrient substances that accelerate growth, efficiency of feed utilization, or are beneficial for health, or metabolism of the animal. Feed additives are an ingredient or combination of ingredients added to the basic feed mix or parts thereof to fulfil the specific need. Usually used in microquantities and requires careful handling and mixing. It is used to improve rate of gain, feed efficiency, prevent and control disease, prevent against environmental influences and economise the cost of animal protein. Mainly feed additives are categorized into two categories, the first one is Nutrient feed additives (amino acids, minerals, and vitamins) and the second is Non-nutrient feed additives (antibiotics, hormones, immunomodulators, enzymes, probiotics).

Various types of feed additives

A. Antibiotics

Non-ionophore antibiotics (chlorotetracycline, zinc bacitracin etc.) and Ionophore antibiotics (monensin, lasalocid, salinomycin etc.) are two groups of antibiotics which are majorly used as antibiotic growth promoters (AGPs). The difference between the two is their mode of action. Ionophore antibiotics form a hydrophobic complex with inorganic cations like sodium, potassium, and calcium. Mainly active against gram-positive organisms because the outer membrane of gram-negative bacteria is impermeable to such complexes. AGPs impart their effect by stimulating the microorganisms in the gut which favours nutrient synthesis, suppresses organisms which compete for critical nutrients and, inhibit toxin-producing bacteria. Ionophore and non-ionophore have been used in non-ruminants and pre-ruminants while, only ionophore are

successfully used in adult ruminants. The use of AGPs led to an increasing number of cases, where antibiotic-resistant bacteria were isolated. This fact has raised serious public health concerns in several countries, leading to either a complete ban or strict restrictions on the use of AGPs. It is expanding options for the use of alternative feed additives. In this context, phyto-genic feed additives are searched to be incorporated in poultry feed as growth promoters.

B. Phyto-genic Feed Additives

Phytogenics are a group of natural growth promoters (NGPs) or non-antibiotic growth promoters used as feed additives, derived from herbs, spices or other plants (e.g., garlic, oregano, thyme, rosemary, coriander, and cinnamon) as well as to their respective plant extracts in the form of essential oils. They are commonly regarded as favourable alternatives to antibiotic growth promoters (AGPs) in poultry production. Phyto-genic feed additives consist of a broad variety of substances, mainly extracts from plant materials, such as flowers, buds, seeds, leaves, twigs, bark, herbs, wood, fruits, and roots. It was reported that these products of plant origin are natural, less toxic, residue free and ideal feed additives for animal when compared to synthetic antibiotics or inorganic chemicals. Phyto-genic substances have antimicrobial, antifungal, antiparasitic, antiviral, antioxidant and insecticidal properties. Phyto-genic feed additives are either available in a solid, dried, and ground form or as extracts or essential oils. Moreover, active components of herbs may improve digestion and stimulate the immune function in poultry.

Herb/species	Latin name	Active principle
Ginger	<i>Zingiber officinale</i>	Gingerols and shogaols
Garlic	<i>Allium sativum</i>	Allicin (diallyl-thiosulfinate)
Cinnamon	<i>Cinnamomum verum</i>	Cinnamaldehyde
Thyme	<i>Thymus vulgaris</i>	Thymol

C. Arsenicals

3-nitro-4-hydroxy phenylarsonic acid (3 nitro), P-amino phenylarsonic acid (arsanilic acid) are example of arsenicals. It improves the growth of broilers and such birds have bright red combs and wattles as it enlarges the capillaries due to its dilator effect.

D. Copper supplements

Routinely used in pig diet as growth promoter. Copper sulphate is added at 0.01% of diet in fattening pigs. It also causes partial defaunation (removal of protozoa from rumen) in ruminants which ultimately result in less protein loss.

E. Hormones

Mainly two categories of hormones are being used in animal feed as feed additive. First category are anabolic hormones (Somatotropin, Thyroxin and Androgens etc.), they stimulate growth of endochondral bones and epiphysis of long bones and aid in nitrogen retention during protein metabolism. Second category of hormones are catabolic Hormones (Oestrogens, glucocorticoids), they inhibit skeletal growth and degrading protein and amino acid.

F. Immunomodulators

They are obtained from organisms or synthesized chemically which can enhance the defence mechanism. e.g., Vitamin C, Vitamin E, Levamisole, quaternary ammonium compounds, chitin.

G. Enzymes

They are usually used with some unconventional feed stuff. The enzymes act in

number of ways. First, they can improve the availability of nutrients from plant by break down of impermeable cell wall structures (Cellulase, Hemicellulase). Second, they destroy materials that interfere with the utilisation of nutrients (Beta-glucanase, Xylanase). In non-ruminants phytase enzyme used for enhancing the bioavailability of phosphorus in cereal-based diet. Protease, amylase, lipase etc. enzymes are supplemented to early weaned animal (lower endogenous enzyme production)

H. Probiotics

Parker coined the term Probiotics It is live culture of non-pathogenic (*Lactobacillus acidophilous*, *L. casei*, *L. bifidus* etc.) organisms which beneficially affect the host animal by improving its intestinal microbial balance. They benefit the host by having a direct antagonistic effect against specific group of undesirable or harmful organism through production of antibacterial compounds, eliminating or minimising their competition of nutrients. Altering the pattern of microbial metabolism in the gastro intentional tract, stimulation of immunity and neutralisation of enterotoxins formed by pathogenic organism. Thus, resulting in increased growth rate, improved feed efficiency.

I. Prebiotics

They are complex carbohydrates (oligosaccharides) soluble in water extracted from yeast cell wall, consisting of 2 to 10 monomeric units. They resist attack by the digestive enzymes of animals and therefore not metabolized directly by the host. They interact with the microbial flora

act as specific growth substrates and alter cell adhesion and immunomodulation. When used in mixed amounts in feed (below 1%) oligosaccharides increases weight gain and improves health status. Effects vary as per type of oligosaccharide employed, the class of animal, its age, animal species and management conditions. A wide variety of oligosaccharides such as mannose-oligosaccharide (MOS) fructo- oligosaccharide (FOS), gluco- and galacto- oligosaccharides is commercially available as feed additives. MOS blocks the attachment of harmful bacteria and prevent their colonization. FOS enhance the growth of probiotic bacteria which reduces harmful bacteria.

