

## An Overview of Respiratory Diseases in Goats

Dr. J. Shashank<sup>1\*</sup>, Dr. N. Rajanna<sup>2</sup>, Dr. J. Saikiran<sup>3</sup>

<sup>1</sup> Subject Matter Specialist (Veterinary Medicine)

<sup>2</sup> Programme Coordinator & Head

<sup>3</sup> Subject Matter Specialist (LPM)

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

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**Abstract:** Goats and sheep can provide meat, milk, leather, and wool, making them valuable assets for the global livestock business, particularly in Southeast Asia, the Mediterranean region, and African nations. Respiratory diseases are the primary cause of death for these animals, accounting for about half of their deaths. Whatever their causes, goat and sheep infectious respiratory diseases account for 5.6% of all small ruminant diseases and disorders. Most of these have an infectious origin, particularly those that are bacterial, parasitic, fungal, or viral. PPR, caprine arthritis encephalitis, and bluetongue are the main viruses that cause respiratory diseases in goats. Through the use of a roadmap, the World Organization for Animal Health (WOAH) has established a global strategy for the eradication of PPR from the planet by 2030. Conversely, the two main bacterial causes of respiratory diseases are *Pasteurella* and *Mycoplasma* species, which can co-infect viral disorders or act as the primary cause. They can also exacerbate existing infections and lead to incorrect diagnoses. Numerous surveillances identified fungal infections, particularly Aspergillosis and Conidiobolomycosis, as well as parasite infections such as nasal myiasis and verminous pneumonia.

### Introduction

Small ruminants particularly sheep and goats contribute significantly to the economy of farmers in the Mediterranean and African and Southeast Asian countries. These small ruminants are valuable assets because of their significant contribution to meat, milk, and wool production,

and their potential to replicate and proliferate. The great Indian leader and freedom fighter M. K. Gandhi "father of the nation" designated goats as "poor man's cow," emphasizing the importance of small ruminants in poor countries. In India, sheep and goats are vital in the economy of poor, deprived, backward classes, and landless labours. To make this small ruminant-based economy viable and sustainable; the development of techniques for early and accurate diagnosis holds prime importance. These small ruminants are highly susceptible to respiratory diseases, which account for almost 50% of mortality amongst them. Irrespective of the etiology, the infectious respiratory diseases of sheep and goats contribute to 5.6 percent of the total diseases of small ruminants. Small ruminants are especially sensitive to respiratory infections, namely, viruses, bacteria, and fungi, mostly as a result of deficient management practices that make these animals more susceptible to infectious agents. The tendency of these animals to huddle and group rearing practices further predispose small ruminants to infectious and contagious diseases (Kumar *et al.*, 2000; Soni and Sharma, 1990) In both sheep and goat flocks, respiratory diseases may be encountered affecting individuals or groups, resulting in poor live weight gain and high rate of mortality. This causes considerable financial losses to shepherds and goat keepers in the form of decreased meat, milk, and wool production along with a reduced number of offspring. Adverse weather conditions leading to stress often contribute to the onset and progression of such diseases. The condition becomes adverse

when bacterial as well as viral infections are combined particularly under adverse weather conditions (Lacasta, *et al.*, 2008). Moreover, under stress, immunocompromised, pregnant, lactating, and older animals easily fall prey to respiratory habitats, namely, *Streptococcus pneumoniae*, *Mannheimia haemolytica*, *Bordetella parapertussis*, *Mycoplasma* species, *Arcanobacterium pyogenes*, and *Pasteurella* species (Kumar *et al.*, 2013; Woldemeskel *et al.*, 2002). Such infections pose a major obstacle to the intensive rearing of sheep and goats and diseases like PPR, bluetongue, and ovine pulmonary adenomatosis (Jaagsiekte) adversely affect international trade (Chakraborty *et al.*, 2014), ultimately hampering the economy.

