

Disease Control in Small Ruminants

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Small ruminants – chiefly sheep and goats – are vital to livelihoods in many parts of the world. They provide meat, milk, wool and income, especially in marginal farming areas. However, sheep and goats are threatened by many contagious diseases that can rapidly devastate flocks. Effective disease control combines vaccination, biosecurity, and good management practices. Coordinated programs can dramatically reduce losses; for example, organized vaccination campaigns against sheep pox and goat pox in Europe have curtailed recent outbreaks. Disease control also protects public health, since many small-ruminant infections (like brucellosis or Orf) can spread to humans. In this article we review the major diseases of small ruminants and the strategies used to prevent and control them, highlighting global initiatives, field practices, and real-world case studies.



Fig. 1. Healthy sheep and goats grazing together in mixed pasture

Major Viral Diseases

Peste des petits ruminants (PPR)

This morbillivirus is one of the most feared diseases of sheep and goats worldwide. It spreads quickly and causes high mortality. PPR typically presents with fever, mouth ulcers, diarrhea and pneumonia. Ahaduzzaman et al. (2020) note that PPR is “the most significant economic threat to the development of sustainable sheep and goat production” globally. Indeed, surveys find PPR antibodies in a large fraction of flocks in Africa and Asia, indicating widespread exposure (pooled prevalence ~39–41%). Control of PPR relies on mass vaccination with live attenuated vaccine, supported by surveillance and movement control. Regional eradication programs (led by FAO and WOA) aim to

eliminate PPR by 2030 through coordinated, free vaccination campaigns and monitoring. Experience shows that even partial campaigns can help: for example, low PPR-vaccination coverage in Tajikistan (only ~2.4% of flocks) resulted in 83% of districts remaining infected, underscoring the need for higher coverage.

Sheep and Goat Pox (Capripox)

Capripoxviruses cause scabby skin lesions, fever and production losses. Recent outbreaks in Europe (2024–25) have demonstrated how serious these infections can be. EFSA (2026) reports that commercial attenuated vaccines for sheep/goat pox provide 80–100% protection. In controlled modeling studies, vaccination drastically curtailed outbreaks: a two-year nation-wide sheep/goat pox vaccination campaign could eradicate an epidemic one year faster than relying on culling alone. Thus, like PPR, goat/ sheep pox is effectively managed by rapid detection plus large-scale vaccination.

Bluetongue and Other Viral Diseases

Bluetongue virus (BTV) and other orbiviruses occasionally affect sheep and goats, causing fever, hemorrhage, and reproductive loss. Control focuses on vector management (sand fly or midge control) and vaccines where available. Foot-and-Mouth Disease (FMD) viruses infect small ruminants but often cause only mild signs; however, because of trade implications, FMD incurs strict movement controls and, in some countries, emergency vaccination. Rift Valley Fever and Contagious Caprine Pleuropneumonia (CCPP) are other viral/bacterial diseases (CCPP caused by a mycoplasma) that recur in parts of Africa and Asia. Where vaccines exist (e.g. CCPP vaccines in Asia), they are used; but in many areas CCPP control relies on rapid antibiotic treatment of sick animals and biosecurity (see below).

Bacterial and Other Infectious Diseases

Contagious Caprine Pleuropneumonia (CCPP)

CCPP (caused by *Mycoplasma capricolum* subsp. *capripneumoniae*) causes severe respiratory disease in goats, with case-mortality often exceeding 60%. Control is challenging because vaccines are not widely available. FAO investigators in Central Asia found that vaccination reduced morbidity (CCPP-morbidity dropped from ~15% to ~6% in vaccinated groups). In practice, CCPP control relies on early detection, antibiotic treatment of cases, and separating healthy from sick animals. Field observations indicate that

goat herders who quickly isolate and treat CCPP cases suffer much lower losses. In outbreak settings where no good vaccine exists, “early detection, prompt diagnosis and early antibiotic and supportive treatment with segregation of affected animals are the recommended actions”.

Brucellosis

Brucella melitensis causes contagious abortion in sheep/goats and is transmissible to humans (undulant fever). Control programs use test-and-slaughter of infected animals and vaccination. For example, many endemic regions apply Rev.1 vaccine to young female sheep and goats, coupled with strict herd testing. Public health measures include pasteurizing milk and educating farmers. Successful eradication in some countries (e.g. Spain) was achieved via rigorous surveillance and culling, illustrating that an aggressive, coordinated approach can eliminate brucellosis from small-ruminant populations.