J. Organic acids

They are usually added as preservative, but their addition to pig diets at higher level has proved beneficial in terms of nutrient digestibility, growth and FCR. Formic and propionic acids are more effective than fumaric or citric acids. Suggested levels of inclusion of acid (kg/tonne diet) are: formic 6-8; propionic 8-10; fumaric 12-15; citric 20-25.

K. Antioxidants

Vitamin E, Vitamin C (Natural), Butylated hydroxy anisole (BHA), Butylated hydroxytoluene (BHT) (Synthetic) are added in feed to avoid rancidity by scavenging free radicals. Certain metals like copper, iron can act as pro-oxidant catalytic and therefore need to be immobilised, sequestrants (Calcium-EDTA, polyphosphates and citric acid) are compounds added to do this. They are metal scavengers binds with metals (copper and iron) which acts as catalyst in oxidation process.

L. Xanthophylls

Xanthophylls enhance the colour or quality of the marketed product. In poultry production we often enhance the yellow colour by incorporating xanthophylls into broiler feed.

M. Grit

Poultry do not have teeth to grind any hard grain, most grinding takes place in the thick muscular gizzard. The more thoroughly feed is

ground, the more surface area is created for digestion and subsequent absorption. Hence, when hard, coarse, or fibrous feeds are fed to poultry, grit is sometimes added to supply additional surface for grinding within gizzard. When mash or finely ground feeds are fed, the value of grit become less. e.g., oyster shells, coquina shells and limestone are used as grit. A level of 4% oyster shell together with 3.5% grind limestone which ultimately resulting in total 3.5% dietary calcium, optimum for layer.

N. Rumen modifiers

During maximum production stage ruminants are given high doses of concentrate feeds for meeting demands for extra energy and protein requirement of the animal. The condition on the other hand lowers the pH of the rumen. Since many of the rumen microbes cannot tolerate low pH environment, the normally heterogeneous balanced population of microbes become skewed, favouring the acidophilic bacteria. The condition often leads to acidosis and thereby upsets normal digestion. The addition of feed buffers and neutralisers shown to have beneficial effects. Commonly used buffers and neutralisers are carbonates, bicarbonates, hydroxides, oxides, salts of VFA, phosphate salts, ammonium chloride and sodium sulphate etc. Buffers like sodium bicarbonate and magnesium oxide are used routinely in dairy cattle, to counteract the depression in milk fat synthesis due to low ruminal pH and reduced acetate/propionate ratio induced by a lower roughage and high grain diet. Sodium bicarbonate should be @ 0.6 to 0.8 percent of a total mixed diet and 1.2 to 1.6 percent of a concentrate mixture. Magnesium oxide should be added @ 0.2 to 0.4 of total mixed diet or 0.4 to 0.6 percent of a concentrate mixture. When feeding a combination of two, 2 to 3 parts NaHCO_3 should be mixed with one-part MgO. Feeding large amounts of these mineral may depress feed intake.

O. Chelates

Chelates aid in transport and to store metal ions. Chelates behave as a carrier for proper absorption, transportation in the circulatory system

and passing across cell membranes to deposit the metal ion at the site where needed. Among amino acids, cysteine and histidine are particularly effective metal binding agents and may be of primary importance in the transport and storage of mineral elements throughout the animal body. Ethylene diamine tetra acetic acid (EDTA) and other similar synthetic ligands also may improve the availability of zinc and other minerals.



Feeding, Housing and Health Management of Nursery Pigs

Shrilla Elangbam*, Vallabhaneni Srikanth, Mir Muneeb Rafiq, Bed Singh, Ajoy Das, Shivani Singh, Baishali Deb, Anamika Pandey, Salam Prabex Kumar Singh

Livestock Production and Management Section, ICAR-Indian Veterinary Research Institute (IVRI), Izatnagar, Bareilly, Uttar Pradesh- 243122, India.

Abstract: A crucial phase of swine production is the effective nurturing of nursery pigs, which establishes the groundwork for the pigs' future growth and development and ensures that they perform well and are healthy. The main goals of feeding and management strategies addressed in this abstract are to maximise the health, growth, and general wellbeing of nursery pigs. Compared to other production phases, nursery feeding and management are still more "art than science." Enhancements made to nursery management will have a significant impact on overall performance, which will maximise farm profit.

Keywords: Nursery pigs, swine, weaning, feeding, growth

Introduction

Weaned piglets transitioning from sow's milk to solid feed are referred to as nursery pigs. A nursery is a structure or building created especially to hold young pigs who have just been weaned and are preparing to go to the grower/finisher stage. Giving the freshly-weaned pig the right surroundings enhances its health, reduces the stress of weaning, and boosts its productivity. Smaller pigs grow more slowly and use less feed, thus better nursery management raises exit weights and enhances grow-out performance. Compared to their heavier counterparts, these post-weaning pigs require longer time to attain slaughter weight due to their slower growth and increased mortality risk (Collins *et al.*, 2017). Inadequate nursery management can lead to a variety of issues, such as higher mortality rates, lower nursery exit weights, and more medicine being used to treat both individual and collective health issues. The various essential aspects of feeding and management techniques meant to maximise the health, growth,

and general wellbeing of nursery pigs are enlisted below.

1. Feeding management

The main objective of the nursery's feeding programme is to supply an economical nutrient-dense, and palatable diet that promotes consistent, quick pig growth. A nursery pig's ability to grow and develop depends critically on its diet. Newly weaned pigs need to get used to eating solid food and drinking from a bowl or water nipple. The importance of weaning management is highlighted by the shift in the environment, being separated from the sow, and going from sow milk to solid feed at the same time. Understanding the nutritional requirements is essential to creating balanced diets that support healthy growth and immune system performance.