### Respiratory tract Diseases

Depending upon the involvement these diseases can be grouped as (1) Diseases of the upper respiratory tract, namely, nasal myiasis and enzootic nasal tumors, mainly remain confined to the sinus, nostrils, and nasal cavity. Various tumors like nasal polyps (adenopapillomas), squamous cell carcinomas, adenocarcinomas, lymphosarcomas, and adenomas are common in the upper respiratory tracts of sheep and goats. However, the incidence rate is very low, and only sporadic cases are reported. (2) Diseases of the lower respiratory tract, namely, PPR, parainfluenza, pasteurellosis, ovine progressive pneumonia, mycoplasmosis, caprine arthritis encephalitis virus, caseous lymphadenitis, verminous pneumonia, and many others that involve lungs and lesions, are observed in alveoli and bronchioles.

## I. Upper Respiratory tract Diseases

### 1. Nasal myiasis

Nasal myiasis in goats, caused by *Oestrus ovis* (the sheep nasal botfly), can lead to several symptoms in infected animals. These flies lay their larvae in the nasal passages of goats, and the larvae migrate through the nasal and sinus tissues, causing irritation and potential secondary infections (Fig.1).

#### Clinical symptoms

**Nasal discharge:** Clear, thick, or purulent discharge is common, sometimes mixed with blood due to irritation and trauma from larvae movement.

**Frequent sneezing and head shaking:** Goats may sneeze, cough, or shake their heads frequently as they try to clear the larvae from their nasal passages.

**Labored breathing and snoring sounds:** Heavy breathing or snoring sounds may be heard due to partial nasal blockage by larvae.

**Restlessness and discomfort:** Goats may rub their noses against objects or the ground, trying to alleviate discomfort.

**Decreased appetite and weight loss:** The constant irritation and stress can reduce feed intake, affecting growth and weight.

**Secondary bacterial infections:** In more severe cases, nasal myiasis can lead to sinusitis and bacterial infections, worsening symptoms and leading to foul-smelling discharge.

#### Treatment, prevention, and control

Ivermectin will kill the larvae at any stage. Other treatments include Ruelene sprayed in each nostril in the fall or winter. It is the need of the hour to establish a proper management and treatment regime for the establishment of an appropriate control strategy.

### 2. Enzootic nasal tumor

An enzootic nasal tumor (ENT) in goats is a contagious, neoplastic disease caused by the enzootic nasal tumor virus (ENTV), which is a retrovirus. It primarily affects the nasal cavities and sinuses, causing tumor growth in the nasal tissues.

#### Clinical symptoms:

**Nasal discharge:** Persistent, often mucopurulent (thick, cloudy mucus with pus) discharge from one or both nostrils. It can be clear initially but may become cloudy and thicker as the tumor progresses.

**Dyspnea:** Labored or noisy breathing, as the tumor growth obstructs the nasal passages.

**Facial deformity:** Swelling or distortion of the face due to the tumor's pressure on nasal structures.

**Nasal obstruction:** Partial or complete blockage of one or both nostrils, leading to open-mouth breathing.

**Epistaxis:** In advanced cases, bleeding may occur from the nostrils.

**Weight loss:** Due to chronic discomfort and difficulty breathing, affected goats often eat less, resulting in weight loss.

**Frequent sneezing or Head shaking:** The tumor irritates the nasal passages, leading to repetitive sneezing or head shaking.

#### Treatment, prevention, and control

There is no vaccine or antiviral treatment for ENTV. Prevention relies on good biosecurity and isolating any animal showing symptoms.

### 3. Irritants, trachea injury

Constant or long-term inhalation of irritants, such as dust or ammonia, and trachea damage through incorrect use of balling or drenching guns can cause respiratory problems.

#### Clinical symptoms

The predominant signs are coughing and sneezing. Animals may have nasal discharge. With simple inflammation of the respiratory passages due to inhaling dust or other irritants, animals appear healthy other than the annoying cough and sneeze. In the case of pharynx injury, the animal may be in severe respiratory distress and may make a snoring sound when exhaling. Other signs would include foul odor to the breath, off-feed, cough, and nasal discharge.

