



## The Impact of Dropsy on *Labeo Rohita* & its Prevention Strategies

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### ABSTRACT

This study looks at preventative methods as well as the effects of dropsy in *Labeo rohita*, often known as Rohu. Fish populations face serious health risks from dropsy, a disorder marked by fluid buildup in the body cavity. These risks include slower development rates, compromised organ function, and higher mortality rates. This study evaluates the pathophysiology, etiology, and environmental factors causing dropsy in *Labeo rohita* using an extensive assessment of the literature and experimental investigation. Additionally, a number of preventative techniques are covered in order to reduce the incidence of dropsy and enhance fish welfare in aquaculture settings. These techniques include feed optimization, water quality management, and disease control methods.

**Keywords:** Causes of dropsy, Affect of dropsy, *Labeo rohita*, Prevention strategies, Treatment.

### Introduction

The most significant of the three major Indian carp species employed in carp polyculture systems is rohu (*Labeo rohita*). This elegant Indo-Gangetic riverine species naturally inhabits the rivers of Pakistan, Bangladesh, and Myanmar, as well as the riverine system of northern and central India. It has been introduced into nearly every riverine system in India, including the Andaman freshwaters, where its population has flourished. Numerous other nations, including the Philippines, Malaysia, Nepal, Sri Lanka, the former USSR, Japan, China, and certain African nations, have also welcomed the species. This carp has a centuries-old traditional culture that dates back to the little ponds of the eastern provinces of India.<sup>[4][10]</sup>

Abnormal fluid accumulation in bodily cavities resulting in organ malfunction and distention of the abdomen is referred to as dropsy. Dropsy is characterized by abdominal bloating, projecting scales, and difficulties swimming in *Labeo rohita*. The growth, survivability, and marketability of the fish can all be severely impacted by this ailment, which might result in severe financial losses for fish farmers and have an effect on the food security of communities who depend on Rohu.

Strategies for effective prevention are essential to addressing this issue. These could include keeping the quality of the water at an ideal level, adopting healthy eating habits, and acting quickly on any illness symptoms. Enhancing *Labeo rohita* health and well-being in aquaculture settings requires an understanding of the causes, symptoms, and preventive strategies.

The effects of dropsy on *Labeo rohita* are extensive and complex. Fish that are infected experience deteriorated health, slower growth, and eventually death. For farmers, this means huge financial losses that have an impact on their ability to produce as well as their revenue. Moreover, dropsy can spread quickly among fish populations, posing a threat to the entire aquaculture sector in a given area and causing widespread epidemics.<sup>[7]</sup>

### Historical background

#### 1. Ancient Times:

##### 1. Ancient Times:

Fish disorders that damage internal organs have been mentioned in ancient Indian scriptures such as the Manusmriti (c. 2nd to 4th century CE). It does not specifically address dropsy in rohu, but it does raise awareness of internal fish illnesses. Approximately 500 BCE, ancient Chinese aquaculture methods emphasize maintaining fish health and water quality, which may have an indirect effect on **preventing dropsy**.

**2. Founding (1930s):** Since researchers started noticing specific signs in infected fish in the 1930s, the disease known as dropsy in fish has been known to exist.

**3. Initial Observations:** Fish with dropsy showed swelling, especially around the abdomen, which gave them a recognizable bloated look.

**4. Bacterial Connection (1950s):** It was discovered in the 1950s that bacterial infections, particularly those brought on by *Aeromonas* and *Pseudomonas* species, are frequently linked to dropsy in fish.

**5. Environmental Factors (1970s):** Research conducted in the 1970s revealed that overpopulation, stress, and poor water quality all played a part in the development of fish dropsy outbreaks.

**6. Diagnostic Progress (1980s–1990s):** Better diagnostic technologies, like molecular approaches and bacterial cultures, made it possible to identify dropsy's causal agents with greater precision.

**7. Impact on Aquaculture (2000s):** Dropsy is still a major problem in aquaculture, affecting many different types of farmed fish and resulting in financial losses.

**8. Preventive Measures (2010s):** To reduce the likelihood of dropsy outbreaks, contemporary fish farming techniques place a strong emphasis on preventive measures, such as preserving ideal water quality, immunization, and biosecurity.