Various feeding management that can be implemented are as follows:

- i. Ensure that the diet is nutrient-balanced and contains the appropriate amounts of protein, energy, vitamins, and minerals.
- ii. Make diet plans depending on the nursery piglets' specific weight and age.
- iii. Make use of premium feed items, such as grains, soybean meal, vitamins, and minerals. Pelletizing improves performance while lowering dustiness, feed bridging problems, and diet segregation.
- iv. To improve the feed's digestibility and palatability, crumble or pellet it.
- v. Create a feeding schedule that entails many meals per day to guarantee consistency in nutrient intake. Pelletizing improves performance while lowering dustiness, feed bridging problems, and diet segregation.

- vi. Observe feed intake and modify the feeding schedule as necessary.
- vii. Make sure to always have access to fresh, clean water to avoid dehydration and encourage feeding.
- viii. Regularly check the purity of the water.
- ix. To boost gut health and improve overall immunity, include health supplements like probiotics.
- x. Tray dividers on the feeders are necessary to keep tiny pigs from resting in the feed tray and possibly becoming trapped.
- xi. Feeding four to six times a day to encourage intake and aids in maintaining the freshest possible feed.
- xii. When pigs are first weaned, there needs to be enough space in the pen for feeders for every pig.

2. Housing Management:

The environment and the housing provided to nursery pigs are crucial to the health and productivity of the young animals. When pigs are weaned, their initial feed consumption is greatly influenced by environmental factors (Wensley *et al.*, 2023). The ideal space, temperature, and ventilation needs to produce an environment that is comfortable. When feed intake is very low, as it is in the initial days following weaning, the temperature would need to be raised. Various housing managements can be done for optimum growth and health and it includes:

- i. Each pig should have enough room to stand, lay down, and get to food and water.
- i. Refrain from overcrowding since it might cause stress and stunt your growth.
- ii. Keep the space tidy and pleasant with the right ventilation.
- iii. Adjust humidity and temperature to maximise pig comfort.
- iv. Pigs should arrive in a dry and warm room.
- v. In order to prevent cooling or excessive heater operation, adjust pit fans to provide enough airflow for minimal ventilation, avoiding excessive airflow.
- vi. Excessive temperature fluctuations should be avoided since they can create health issues.
- vii. To track temperature variations, a thermometer capable of recording both the high and low temperatures have to be placed in every nursery room.

- viii. A room with enough lighting will encourage more feed intake and better elimination habits are encouraged by a brighter barn.
- ix. After weaning, aim for a light intensity of 100 lux, measured at the pig's level.
- x. Ensure that the resting place is always dry, warm, and clean.

3. Health monitoring and disease management

Proactive health management strategies, such as vaccination, parasite control, and disease surveillance for prevalent nursery pig illnesses, To maintain a healthy pig population, the importance of early detection, quarantine procedures, and veterinary intervention is emphasised. It is recommended that the mortality rate for nursery piglets not surpass 10%. A decrease in group health issues reduces the requirement for medicines.

In order to guarantee a clean and disease-free nursery environment, strategies for disease prevention, biosecurity precautions, and waste management are also discussed.

- i. Ensure that all feed intake, health, and intervention records are kept up to date.
- ii. Keep a regular eye on the behaviour, feed intake, and general health of the pigs.
- iii. Implement a health care programme that includes vaccinations and disease prevention measures.
- iv. Implementing preventative steps to stop the introduction of diseases and infections onto farms, as well as to stop their spread, is known as biosecurity.
- v. Immediately isolate and care for sick pigs.
- vi. Termite management among other animals to prevent disease-transmission is important.
- vii. Utilise external bait stations and ensure preventing rodents and birds reduce the amount of lush vegetation that surrounds the building.
- viii. To remove possible harbour areas, clear up unnecessary clutter or debris.
- ix. To stop birds from entering the property, install and maintain bird netting.
- x. Track the fly and bug populations all year long as pig infections can be transmitted by flies.
- xi. Refresh disinfectant baths and designate particular boots to improve biosecurity.



Conclusion

Last but not the least, the abstract offers an overview of all the important factors to take into account when feeding and managing for nursery pigs. To ensure the success of nursery pig production and create the foundation for a profitable swine operation, it is vital to implement excellent practices in nutrition, housing and health management.

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देसी मागुर, क्लारियस मागुर (हैमिल्टन, 1822) पालन और स्वास्थ्य प्रबंधन

अरुण शर्मा*, थोंगाम इबेम्बा चानू

भा.कृ.अनूप.- केन्द्रीय मात्स्यिकी शिक्षा संस्थान, पंच मार्ग, ऑफ यारी रोड, मुंबई - 400061, भारत.

परिचय:

क्लारियस मागुर जिसे आमतौर पर भारत में मगुर के नाम से जाना जाता है, भारत में कैटफ़िश की एक महत्वपूर्ण जलीय कृषि प्रजाति है (चित्र.1)। उन्हें मिट्टी के तालाबों में भारत के प्रमुख हिस्से में पाला जाता है। मागुर में ऑक्सीजन की कमी वाली पर्यावरणीय परिस्थितियों में भी बढ़ने की क्षमता होती है। वे देश में उच्च मांग में हैं क्योंकि यह माना जाता है कि मागुर औषधीय गुणयुक्त होता है। मागुर मोनो और पॉली कल्चर दोनों सिस्टम में कल्चर किया जा सकता है। हालांकि, अन्य खेती योग्य प्रजातियों के साथ संयोजन में मागुर पालन को अभी तक मानकीकृत नहीं किया गया है। मगुर वर्ष के विभिन्न मौसमों में अलग-अलग बीमारी के प्रकोप से पीड़ित होता है और उसके लिए उपयुक्त प्रबंधन रणनीति अपनाई जानी चाहिए। इस दिशा में आई.सी.ए.आर.-सी.आई.एफ.ई., एफ.डब्ल्यू.एफ.एफ., बलभद्रपुरम, काकीनाडा केंद्र ने रोहू (लेबियो रोहिता) के साथ-साथ मोनो और पॉलीकल्चर दोनों सिस्टम में मागुर की ग्रो-आउट कल्चर प्रणाली को मानकीकृत करने और बेहतर स्वास्थ्य प्रबंधन की पहल की है। इस आलेख में मगुर की ग्रो-आउट कल्चर प्रणाली और विभिन्न स्वास्थ्य प्रबंधन प्रक्रिया के बारे में चर्चा किया गया है:

तालाब की तैयारी:

1 मीटर गहराई वाले 200-1000 m² (0.02-0.1 हेक्टेयर) आयताकार मिट्टी के तालाब को ग्रो-आउट तालाब के रूप में इस्तेमाल किया जाता है (चित्र.2)। बड़े आकार के तालाबों का उपयोग भी किया जा सकता है। मिट्टी के तालाब के तल को प्राथमिकता दी जाती है क्योंकि यह बेहतर प्लवक विकास में सहायता करता है। यह सुनिश्चित करना महत्वपूर्ण है कि तालाब तल या बांध किसी भी छेद या दरार से मुक्त हो। मागुर तालाब जलीय खरपतवारों से मुक्त होना चाहिए (चित्र.3)। मागुर मछली में एक स्थान से दूसरे स्थान पर चलने की क्षमता होती है। वे बंधों पर चढ़ सकते हैं और जमीन पर भी काफी दूरी तय कर सकते हैं, यही कारण है कि उन्हें "

वॉकिंग कैटफ़िश" कहा जाता है। मागुर के स्थानांतरण को रोकने के लिए 0.75 मीटर (सतह जल और तालाब बांध के बीच) का एक स्पष्ट फ्री बोर्ड होना आवश्यक है। यह भी देखा गया है कि चिकनी मिट्टी मागुर पालन के लिए अधिक उपयुक्त होती है। तालाबों की तैयारी के लिए इसमें 250 किग्रा/हेक्टेयर (CaCO₃) की दर से चूना डाला जाता है। पुराने और बारहमासी तालाबों के मामले में, मगुर मछली के भंडारण से 10-15 दिन पहले 500-750 किलोग्राम/हेक्टेयर की दर से क्लिक लाइम डाला जाता है। क्लिक चूने के प्रयोग से तालाबों में अवांछित शिकारियों और अन्य जीवों से छुटकारा पाने में मदद मिलती है। यदि तालाब अवांछित मछलियों से संक्रमित हैं तो उनसे छुटकारा पाने के लिए 4 किग्रा/200m² (200 किग्रा/हेक्टेयर) की दर से ब्लिचिंग पाउडर डाला जा सकता है। मागुर में हवा में सांस लेने की अपनी अनिवार्य प्रकृति के कारण, वे आम तौर पर एक विशिष्ट अंतराल के बाद वायुमंडलीय ऑक्सीजन के लिए पानी की सतह पर आते हैं, इसी कारण से मागुरपे पक्षियों द्वारा शिकार होने का खतरा रहता है। इस कारण से मागुर मछली तालाब को नायलॉन नेट से ढक दिया जाता है (चित्र.4)। तालाबों को छने हुए पानी (60 मेष का आकार के साथ) से भरा जाता है और फिर जैविक खाद जैसे गाय के गोबर का घोल @ 20 किग्रा/200m² (1000 किग्रा/हेक्टेयर); प्लवक वृद्धि के लिए ग्राउंड नट ऑयल केक @ 2 किग्रा/200m² (100 किग्रा/हेक्टेयर); डीएपी @ 2 किग्रा/200m² (100 किग्रा/हेक्टेयर) डाला जाता है। यह आवश्यक है कि हर दो महीने के अंतराल पर (आमतौर पर पानी की गुणवत्ता और प्लवक की स्थिति के विश्लेषण के बाद) समान मात्रा में खाद डालकर मानुरिंग किया जाए।

स्टॉकिंग:

यह वांछनीय है कि स्टॉकिंग के लिए 7-10 सेमी लंबाई की मागुर फिंगरलिंग ही तालाब में डाला जाए। शोध से पता चलता है कि 10 सेमी या उससे अधिक की





Fig.1



Fig.2



Fig.3



Fig.4



Fig.5



Fig.6



Fig.7



Fig.8



Fig.9



Fig.10

चित्र.1: देसी मगुर (*क्लारियस मागुर*); चित्र.2: सूखा तालाब; चित्र.3: जलीय खरपतवारों के साथ तालाब; चित्र.4: मत्स्यपालन तालाब जाल से ढकना; चित्र.5: मछली स्टॉक का आकलन करने के लिए परीक्षण जाल; चित्र.6: 1 साल पालन के बाद मगुर की वृद्धि; चित्र.7: एक साल पालनेके बाद किसानों को मगुर का वितरण; चित्र.8: जीवित मागुर मछली परिवहन के लिए छिद्रित ढक्कन के साथ गोल प्लास्टिक के टब चित्र.9: बीमारीसे मगुर की मौत; चित्र.10: मागुर अल्सर।

मागुर फिंगरलिंग की वृद्धि और जीवित रहने के मामले में बेहतर परिणाम देती है। मोनोकल्चर के लिए 5-6 न./एम² (50,000-60,000/हेक्टेयर) और कार्प के साथ पॉलीकल्चर के लिए 2-3 न./एम² (20,000-30,000/हेक्टेयर) की दर से फिंगरलिंग का स्टॉकिंग किया जाता है। मागुर के साथ पॉलीकल्चर के लिए रोहू (लैबियो रोहिता) फिंगरलिंग को 1 न./एम² (10,000 न./हेक्टेयर) की दर से स्टॉक किया जाता है। मार्केटिंग के लिए मागुर को पकड़ना मछली पालन के एक वर्ष के बाद की जा सकती है या पालन के 5-6 महीने बाद की जा सकती है। मछली पालन के दौरान मागुर स्टॉक वृद्धि और स्वास्थ्य मूल्यांकन की लिए परीक्षण जाल चलाके मछली की जांच करना आवश्यक है (चित्र.5)।

आहार एवं आहार प्रबंधन:

मागुर सर्वाहारी मछली हैं और इन्हें प्रोटीन युक्त आहार की आवश्यकता होती है। मागुर को पेलेटेड आहार शरीर के वजन के 5% के हिसाब से 30% प्रोटीनयुक्त आहार दिया जाता है। मागुर मछली रात के समय अधिक सक्रिय होती है, इसलिए दिन के कुल आहार में से 30% सुबह के समय और 70% शाम के समय में दी जाती है और भोजन के समय का सख्ती से पालन किया जाता है। रोहू मछली को 5% औसत शरीर का वजन के हिसाब से चावल की भूसी खिलाया जाता है। अतिरिक्त आहार के प्रयोग से बचें, क्योंकि अधिक फीड से गंदगी फैलती है और तालाब का तल प्रदूषित हो जाता है, जिसके परिणामस्वरूप पानी की गुणवत्ता खराब हो जाती है और रोगजनक जीवकी संख्या बढ़ जाती है और बीमारी फैलती है।

जल गुणवत्ता प्रबंधन:

ग्रो-आउट मछली पालन प्रणाली में जल गुणवत्ता प्रबंधन एक महत्वपूर्ण पहलू है। मागुर कल्चर तालाब के लिए इष्टतम जल स्तर एक मीटर है; नियमित अंतराल पर ताजा पानी डालकर तालाबों में जल स्तर बनाए रखा जाना चाहिए। अनुकूल वातावरण प्रदान करने के लिए मछली पालन के तीसरे महीने से पाक्षिक अंतराल पर 10-15% पानी का आदान-प्रदान करने की जरूरत है। मागुर पालन के लिए इष्टतम जल गुणवत्ता मापदंडों का उल्लेख तालिका 1 में किया गया है। मागुर कल्चर में अमोनिया पानी की गुणवत्ता को सीमित करने वाले मापदंडों में से एक है।

मार्केटिंग के लिए मछली पकड़ना:

मार्केटिंग के लिए मछली एक वर्ष की पालन अवधि के बाद 150-180 ग्राम की आकार सीमा के साथ या 6 महीने की पालन अवधि के बाद 80-100 ग्राम की आकार सीमा पर की जा सकती है (चित्र.6)। मछली पकड़ने की लिए तालाब का पानी निकाल दिया जाता है और मछलियों को आउटलेट पर एकत्र किया जाता है और तालाब के तल से निकाला जाता है। छोटी और लंबी दूरी के परिवहन के लिए पकड़े गए मागुर स्टॉक को थोड़ी मात्रा में पानी के साथ छिद्रित शीर्ष वाले टिन कंटेनर में रखा जा सकता है।

उत्पादन:

आम तौर पर जब मागुर फिंगरलिंग को ग्रो-आउट कल्चर तालाब में 10 सेमी के आकार में रखा जाता है, तो मागुर और रोहू दोनों की एक वर्ष के पालन के बाद लगभग 70-80% जीवित रहने की संभावना होती है। 1 वर्ष की मछली पालन अवधि के बाद मागुर मछली को रु. 300-450/- प्रति किलोग्राम खेती की कीमत दर पर बेचा जा सकता है (चित्र.7)।

मागुर परिवहन:

उपभोक्ताओं को मछलियों के उचित वितरण के लिए मछली का परिवहन और वितरण चैनल बहुत प्रभावी होना चाहिए। यह मत्स्य पालन का एक महत्वपूर्ण पहलू है, क्योंकि जीवित और संरक्षित दोनों प्रकार की मछलियों को आवश्यकता के अनुसार एक स्थान से दूसरे स्थान तक ले जाया जा सकता है। इसका एक बड़ा फायदा यह है कि मागुर को जीवित स्थिति में बहुत आसानी से ले जाया जा सकता है, जिसके कारण उनकी कीमत अधिक होती है। मागुर के स्थानीय परिवहन के लिए एल्युमीनियम हंडीज़ का उपयोग किया जाता है और लंबी दूरी के परिवहन के लिए छिद्रित ढक्कन वाले गोल आकार के टिन और प्लास्टिक के कंटेनर का उपयोग किया जाता है (चित्र.8)। कंटेनर में डालने से पहले उनके पेक्टोरल फिन को रबर ट्यूब से ढक दिया जाता है ताकि अन्य मछलियों और कंटेनर को नुकसान न हो।

स्वास्थ्य प्रबंधन

निवारक उपाय:

मागुर जलकृषि के सभी चरणों में रोग के खतरों से ग्रस्त है (चित्र.9; चित्र.10)। उनके बिना स्केल शरीर के कारण वे रोगों के लिए अतिसंवेदनशील हैं, यहां तक

कि तालाब तल, जाल या अन्य सब्सट्रेट के साथ मामूली रगड़ से त्वचा विपथन होता है, जो आगे विभिन्न जीवाणु और फंगल संक्रमण से और अधिक फेल जाता है। रोग के प्रकोप को रोकने के लिए निम्नलिखित स्थिति को अनुकूलित किया जाता है:

- अनुकूलतम पानी की गुणवत्ता
- अनुकूलतम भोजन
- मानक स्टॉकिंग घनत्व

उपचार संभावनाएं:

जब भी मागुर में किसी भी बीमारी का प्रकोप होता है तो रोग प्रेरक एजेंट की पुष्टि के लिए प्रयोगशाला परीक्षण के लिए भेजा जाना चाहिए। मछली मृत्यु दर को रोकने के लिए विश्लेषण किए गए नमूनों के परिणामों के आधार पर सही समय पर सही उपचार का प्रयोग करना आवश्यक है। किसानों को रोग प्रकोप के मामले में प्रयोगशाला में निम्नलिखित नमूनों का परीक्षण करना चाहिए:

- रोगग्रस्त तालाब के पानी का नमूना
- मरणासन्न या ताजा मृत मछली
- फ़ीड नमूना

निष्कर्ष:

देसी मागुर पालन एक अत्यधिक किफायती जलीय कृषि उद्यम है। मागुर की खेती में सफल होने के लिए विभिन्न चिकित्सीय और रोगनिरोधी उपायों का सावधानीपूर्वक पालन करना जरूरी है।



Care and Management of New Born Calf

Manju Bissu¹ Priyanka Bissu (PG Scholar)² Sandeep Bissu (PG Scholar) and Manisha Godara (PG Scholar)

* (PhD Scholar), post-graduate institute of Veterinary Education and Research, Jaipur
(Department of Animal Genetics and Breeding)