#### Treatment, prevention, and control

Remove all sources of respiratory irritants from the environment. Dispose of moldy hay, shake dusty hay away from animals, or wet the hay. Environmental dust can be eliminated by wetting the area. Clean bedding to remove urine and feces. Ensure good ventilation and maintain as clean an environment as possible. Follow proper procedure when using balling and drenching guns.

## II. Lower Respiratory tract Diseases

### 1. Peste des petits ruminants (PPR)

Peste des Petits Ruminants (PPR), also known as "goat plague," is a highly contagious viral disease affecting small ruminants like goats and sheep. It's caused by the PPR virus, a member of the Paramyxoviridae family. Symptoms often appear suddenly and can progress quickly, so early detection is essential to prevent outbreaks (Fig.2 & 3).

#### Clinical Symptoms

**Fever:** High fever (104–106°F) is often the first sign, lasting 3-4 days.

**Respiratory signs:** Nasal discharge: Begins as clear, watery discharge, which can become thick and yellowish.

**Coughing:** Often deep and frequent, indicating respiratory distress.

**Labored breathing:** Especially if the infection progresses to pneumonia.

#### Digestive Symptoms:

**Diarrhea:** Watery, sometimes bloody, leading to rapid dehydration.

**Anorexia:** Refusal to eat, causing rapid weight loss and weakness.

### Oral Lesions:

**Sores and ulcers:** Appear inside the mouth, on the gums, and the lips.

**Excessive salivation:** Often due to painful oral ulcers.

**Eye discharge:** Watery or purulent discharge from the eyes, can lead to blindness in severe cases.

**Lethargy and depression:** Infected goats may show signs of lethargy, depression, and isolation from the herd.

**Death:** In severe cases, especially without treatment, death can occur within a week of symptom onset.

#### Treatment, Prevention, and Control

Timely diagnosis and supportive care (fluids, antibiotics for secondary infections) can improve survival rates in affected goats. Vaccination is the most effective method to prevent PPR in areas where the virus is present. Immediate isolation of infected animals, strict biosecurity, and notification to veterinary authorities are essential to control the spread.

### 2. Blood-borne infections

Most respiratory disease problems of goat kids are due to septicemia or blood-borne infections. While these diseases involve all systems of the kid, respiratory symptoms often predominate. Commonly, these infections are due to inadequate colostrum consumption and housing in an environment with heavy bacterial loads. Some organisms responsible for these infections include *E. coli*, *Pasteurella haemolytica*, *Pasturella multocoda*, *Mycoplasma*, and *Streptococci*.

#### Clinical Symptoms

These diseases generally occur where wet, unsanitary, and crowded conditions exist. The onset is sudden with kids becoming weak and depressed, refusing to eat, running a fever, and breathing rapidly. Sometimes, sudden death is the only sign. Large numbers of triplet or quadruplet litters may increase incidence.

#### Treatment, prevention, and control

Kids exhibiting these signs are in a medical emergency. Treat using antibiotics having a gram-negative/gram-positive spectrum to counteract a wide variety of organisms. A veterinarian may prescribe ceftriaxone, enrofloxacin, or oxytetracycline. Anti-inflammatory drugs will help alleviate signs and symptoms. Provide fluids and

ensure the kid is eating. Proper management of dams and kids can prevent occurrence. Late gestation dams should be in good body condition. Maternity pens and kidding pens should be clean and adequately ventilated. Ensure navels are dipped in iodine at birth and that kids consume adequate colostrums.

### 3. Enzootic Pneumonia

Enzootic pneumonia is the end stage of infections by a variety of primary agents (mycoplasma, chlamydia, adenovirus, syncytial virus, IBR, Caprine herpes virus) or by the various stresses experienced in intensive weanling management, most notably coccidiosis. This pneumonia is usually a herd problem in goats raised in confinement or under intensive management. Predisposing conditions include crowding, inadequate ventilation, and high humidity (Fig.4).