**9. Recent Developments:** Investigations into the particular infections and environmental elements causing dropsy in rohu are still ongoing. Novel therapeutic and preventive strategies, such as the application of nanotechnology, herbal extracts, and probiotics, are being researched. More attention is being paid to sustainable aquaculture methods, which include biosecurity, water management, and responsible feed formulations to reduce the danger of dropsy.

#### **Causes of dropsy on *Labeo rohita***

**1. Bacterial infections:** Bacterial pathogens like *Aeromonas hydrophila*, *Pseudomonas aeruginosa*, and *Streptococcus aureus* are prime culprits.<sup>[1][2]</sup>

##### **Causes of dropsy due to bacterial infections:**

**Immune System Compromised:** Fish with weakened immune systems are more susceptible to bacterial illnesses. Stress can weaken fish's immune system, leaving them vulnerable to bacterial infections. Examples of stressors include bad water quality, overpopulation, a poor food, and aggressive tankmates.

**Gram-Negative Bacteria:** Dropsy can be caused by a number of gram-negative bacteria that are commonly found in aquariums. *Aeromonas* species, *Pseudomonas* species, and *Vibrio* species are among them. Internal inflammation and fluid accumulation can result from these bacteria infecting wounds, gills, or the digestive tract.<sup>[11]</sup>

**Organ Dysfunction:** The ability of critical organs like the kidneys, liver, and gills to appropriately control fluid balance can be harmed by bacterial infections. As a result, there may be an accumulation of fluid in the tissues and body cavities, which can lead to the characteristic dropsy swelling.

**Bacterial Toxins:** Some types of bacteria produce toxins that impair organ function and further erode the immune system. The fish's recovery may be hampered by this chain of events, which might exacerbate dropsy symptoms.

**Secondary Infections:** If a bacterial infection is left untreated, it may spread to other body regions or weaken the fish even more, which leaves it open to secondary infections from parasites or other opportunistic germs. This may make the dropsy disease worse and lower the prognosis.

**2. Parasitic infections:** Protozoan parasites like *Myxobolus* spp. and *Ceratomyxa* spp. can cause dropsy symptoms.

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#### **Causes of dropsy in fish due to parasitic infections:**

Fish suffering with dropsy, sometimes referred to as bloat, exhibit an abnormal buildup of fluid in their tissues or body cavities, giving them a bloated or pinecone-like look. Although there are a number of causes of dropsy, parasitic infections are a major worry. The following particular parasite diseases can cause dropsy in fish:

##### **Flukes:**

- These flatworms attach to the gills, skin, or fins of fish, damaging tissues and disrupting proper oxygen uptake.
- Common fluke types include monogeneans and digeneans.
- Symptoms: Flashing, gasping for air, lethargy, and skin lesions.

##### **Tapeworms:**

- These internal parasites live in the intestines of fish, absorbing nutrients and releasing harmful toxins.
- They can cause malnutrition, stunted growth, and dropsy.
- Symptoms: Lethargy, weight loss, and abdominal distention.

##### **Nematodes (Roundworms):**

- These worms can infest various organs in fish, including the intestines, muscles, and even the swim bladder.

- They can damage tissues, disrupt organ function, and lead to dropsy.
- Symptoms: Loss of appetite, emaciation, and erratic swimming.

#### **Myxosporeans:**

- These microscopic parasites form cysts in various fish tissues, including the kidneys, muscles, and gills.
- They can damage organ function and disrupt fluid balance, leading to dropsy.
- Symptoms: Abdominal swelling, exophthalmos (pop-eye), and skin lesions.

#### **Acanthocephalans (Hookworms):**

- These spiny worms attach to the intestine of fish using barbed hooks, causing tissue damage and internal bleeding.
- This can lead to anemia, electrolyte imbalance, and dropsy.
- Symptoms: Lethargy, anemia, and loss of appetite.

**3. Nutritional deficiencies:** Lack of essential vitamins and minerals, particularly protein and vitamin B12, can weaken the immune system and contribute to dropsy.



**Fig 1: Fish affected by nutritional deficiency**

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### **Causes of dropsy in fish due to nutritional deficiencies:**

#### **Protein Deficiency:**

The liver produces less albumin when it consumes less protein.

By keeping the body's fluid balance intact, albumin helps avoid fluid accumulation in the belly (dropsy).

Furthermore, fish that are low in protein have weakened immune systems, which leaves them more vulnerable to secondary infections that exacerbate dropsy.

#### **Essential Fatty Acid Deficiency:**

The integrity and functionality of cell membranes are disrupted by a deficiency in omega-3 fatty acids, specifically EPA and DHA.