¹ & ³* (PG Scholar) Rajasthan University of Veterinary and Animal Sciences, Bikaner
(Department of Livestock Production Management)

²* (PG Scholar) Rajasthan University of Veterinary and Animal Sciences, Bikaner
(Department of Veterinary Physiology)

The first few hours after calving have most critical period for calf in his entire life. A comfortable clean area is needed. After birth first off remove mucus from nostrils and mouth so calf can easily breathe and avoided from blockage of respiratory passage. To stimulate breathing, use piece of straw to tickling nasal passage. To prevent or remove any fluid inhalation, uplifting of hind legs of calf, after ensuring proper breathing allow dam to lick calf. Licking by dam makes calf clean and dry. Sometimes primipara dams show shy behaviour in that case cleaning of calf can be assist by attendants with the help of clean towel. It enhances circulation in calf body and minimizes heat loss by drying coat its helps in maintenance of body temperature between 38 °C to 39 °C.

Management of naval cord should be done in very hygienic manner because chances of infection entry through naval cord are much higher. Any mistake can lead to serious disease like navel ill/joint ill etc. Immediately after confirming proper respiration of new born, tie or ligate the naval cord with clean thread 2cm away from base. Then cut the naval cord by sterile or disinfected scissor 2 inches from base. Then apply antiseptic solution (7% tincture iodine solution) or dip the attached part of naval cord in antiseptic solution. For good management reapply antiseptic solution after 12 hours.

Mostly within one hour or some times it can be upto 2 hour calf starts standing. Colostrum feeding is must needed for calf survival. Colostrum is rich in nutrients and antibodies that simple milk don't have, It reduces mortality rate and boosts immunity of calf that helps newborn to adapt in new environment. Colostrum feeding also helps in meconium (first faeces of neonate calf) excretion. To allow calf to suck milk from mother dam first check milk to avoid any abnormality or infection in milk, and clean dam udder. Within 2 hour of birth provide colostrum upto 1/10th of body weight of calf and later on in next 12 hour provide 2 liters colostrum. Colostrum feeding should be done upto 5 days. Check the status and temperature of new born calf every 2 hour.

Types, Frequency, Clinical Signs and Management of Fish Crustacean Parasites

* Dr. G. Ganesh and Dr N. Rajanna

*Subject Matter Specialist (Aquaculture)

Programme Coordinator & Head

Krishi Vigyan Kendra, P.V. Narsimha Rao Telangana Veterinary University, Mamnoon, Warangal-506 166.

1. Introduction

Fish illnesses can be classified as infectious or non-infectious. Non-infectious diseases are abiotic in nature and result from a variety of biotic sources, such as bacteria, fungus, viruses, and parasites from other animal species. Due to their contagious nature and ability to spread quickly across several hosts, particularly in contaminated environments, parasitic illnesses in fish are typically regarded as biological markers of environmental pollution. There are two kinds of parasites: "obligate" parasites that require hosts to survive and/or reproduce, and "opportunistic" parasites that live freely and feed on vulnerable hosts, a condition known as opportunistic parasitism. An unjust connection in which one living entity gains while the other suffers is known as parasitism. Fish infections with parasites affect fish output both directly and indirectly. The parasites affect the development and reproductive capacity of the hosts and raise the death rates of the infected fish, which results in a large financial loss for the aquaculture sector. One tactic for that unequal relationship is ecto-parasitism, in which the parasite targets the external organs of the ultimate host, such as the integumentary system and bodily apertures, which typically have an impact on the hosts' physiology, behaviour, energetics, and even morphology. Numerous ectoparasite species, ranging from Protozoa like *Trichodina* sp. to Chordata like Sea lamprey (*Petromyzon* sp.), have been shown to cause disease in fish farms. The tiny crustaceans occasionally cause internal organ infestations and endoparasitization in their hosts. Because they have evolved to be closely related to and dependent on other creatures for existence, a number of crab species have contributed to the spread of illness. These crustacean parasites have the ability to infect

fish species found in fresh, brackish, and marine water environments globally. While endo-parasitic crustaceans remain in the bloodstream or target internal organs such as the heart and branchial tissues, ectoparasite crustaceans target the integument, gills, nostrils, and/or oral cavity of fish. Additionally, Crustacea may infect fish at various phases of their lives and readily adapt to their hosts; this infestation might manifest as a single fish having a double, triple, or numerous parasites, which can lead to significant disease outbreaks in aquaculture. In addition, blood parasites and other microbiological pathogens like viruses are spread by parasitic crabs. Consequently, secondary infectious illnesses are typically linked to fish parasitism, exacerbating the severity of the infestation and the suffering of the affected fish. Fish parasites include a wide variety of crustacean species, all of which belong to one of three main groups: branchiura, isopods, or copepods. This page reviews a substantial amount of information on fish parasitizing crustaceans, including their prevalence, pathophysiology, and management.

Major Crustacean Parasites for Fish

The primary groups that make up the classes of parasitic crustaceans are known to include Copepoda, Branchiura, Isopoda, Amphipoda, Barnacles, and Ostracoda. The three main categories of fish crustacean parasites are Copepoda, Isopoda, and Branchiura. These groups are either ecto- or endoparasites; moreover, the only family in the world that has mesoparasites on fish is the Lernaeidae (Copepoda) family. Ostracoda are not parasites and cannot pose a major threat to the host fish, but they can attach themselves to fish tissues that have been harmed by other isopod parasites and feed on the mucus and skin debris. The parasitism of an ostracod (*Sheina*



Fig.1. Lernaea Diseases Effected Fish

orri) on a shark's gills was, nonetheless, documented in early research; however, they did not guarantee that the ostracod would really consume shark flesh.