#### Clinical Symptoms

Animals will have a moist, soft cough, increased respiratory rate, nasal discharge, watery eyes, and decreased gains. When listening to the lungs, crackling and wheezing are heard.

#### Treatment, prevention, and control

Many of the pathogens associated with caprine pneumonia are not susceptible to certain drugs. Products that may be effective include Tetracyclines, Tylosin, Trimethoprim sulpha, Nuflo (Florfenicol), Ceftiofur, and SpectoGard given under the supervision of a veterinarian. Reduce stress and overcrowding, and maintain adequate ventilation and sanitation to reduce incidence.

### 4. Pasteurella Pneumonia

Pneumonic pasteurellosis (*Pasteurella*) is a killer pneumonia in all livestock species affected. *Pasteurella pneumonia* is caused by either *Mannheimia hemolytica* which causes sudden death or *Pasteurella multocoda* which causes respiratory signs with pneumonia. *Mannheimia (Pasteurella) hemolytica* is blood-borne and outbreaks usually occur in feedlot conditions where animals are stressed, transported, and commingled. Usually, several animals will be involved. They will be noticeably sick and off-feed by themselves. Commonly, nutritional management, ventilation, and parasite control are less than ideal.

#### Clinical Symptoms

Typically, the first animal is found dead followed by signs of pneumonia noticed in herd

mates. Affected animals will be off-feed, have a moist cough, and appear depressed. The lungs will typically make a wheezing or crackling sound. *Pasteurella multocoda* is capable of entering the bloodstream and causing arthritis and mastitis (Blue bag mastitis).

#### Treatment, prevention, and control

Drugs such as penicillin, ampicillin, tetracycline, oxytetracycline, tylosin, florfenicol, and ceftiofur have been reported to be effective in the treatment of pneumonia in goats. Vaccination is the best form of control of the disease. Effective vaccines such as alum precipitated and oil adjuvant vaccines have been developed. Recently, recombinant DNA vaccines that confer significant protection and antibody response in goats have been reported.

### 5. Mycoplasma pneumonia

The *Mycoplasma* species are commonly involved in the pneumonia of goats, although usually more of a problem for dairy goats than meat goat producers. Mycoplasmosis is now regarded as an emerging disease and poses huge economic constraints for farmers and small ruminant-rearing countries. In general, they cause a "cuffing" pneumonia with bronchitis that is commonly seen as a form of Enzootic Pneumonia. Pleuropneumonia is a specific disease caused by *Mycoplasma mycoides* and is a significant cause of sickness and death in does and kids. In kids, the organism is transmitted orally through contaminated milk or colostrum. Outbreaks often occur when animals are stressed, such as in overcrowded conditions, and up to 80 to 90% of affected kids die or are euthanized as a result of permanent joint damage. The mycoplasma organisms are commonly isolated from the ear canal of goats. It is postulated that ear mites (*Psoroptes cuniculi*) may be involved in transmission.

#### Clinical Symptoms

The disease is highly contagious and usually involves multiple animals in the herd. Signs include fever, cough, respiratory distress, joint damage and lameness, nervous system disorders, and/or mastitis. Young animals are usually involved with outbreaks of the pneumonic or polyarthritic forms. Three clinical syndromes seen in goats include Peracute illness characterized by high fever and death within 12 to 24 hours. Central Nervous System syndrome with neurologic signs and death within 24 to 72

hours. Acute to subacute syndrome with high fever, multiple joint arthritis, mastitis, and pneumonia.

**Treatment, prevention, and control**

Antibiotics must have a mycoplasma spectrum of activity. Penicillin, amoxicillin, and cephalosporin may not be effective. Products such as tylosin, tetracycline, erythromycin, and Nuflor may be effective. Treatment can assist in relieving symptoms of the disease but affected animals may shed the organism for life. Some animals may appear to respond to treatment but will relapse and be chronically poor performing.