This may result in ascites, or dropsy, which is a bodily cavity full with fluid leaking from blood vessels.

Furthermore, renal function is impacted by shortages in essential fatty acids, which impairs fluid management and exacerbates dropsy.

#### **Vitamin Deficiencies:**

The vascular system and other connective tissues are weakened by a vitamin C shortage.

This may worsen dropsy by increasing vascular permeability and allowing fluid to seep into the bodily cavity.

Other vitamin deficiencies, such as those in B12, thiamine, and biotin, might also have an impact on how proteins are metabolized and absorbed, which can impede the formation of albumin and possibly lead to dropsy.

#### **Mineral Deficiencies:**

Electrolyte balance and fluid management can be affected by deficiencies in minerals such as sodium, potassium, and magnesium.

Both dropsy and fluid retention may result from this imbalance.

Dropsy symptoms can be made worse by some mineral deficiencies, such as a potassium shortage, which can also have a detrimental effect on the kidneys.

**4. Environmental factors:** Poor water quality (high ammonia, nitrite, or organic matter), overcrowding, and stress can trigger disease outbreaks.

#### **Environmental Factors Contributing to Dropsy in Fish:**

##### **Water Quality:**

- **Improper pH:** Water pH outside the recommended range for the specific fish species can disrupt their osmoregulation (fluid balance), leading to fluid accumulation and dropsy.
- **Ammonia and Nitrite Spikes:** These toxic byproducts of fish waste and organic matter buildup can stress and weaken the immune system, making fish more susceptible to infections that contribute to dropsy.
- **Low Oxygen Levels:** Insufficient oxygen in the water can damage internal organs like the gills and kidneys, impairing their ability to regulate fluids and potentially leading to dropsy.
- **Temperature Fluctuations:** Rapid and significant changes in water temperature can put stress on the fish's physiology, impacting organ function and potentially triggering dropsy.

##### **Overcrowding:**

- **Limited Space:** In overcrowded tanks, competition for resources and increased aggression can elevate stress levels in fish, compromising their immune system and making them more prone to infections that cause dropsy.
- **Poor Water Circulation:** Stagnant water in overcrowded tanks leads to inefficient waste removal and oxygen distribution, contributing to poor water quality and potentially triggering dropsy.

##### **Dietary Deficiencies:**

- **Improper Nutrition:** An imbalanced diet lacking essential vitamins and minerals can weaken the fish's overall health and immune function, increasing their susceptibility to infections and dropsy.
- **Overfeeding:** Excessive feeding can contribute to poor water quality through increased waste production, further stressing the fish and potentially leading to dropsy.

##### **Toxic Pollutants:**

- **Exposure to Chemicals:** Pesticides, fertilizers, or even household cleaning products entering the water can act as toxins, damaging fish organs and disrupting fluid balance, potentially leading to dropsy.
- **Heavy Metals:** Accumulation of heavy metals like copper or lead in the water can damage internal organs and impair their function, contributing to dropsy symptoms.

##### **Stressful Environments:**

- **Incompatible Tankmates:** Aggressive tankmates can cause constant stress and physical injuries to other fish, weakening their immune system and making them more susceptible to dropsy.
- **Excessive Noise or Light:** Loud noises or constant bright light can be stressful for fish, impacting their health and potentially leading to dropsy.
- **Improper Aquarium Maintenance:** Neglecting regular water changes, cleaning, and maintaining proper equipment can significantly contribute to poor water quality and stress levels in fish, increasing the risk of dropsy.



**Fig 2:Dropsy effected fish collect from the culture pond**

### **Impact of dropsy on *Labeo rohita***

Dropsy, also known as ascites, can have a significant and negative impact on *Labeo rohita*, commonly known as rohu fish. <sup>[9]</sup>Here's a breakdown of the potential consequences:

#### **1.Physiological Effects:**

- i. **Internal fluid accumulation:** The hallmark of dropsy is the abnormal accumulation of fluid in the abdominal cavity, putting pressure on internal organs and compromising their function.
- ii. **Organ dysfunction:** Compressed organs, including the liver, kidneys, and intestines, experience impaired function, leading to decreased appetite, digestion issues, and reduced oxygen uptake.
- iii. **Electrolyte imbalance:** Fluid shifts affect electrolyte balance, disrupting cellular processes and further impacting organ function.
- iv. **Immune suppression:** Dropsy can weaken the immune system, making *Labeo rohita* more susceptible to secondary infections. <sup>[15][5]</sup>