A. Order: Copepoda

On fish, copepods are the most frequent and widespread type of parasite. Copepoda are tiny to microscopic crustacean parasites that were free-living in their early life stages before, in most cases, becoming fish pathogenic and causing significant mortality rates in fish farms, in contrast to the generously sized Isopoda and Branchiura. It has been observed that some copepod members parasitize a broad variety of fish species globally. While some of their larval stages are free-living crustaceans, the adults of the genus *Caligus* (order Siphonostomatoida) are ectoparasites and are known as fish lice (Sea fish lice). 2009 saw the isolation of the parasite copepod *Caligus chistos* from the body surface and gill chambers of marine fish kept in floating cages in Malaysia. This was the

documented case of the copepod. Certain mature male copepods, including *Ergasilus* sp., are able to live freely, but the females are limited to parasitizing fish. It has been documented that salmincola species ecto-parasitize both wild and farmed salmonids. Other common fish lice copepods that have been observed to infest the external bodies of multiple freshwater fish gathered from various aquaculture facilities include *Lernaea* sp. and *Ergasilus* sp.

B. Order: Isopoda

Cymothoids, Epicardiae, and Gnathiids are the three primary parasite groups that make up crustacean isopods. Only fish are parasitized by adult cymothoids, gnathiid larvae parasitize fish while their adult forms live freely, and epicardia parasitize other Crustacea. Some isopods are obligatory parasites, much as all other parasites, while others are opportunistic. There have been reports of fish larvae and adults being infected by a number of cymothoids isopods. They attack the

host's primitive tongue (the tongue-biter parasite *Ceratothoa famosa*) or infest various bodily cavities and surfaces. They may even attach themselves within the body and feed on its blood. Furthermore, isopods have the ability to endoparasitize the internal organs of their hosts due to their minuscule size.

C. Order: Branchiura

Branchiura has a number of fish parasite groups that have been extensively researched, covering topics ranging from sexual size dimorphism to fish and frog pathogenicity. Often referred to as fish lice or fish louse, *Argulus* sp. is one of the most prevalent Branchiura parasites on fish and associated species. Globally, there are about 100 distinct species of *Argulus* that may infect freshwater and marine fish in both natural and artificial environments, including ponds and wild fish. A few of these species can also infect toads and frogs.

vulnerability to parasite illnesses is, however, influenced by their size and age. Larger fish are more likely than smaller fish to be infected with *Argulus foliaceus* and *Ergasilus sieboldin*. The duration of exposure is a crucial element in the parasites' ability to gather on their hosts and cause illness. To a certain degree, the incidence varies between the fish's contaminated areas. In many different aquatic environments and depths, Ectoparasitism is common; however, in deep-sea communities, the diversity of both the hosts and the ectoparasites declines, and the ectoparasites are frequently detached. Further elements that affect the fish's vulnerability to parasite infections include lighting and their sluggish swimming pace in the dark. Summer is the season when parasitic infections and development occur more frequently because of the higher water temperatures. The crab parasites, on the other hand, usually hatch their eggs throughout the summer at a considerably slower pace and at a faster rate during the winter.

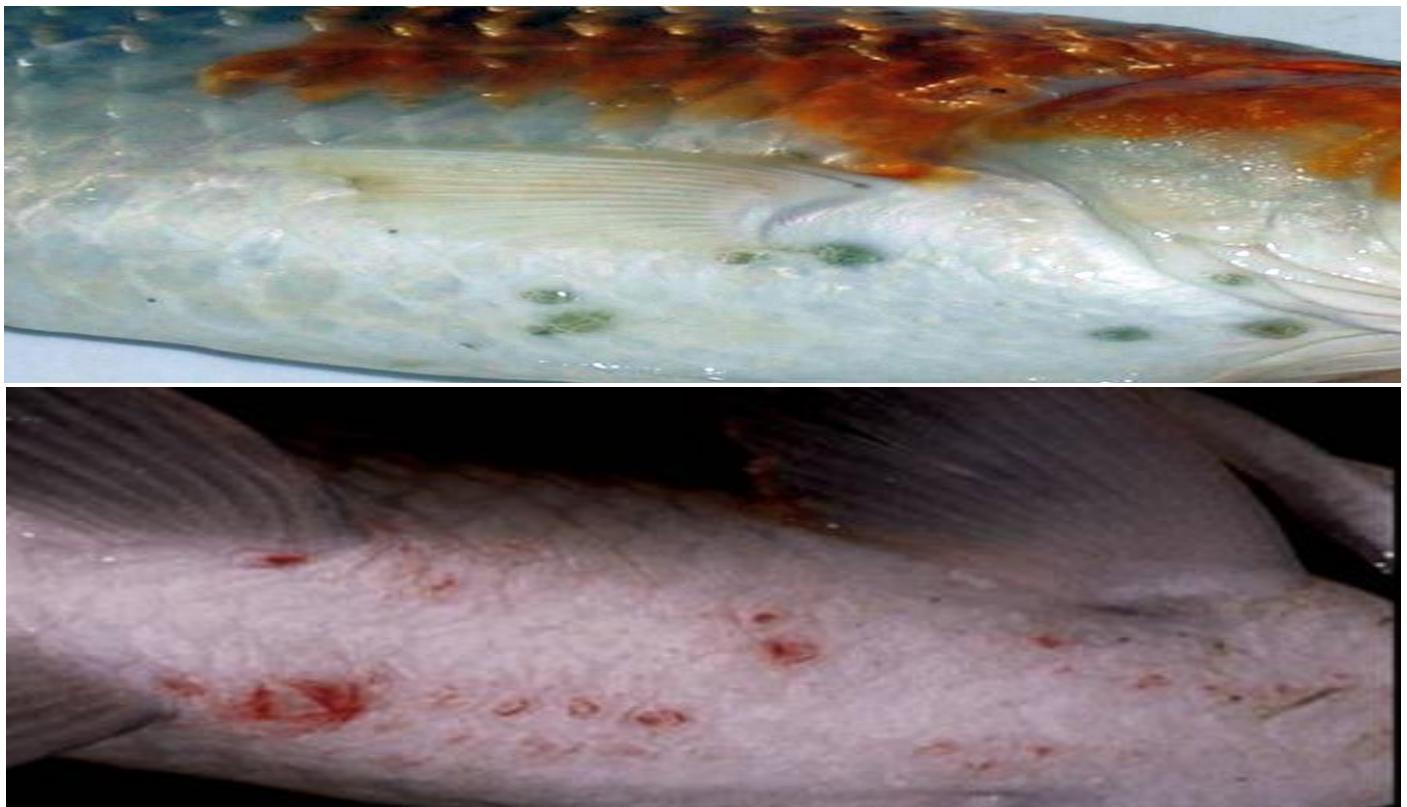


Fig.2. Argulus Diseases Effected Fish

Prevalence of the Crustacean Parasitism and Fish Susceptibility

Crustacean parasitism, which is widespread in contaminated habitats, may affect any type of fish found in fresh, brackish, or marine waters, including farmed, wild, and feral fish. Fish's

Branchiura *Argulus coregoni* has been known to have a higher egg prevalence in the summer, and the deeper stones have the greatest egg grasping. With a higher frequency in warm marine waters, isopod crustacean parasites have been documented as obligatory ectoparasites for fish in both fresh and

marine waters. In July, a greater seasonal predominance of the copepod *Lernaea cyprineca* was observed.