Foot Rot, Scald and Other Bacteria

Bacterial hoof infections (foot rot) cause lameness and productivity loss. Control combines footbathing (e.g. zinc sulfate or formalin baths), hoof trimming, and in some cases vaccination against *Dichelobacter nodosus*. Other bacterial diseases include anthrax (controlled by annual vaccination in endemic areas) and leptospirosis. Orf (contagious ecthyma) is a viral skin disease transmitted by *Parapoxvirus* – although not a classic “bacteria,” it is managed here. Orf causes scabby lesions on lips, teats and feet. There is no drug cure; control relies on hygiene and live vaccination on affected farms. Merck’s veterinary manual notes that orf vaccines exist but should only be used on farms where the virus is already present, because vaccinating a naïve flock can spread the virus further. Moreover, animals recovering from an orf outbreak typically have lifelong immunity at the lesion sites, reducing the need for repeated vaccination once a flock is endemic.

Parasitic Diseases

Internal Parasites (Worms)

Gastrointestinal nematodes (especially *Haemonchus*, the barber-pole worm) are ubiquitous in sheep and goats. Heavy infestations cause anemia, diarrhea and weight loss. Control is *integrated*: strategic deworming using effective anthelmintics, pasture rotation, and selective treatment. Many regions now recommend targeted (selective) treatments only for high-shedding animals, to slow drug resistance. Tools like FAMACHA© (eye-color chart to assess anemia from *Haemonchus*) help farmers treat only those animals that need it. Nutrition also matters: well-fed sheep/goats develop better resistance to worms. International groups (e.g. the American

Consortium for Small Ruminant Parasite Control) provide infographics on such strategies.

External Parasites

Mites and lice can cause mange and irritation. Control uses topical insecticides or injectable ivermectins, along with cleaning of bedding and equipment. Ticks (vectors of diseases like *Babesia*) are managed by pasture rotation and acaricides. In endemic areas, systemic insecticide treatments (pour-ons or injectables) timed to tick seasons can break transmission.

Integrated Control Strategies

Effective disease control requires a holistic farm plan:

- **Vaccination Programs:** Wherever possible, use proven vaccines. For example, annual vaccination of all susceptible animals against PPR and sheep/goat pox is now standard practice in many countries. Foot-and-mouth and bluetongue vaccines are used regionally under government programs. Ensure cold-chain management so vaccines remain potent. EFSA’s analysis shows that comprehensive SGP vaccination (covering whole regions or countries) can dramatically shorten epidemics.
- **Biosecurity and Quarantine:** Prevent diseases from entering a flock. Buy animals only from certified healthy sources and isolate new arrivals for several weeks. Clean and disinfect tools, vehicles and clothing between farms. Control movements during outbreaks: culling and movement bans stopped sheep/goat pox faster in Europe than vaccination alone.
- **Surveillance and Diagnostics:** Regularly inspect animals and report unusual symptoms. Use laboratory tests to confirm infections early. For example, PCR testing of blood or nasal swabs can diagnose PPR or brucellosis. Early detection allows rapid response (e.g. ring vaccination or treatment) before disease spreads.
- **Nutrition and Herd Management:** Good nutrition bolsters immunity. Minerals (selenium, copper) and vitamins reduce susceptibility. Stress reduction is important – avoid overcrowding and provide shelter from extremes of weather. Proper colostrum feeding in newborn lambs/kids builds early immunity. Separating different age groups (e.g. removing lambs to fresh pasture) can interrupt parasite life cycles.
- **Farmer Education and Community Involvement:** Empower farmers with knowledge. Extension

services that train shepherds on recognizing disease signs and administering vaccines greatly improve outcomes. Community campaigns (e.g. coordinated vaccination days) help achieve the high coverage needed for herd immunity. Experience in West Africa shows that combining PPR vaccinations with other interventions (deworming, nutrition) was more acceptable to farmers than single-disease campaigns.

Case Study – Tajikistan Respiratory Disease

In Tajikistan, new introductions of PPR and CCPP caused severe outbreaks in 2006–09. After local experts analyzed the data, they recommended targeted controls. For goats, CCPP vaccines gave some protection (vaccinated morbidity ~6% vs ~15% unvaccinated). In practice, Tajik vets used rapid antibiotic therapy and isolation for CCPP (since effective vaccines were lacking). For PPR, low

vaccination coverage meant the virus persisted; the lesson was that mass annual PPR vaccination was essential to stop village epidemics. The FAO report concluded that an integrated plan – combining annual PPR vaccination of all small ruminants, monitoring of respiratory disease and community engagement – was the way forward.