The organism is spread by direct contact, through the air, milk, and ear mites. Control is by the following program:

- Separate groups by age (adults and weanlings).
- Maintain the all-in-all-out flow of animals or quarantine all new arrivals.
- Pasteurize milk before feeding.
- Control ear mites with Ivermectin.
- Optimal sanitation and air quality for housed animals.

**6. Verminous pneumonia**

Verminous pneumonia is a chronic and prolonged infection of sheep and goats caused by any of several parasitic nematodes (e.g., Dictyocaulus filarial, Muellerius capillaries, and Protostrongylus rufescens), characterized clinically by respiratory distress and pathologically by bronchitis and bronchopneumonia. In goats, Muellerius capillaries are the most common lungworm. There is diffused pneumonia in affected goats without the presence of any nodular lesion. The parasite predisposes animals to secondary infections thereby compromising their health in general. Young grazing animals (weaners) are most commonly affected. These parasites prefer low-lying, moist pastures. Some of the parasites, Muellerius and Protostrongylus, for example, require snails or slugs as intermediate hosts in their life cycle.

**Clinical Symptoms**





Signs usually consist of persistent, chronic coughing in a herd or flock. Animals will have an increased respiration rate and lose weight. The most severely affected animals will be young animals on their first full season of grazing.

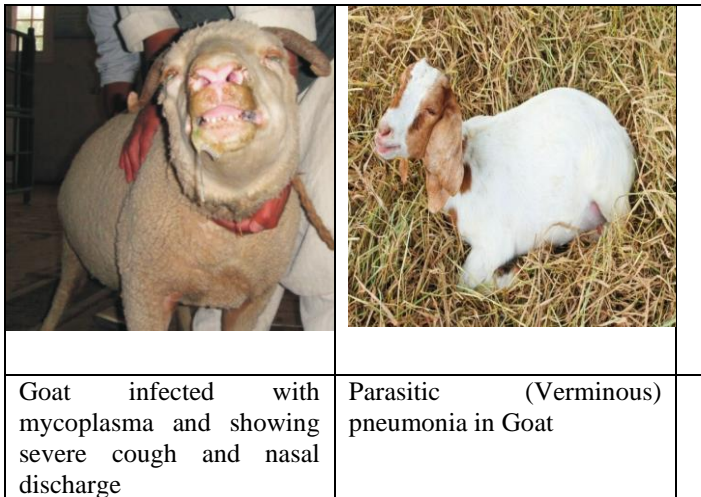
**Treatment, prevention, and control**

It is unclear how effective treatment is for this condition. Anthelmintics will stop parasite egg production but may not effectively remove the parasite. Prevention strategies include avoiding snow, and wet pastures, particularly during the early morning hours or at night. Clean up piles of wet, rotting vegetation where snails may live. Avoid mixing different age groups of animals or having young animals graze on pastures contaminated by adults. Frequent deworming with certain anthelmintics can also help control the parasite. However, this is not recommended as frequent, herd-wide use of anthelmintics will increase the rate of drug resistance by other internal parasites such as Haemonchus contortus (barberpole worm).

**Conclusion**

Respiratory diseases in goats are a significant health concern in goat farming, as they can lead to poor animal health, reduced productivity, and sometimes mortality. Preventing respiratory diseases in goats includes maintaining good ventilation, reducing overcrowding, minimizing stress, ensuring a nutritious diet and implementing vaccination programs where available (especially against pneumonia). Regular deworming and isolation of infected animals can help prevent the spread of bacterial, viral and parasitic infections in goats.

	
Nasal bots and wireworm (bottle jaw) infections in goat	Goat infected with PPR and showing scabs or nodules around the nose and mouth
	
Goat infected with PPR and showing apathy and sero-mucopurulent nasal discharges	Goat infected with enzootic pneumonia and showing severe mucoid nasal discharge



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