**Fig 3: Physical changes**

#### **2.Behavioral Changes:**

- i. **Lethargy and reduced activity:** Discomfort and organ dysfunction lead to decreased activity and swimming behavior.
- ii. **Loss of appetite:** As internal organs are compressed, appetite loss and reduced food intake are common.
- iii. **Difficulty breathing:** Fluid accumulation can impede gill function, making breathing difficult.
- iv. **Abnormal swimming patterns:** Buoyancy changes due to fluid accumulation can result in erratic swimming patterns or difficulty maintaining upright posture. <sup>[14]</sup>

### 3.Reproduction and Mortality:

- i. **Impaired gonadal development and fertility:** Dropsy can negatively impact reproductive health, leading to reduced gamete production and spawning success.
- ii. **Increased mortality:** Severe cases of dropsy, or complications arising from it, can lead to increased mortality rates in *Labeo rohita* populations.

### Additional Considerations:

- i. **Causes of dropsy in *Labeo rohita*:** Bacterial infections, nutritional deficiencies, parasitic infestations, and environmental factors like water quality issues can contribute to dropsy development.
- ii. **Diagnosis and treatment:** Prompt diagnosis through physical examination, water quality analysis, and potentially internal organ assessments is crucial for effective treatment. Treatment options may involve antibiotics, antiparasitics, dietary adjustments, and water quality improvements.
- iii. **Impact on aquaculture:** Dropsy outbreaks in aquaculture settings can lead to significant economic losses due to reduced fish production and increased mortality. Implementing biosecurity measures and proactive health management practices are essential for preventing and controlling dropsy in farmed *Labeo rohita*.

### *Labeo rohita* with dropsy

- i. **Organ dysfunction:** The accumulated fluid can put pressure on internal organs, leading to impaired function of the liver, kidneys, and intestines. This can disrupt digestion, nutrient absorption, and waste elimination.
- ii. **Reduced growth and reproduction:** Dropsy can significantly impact the growth and reproductive performance of *Labeo rohita*. Affected fish may experience stunted growth, delayed maturation, and reduced fertility.
- iii. **Increased susceptibility to other diseases:** The weakened immune system and stressed physiological state of fish suffering from dropsy make them more vulnerable to secondary infections and other diseases.
- iv. **Mortality:** In severe cases, dropsy can be fatal for *Labeo rohita*. If left untreated, the complications of the condition can lead to organ failure and death.



**Fig 4: Laboratory diagnosis**

### Prevention strategies

Dropsy, also known as ascites, is a common and often fatal disease in fish. It's not a single disease, but rather a symptom of various underlying issues that cause fluid buildup in the fish's body cavity, leading to a swollen abdomen. While treating dropsy is possible in some cases, prevention is always the best approach. Here are some key strategies to keep your fish healthy and dropsy-free:

#### 1. Maintain optimal water quality:

**Regular water changes:** Perform partial water changes of 10-25% weekly to remove harmful toxins and waste products that can stress fish and weaken their immune system.

#### Aquarium water change

- **Filtration:** Invest in a good quality filter system appropriate for your tank size and fish population. Clean the filter media regularly as per the manufacturer's instructions.
- **Water parameters:** Monitor and maintain stable water parameters like pH, ammonia, nitrite, and nitrate within the optimal range for your fish species. Avoid sudden changes in water chemistry.

## 2. Prevent overcrowding:

- **Tank size:** Choose a tank size that provides adequate swimming space for all your fish. Generally, allow 1 gallon of water per inch of adult fish.
- **Stocking density:** Don't overcrowd your tank. Research the space requirements of your fish species and avoid exceeding the recommended stocking density.

## 3. Provide a healthy diet:

- **Variety:** Feed your fish a varied diet of high-quality flakes, pellets, frozen or freeze-dried foods, and occasional blanched vegetables. Avoid overfeeding, which can pollute the water and contribute to dropsy.
- **Portion control:** Feed your fish only the amount they can consume within a few minutes, two to three times a day.

## 4. Minimize stress:

- **Quarantine new fish:** Always quarantine new fish for at least two weeks before introducing them to the main tank to prevent the spread of diseases.
- **Peaceful tank mates:** Choose tank mates that are compatible with each other to avoid aggressive interactions and bullying.
- **Provide hiding places:** Ensure your tank has plenty of hiding spots and plants for your fish to feel secure and reduce stress.