Clinical signs

A range of clinical symptoms have been displayed by the infected fish as a defence strategy. many studies mentioned many typical clinical indications that define the ectoparasites of crustaceans. Fish die as a result of osmoregulatory failure and secondary illnesses brought on by severe sea lice infestation (*Lepeophtheirus* sp. and *Caligus* sp.). To get rid of the unpleasant ectoparasites, the afflicted fish scrapes its body against hard surfaces while the host fish secretes more mucus from its skin and gills. Argulosis was primarily characterised by fast operculum motions, profuse mucus production, and redness and opacity of the skin). An infestation of Branchiura and Copepoda is often indicated by swelling of the attachment sites in conjunction with erythematous and haemorrhagic symptoms. Adhesion sites for worms have been documented to exhibit skin damage and inflammations. gills that are blocked and anoxia were also reported as signs of crustacean ectoparasites. A frequent indicator of an isopoda infestation is severe tissue deterioration and malfunction that extends to the replacement of fish mouth. Not to be overlooked is the possibility that ectoparasites may modify the host skin microbiome; this is linked to the frequent switching of the hosting fish or location. In addition to causing skin damage, this may make the host more vulnerable to subsequent infections. The copepod *Lernaea cyprineca*'s microbiome was recently discovered to deviate markedly from the typical microbial communities of unbroken skin, whether from fish that were infected or not. This suggests that the skin microbiome is altered when a crustacean infestation causes a skin ulcer. Furthermore, fish tissues' proteome and transcriptome characteristics may be changed by crustacean parasites; as a result, in-depth molecular studies on the proteome and transcriptomic levels are necessary to comprehend the host parasite interactions.

Treatment and Control

Aquaculture relies heavily on prevention of fish diseases over treatment, so managing fish health (prophylactics in feed, for example) and environment (maintaining water and feed quality,

avoiding pond overstocking, drying, and liming) is essential to preventing parasitic infections. Effective feedback greatly depends on prompt treatment and a precise pond case history questionnaire. Furthermore, the development of ant parasite vaccines is strongly linked to omics technologies; still, fish parasitology is still pursuing this new field in parasitology.

a. Chemotherapeutic Control

In aquaculture chemotherapy, a number of chemicals are often utilised, either separately or in combination. Chemotherapeutic treatments, such as avermectins, benzoylphenyl urea, pyrethrin/pyrethroid compounds, hydrogen peroxide (oxidising agent), and organophosphates, were claimed to be effective in controlling sea lice in an early research. A number of parasites were defeated with the help of sodium chloride, Dipterex, and lime; in fish farms, argulosis was successfully treated with lime, potassium permanganate. controlled argulosis treated indefinitely with "Benzene hexachloride" at modest dosages (0.12 and 0.25 mg/L) Interestingly, the use of bio safe and highly delivered natural medicines has been popular recently, particularly for the treatment of endoparasites infestations. These days, the use of bio therapeutics with high delivery, efficiency, and biosafety is popular. This is especially true for managing endo-parasitic diseases, as it helps prevent any potential adverse effects that might endanger fish or the environment. More research is still required in this developing subject, although bio nanotechnology has recently been strongly linked to fish medicine for a number of bio therapeutic uses.

b. Biological Control

In instances when fish infections are spreading, it is recommended to use manual methods like quarantine and thorough programmes for managing fish health and ponds instead of chemotherapy, which might have detrimental side effects for fish and their customers. Biological management with the use of cleaning symbionts is a frequent substitute technique for managing crustacean parasites. Hence, certain aquatic animals likely from different fish species are frequently employed in aquaculture to biologically manage parasites, and they show promise in managing crustacean ectoparasites. For the purpose of maintaining fish health and controlling

crustacean parasites, it is advised to source wrasse fish from farms, particularly in the first year of the fish's life cycle. According to reports, wrasse parasites provide little to no damage to farmed fish since they are unique to wrasse and/or need an invertebrate host to finish their life cycle. In previous research, two wrasse species the rock cook (*Centrolabrus exoletus*) and the goldsenny (*Ctenolabrus rupestris*) reported a successful symbiosis cleaning strategy for delousing farmed Atlantic salmon (smolt) while taking infestation pressure quantification and wrasse/salmon ratios into account. For the purpose of delousing Atlantic salmon, Ballan wrasse (*Labrus bergylta*), both farmed and wild, were used. Similarly, in Atlantic salmon-intensive farms, the biological control of sea lice (*Lepeophtheirus salmonis*) infestation was achieved with the use of lumpfish (*Cyclopterus lumpus* L.).

Conclusion

The aquaculture business faces a significant danger from parasitic crustaceans. All habitats on Earth are home to them, albeit they are more common during the warm seasons when temperatures are greater. Fish overstocking, temperature, light, depth, age, size, and swimming speed are the primary parameters influencing the incidence of crustacean parasitism on fish. Furthermore, the length of time spent in contact with the parasites affects how bad the infestation gets. Fish that host to crustacean parasitism suffer significant harm and tissue malfunction, which has the potential to wipe out the whole population of affected fish. Both biological control techniques and medicines are available for eliminating the crustacean parasites. Biological control methods and bio therapeutics, however, are strongly advised for the protection of the environment.

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