Case Study – Europe’s Response to SGP

The sheep/goat pox outbreaks of 2024–25 in Greece and Bulgaria prompted EU authorities to use emergency measures. An EFSA assessment found that vaccinating flocks with live SGP vaccine reduced viral shedding and greatly limited epidemic spread. Modeling showed that with 80% vaccine efficacy, a two-year nationwide campaign plus standard culling would eradicate the virus one year earlier than culling alone. This underscores that vaccination, when deployed promptly and broadly, is a **critical tool** in disease control.

Table 1: Major diseases of sheep and goats and their control or prevention measures

Disease	Agent/Type	Control Measures
<i>Peste des Petits Ruminants (PPR)</i> <i>Sheep/Goat Pox</i>	PPR virus (morbillivirus) Capripoxvirus (sheeppox/goatpox)	Mass vaccination (annual); quarantine; surveillance Live attenuated vaccine (80–100% efficacy); culling and movement control
<i>Contagious Pleuropneumonia (CCPP)</i> <i>Contagious Ecthyma (Orf)</i> <i>Brucellosis</i>	<i>Caprine Mycoplasma capricolum</i> capripneumoniae Parapoxvirus <i>Brucella melitensis</i>	(No widely available vaccine) – early antibiotic treatment, isolate sick goats Supportive care; live vaccine only on infected farms Test-and-slaughter; Rev-1 vaccination in sheep/goats; milk pasteurization
<i>Bluetongue</i>	BTV (orbivirus, midge-borne)	Vaccination (serotype-specific) where needed; vector control
<i>Foot-and-Mouth Disease (FMD)</i> <i>Gastrointestinal Worms</i>	FMD virus (picornavirus) Nematodes (e.g. <i>Haemonchus</i>)	Stamping-out; emergency vaccination (as needed) Rotational grazing; selective deworming (FAMACHA); genetic selection
<i>External Parasites</i>	Lice, mites, ticks	Topical/injectable insecticides; pasture management

Best Practices and Recommendations

For veterinarians and farmers, the keys to successful disease control are integration and persistence. No single measure suffices. A few guiding principles:

- **Plan Regular Vaccination Schedules:** Maintain annual vaccine campaigns for all core diseases (Table 1). Track vaccination dates and ensure boosters are given on time. Coordinate with neighbors to cover the entire community and avoid gaps.
- **Maintain Good Record-Keeping:** Document all treatments, births, deaths and illnesses. This helps identify patterns (for example, seasonal parasite flares) and measure control progress.

- **Improve Nutrition and Housing:** Adequate feed and clean water boost immunity. Regularly trim hooves and remove manure from pens. Prevent overcrowding, which amplifies disease spread.
- **Train and Educate:** Conduct farmer workshops on recognizing disease signs (e.g. PPR’s “purple tongue”) and on proper dosing of drugs or vaccines. Visual aids (posters, infographics) on deworming or vaccine timing can reinforce practices.
- **Monitor and Survey:** Work with local veterinary authorities to periodically sample flocks for antibodies against key diseases. In many places, participatory epidemiology (involving farmers in reporting) has improved outbreak detection.

- **One Health Collaboration:** Remember that controlling zoonoses (e.g. orf, brucellosis) protects human health. Vets should liaise with public health officials when making policies (e.g. pasteurization laws).

By combining modern veterinary tools with age-old husbandry wisdom, communities can keep their flocks healthy. In regions where these principles have been followed, small ruminant productivity has rebounded. For example, Rajasthan (India) saw a dramatic drop in PPR outbreaks after a statewide vaccination campaign, boosting lamb survival rates. In Tanzania, farmer-led cooperatives that provide cooperative animal-health services have achieved high vaccine coverage and reduced deaths from tick-borne diseases. These successes show that, even in resource-limited settings, diligent disease control pays off.

Conclusion

Disease control in sheep and goats is challenging but achievable. Understanding the enemy – the pathogens and parasites – allows targeted interventions. Vaccines, when available, should be widely used; when they are not, early treatment and isolation become critical. Crucially, control is not just a veterinary issue but a community effort. Veterinary programs that engage livestock keepers directly (for example, community vaccinators or village animal-health workers) tend to have the best outcomes. By integrating vaccination, biosecurity, nutrition and surveillance, small-ruminant owners can protect their animals, their livelihoods, and public health. The evidence from around the globe is clear:

proactive, science-based control measures can keep flocks thriving and free of major diseases. As PPR eradication and SGP control campaigns have shown, sustained effort and coordination can turn the tide on small-ruminant diseases.

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