## 5. Observe your fish regularly:

Regularly monitor your fish for any signs of illness, including dropsy symptoms like a swollen abdomen, pineconing scales, lethargy, and loss of appetite. Early detection and intervention can significantly improve the chances of successful treatment.

### Additional tips:

- Maintain proper tank hygiene by vacuuming the substrate regularly and removing uneaten food debris.
- Avoid introducing plants or decorations from other tanks without disinfecting them properly.
- Use aquarium medications sparingly and only as directed by a qualified fish veterinarian.



**Fig 5: Preventing medicine**

### Treatment of Dropsy in *Labeo rohita*:

#### 1. Diagnosis:

- Observe for symptoms like distended abdomen, scales protruding, difficulty swimming.
- Confirm with water quality tests and gill examination.
- Identify underlying cause (bacteria, parasites, nutritional deficiency).<sup>[3]</sup>

## 2. Immediate Steps:

- Isolate affected fish to prevent spread.
- Improve water quality: aeration, filtration, partial water changes.
- Adjust temperature and pH to suitable range for *Labeo rohita*.

## 3. Treatment Options:<sup>[3][13]</sup>

### a) Antimicrobial:

- Antibiotics (oral or bath): amoxicillin, chloramphenicol, erythromycin (consult veterinarian for specific recommendations and dosages).
- Green synthesized silver nanoparticles (research-backed option).<sup>[13][3]</sup>

### b) Parasiticide:

- Formalin bath (short duration, consult veterinarian for safe concentrations).
- Potassium permanganate bath (brief exposure, monitor water quality).

### c) Supportive Care:

- Electrolyte bath (improves osmoregulation).
- Vitamins and minerals supplementation.
- High-quality, easily digestible diet.

## 4. Monitoring and Prognosis:

- Observe fish for improvement in symptoms.
- Continue treatment course as recommended by veterinarian.
- Maintain optimal water quality and hygiene.

## 5. Prevention:

- Implement biosecurity measures: quarantine new fish, avoid overcrowding.
- Maintain good water quality through regular monitoring and maintenance.
- Provide a balanced and nutritious diet.

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## Treatment for dropsy in *Labeo rohita* will depend on the underlying cause. Here are some general approaches:

**1. Improve water quality:** Ensure clean, well-aerated water with appropriate pH and temperature levels.

**2. Isolate infected fish:** Separate sick fish from healthy ones to prevent the spread of infection.

**3. Antibiotics:** If bacteria are the cause, consult a veterinarian or fish health specialist for appropriate antibiotics. Commonly used antibiotics for dropsy include oxytetracycline, erythromycin, and chloramphenicol.

**4. Epsom salt baths:** Short baths in Epsom salt (magnesium sulfate) solution can help reduce inflammation and fluid buildup.

**5. Nutritional supplements:** Provide a balanced diet rich in vitamins and minerals, particularly vitamin C and thiamine.

**6. Surgery:** In severe cases, surgery may be necessary to drain fluid from the abdominal cavity.

### Prevention is always better than cure:

- Maintain good water quality and hygiene in the aquarium or pond.
- Provide a healthy diet rich in vitamins and minerals.
- Avoid overcrowding fish.
- Quarantine new fish before introducing them to the main tank.
- Regularly monitor fish for signs of disease.



**Here are some additional tips for treating dropsy in *Labeo rohita*:**

- Handle fish carefully to avoid further stress.
- Do not use over-the-counter medications without consulting a veterinarian or fish health specialist.
- Be patient, as recovery from dropsy can take time.
- Early diagnosis and treatment are essential for improving the chances of survival for *Labeo rohita* with dropsy. If you notice any signs of dropsy in your fish, such as a swollen abdomen, pineconing scales, or lethargy, seek professional help immediately.

**Conclusion**

Dropsy is a serious hazard to *Labeo Rohita*, affecting its general health and well-being. Preventive measures, including as maintaining ideal water quality, eating a healthy diet, and identifying symptoms early on, are essential for reducing the incidence of Dropsy. Maintaining *Labeo Rohita* populations in aquaculture environments requires the application of a comprehensive fish health management strategy. To improve preventative measures and guarantee the long-term health of this significant fish species, more research and attention to detail are essential.

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