

## Role of Supportive Therapy in Treating Animal Parasitic Diseases

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### Introduction

#### The Silent Threat of Parasites in Animal Health

Parasitic diseases are a major challenge across the animal kingdom, impacting pets, livestock, and wildlife. These tiny organisms i.e., worms, ticks, fleas, and protozoa, may be invisible, but their effects are profound. A dog suddenly lethargic, a cow producing less milk, or a wild deer struggling to evade predators may all be victims of parasitic infections. These conditions cause suffering, economic losses in animal sector, and even risks to human health through zoonotic diseases.

While antiparasitic drugs target the parasites directly, they often aren't enough when an animal is already weakened, dehydrated, or battling secondary infections. This is where supportive therapy shines. Supportive therapy bridges the gap between diagnosis and recovery, significantly improving outcomes in severe cases. It doesn't kill parasites but stabilizes the animal, relieves symptoms, and speeds recovery.

Parasitic diseases affect millions of animals worldwide. In pets like dogs and cats, parasites are a top reason for vet visits. For example, heartworm infections are common in dogs across the world. In livestock, parasites like gastrointestinal worms and liver flukes cause billions in losses annually through reduced productivity and mortality. Wildlife isn't spared either, as parasites weaken populations and disrupt ecosystems.

#### Understanding Parasitic Diseases: The Enemy Within and Without

To understand supportive therapy's importance, we must first know the parasites. They fall into two main categories, ectoparasites (external)

and endoparasites (internal), each causing unique harm.

#### Ectoparasites: The External Menace

Ectoparasites, such as ticks, fleas, mites, and lice, live on the animal's exterior, feeding on blood, skin, or tissue fluids. Their effects range from mild irritation to life-threatening conditions.

- **Ticks:** These arachnids spread diseases like babesiosis, theileriosis, anaplasmosis, etc in animals. Heavy infestations cause anemia, skin infections, and systemic illness. A single female tick can lay thousands of eggs, perpetuating infestation cycles.
- **Fleas:** Beyond intense itching, fleas transmit tapeworms and other pathogens. Severe infestations in kittens or puppies can cause life-threatening anemia due to blood loss.
- **Mites and Lice:** Mites cause mange, leading to hair loss, thickened skin, and bacterial infections. Lice, though less common, cause similar irritation and spread quickly in crowded conditions like shelters.

Primary treatments include topical or oral parasiticides like fipronil or ivermectin. However, supportive therapy is key for managing symptoms. Anti-inflammatory drugs reduce swelling and itching, fluids combat dehydration, antibiotics treat secondary bacterial infections, and nutritional support restores energy.

#### Endoparasites: The Internal Menace

Endoparasites, including helminths (worms) and protozoa, live inside the host, targeting organs like the intestines, lungs, liver, or blood.

- **Helminths:** Roundworms, hookworms, and tapeworms are common. In puppies,

roundworms cause bloating, stunted growth, and intestinal blockages. Hookworms feed on blood, leading to severe anemia, especially in young or malnourished animals. Tapeworms steal nutrients, causing weight loss.

- **Protozoa:** Single-celled parasites like coccidia cause gastrointestinal and systemic issues. Coccidiosis in cattle and poultry leads to bloody diarrhoea and dehydration, while giardiasis can cause chronic diarrhoea and malabsorption.
- **Blood Parasites:** *Babesia* and *Trypanosoma*, transmitted by arthropods vector, attack red blood cells or tissues. Babesiosis in dogs causes hemolytic anemia, with symptoms like coffee colour urine and jaundice. Trypanosomosis in cattle reduces milk production.

Endoparasites often trigger secondary issues, like bacterial infections from damaged tissues or malnutrition from nutrient loss. Supportive therapy, including fluids, nutritional supplements, and antibiotics, stabilizes animals during treatment.

#### Zoonotic and Ecological Impacts

Parasitic diseases don't just affect animals; they impact humans and ecosystems. Zoonotic parasites, like *Toxoplasma* from cats or *Echinococcus* from dogs, can infect humans, causing serious health issues. In wildlife, parasites like liver flukes in deer or avian malaria in birds weaken populations, disrupting food chains. Treating animal parasites protects human and environmental health.

#### Role of Supportive Therapy: Building Resilience

Supportive therapy is the practice of maintaining an animal's physiological balance while antiparasitic drugs work. It's not about curing the infection but ensuring the body can withstand the assault and recover fully. This is critical in severe cases where animals are immunocompromised, dehydrated, or battling multiple infections. Supportive therapy is tailored to the animal's condition and the parasite involved. Common interventions include:

- **Fluid Therapy:** Parasitic diseases often cause dehydration through vomiting, diarrhea, or blood loss. Intravenous (IV) or subcutaneous fluids, like lactated Ringer's solution, restore hydration and electrolyte

balance. In coccidiosis, rehydration solutions can save calves.

- **Nutritional Support:** Parasites steal nutrients, causing malnutrition and weight loss. High-calorie diets, vitamin supplements (e.g., B12 for anemia), and tube feeding for weak animals are common. In livestock, fortified feeds boost recovery.
- **Pain Management:** Parasites cause discomfort, from abdominal pain in worm infections to itching from fleas. Non-steroidal anti-inflammatory drugs (NSAIDs) like meloxicam or analgesics reduce pain and inflammation.
- **Antibiotics and Antifungals:** Secondary bacterial or fungal infections are common, especially in mange or intestinal damage. Antibiotics like amoxicillin or antifungals like ketoconazole address these complications.
- **Blood Transfusions:** In severe anemia (e.g., babesiosis or hookworm infections), transfusions restore red blood cell counts.
- **Environmental Management:** Clean bedding, isolation to prevent parasite spread, and stress reduction (e.g., quiet environments) aid recovery. In shelters, hygiene prevents reinfestation.
- **Immunomodulation:** In chronic infections, drugs like levamisole may boost immunity, though used cautiously due to side effects.

Supportive therapy significantly improves survival rates in severe parasitic infections, especially for young, elderly, or immunocompromised animals.

#### Science of Support

Parasites disrupt homeostasis, the body's internal balance. For example, hookworms cause blood loss, leading to shock; protozoa like *Giardia* damage intestinal villi, impairing nutrient absorption. Supportive therapy counteracts these effects:

- **Fluid Dynamics:** Crystalloid fluids composed of water and small solutes like electrolytes and glucose. These solutions are widely used for maintaining fluid balance and medication delivery. They are categorized based on their tonicity in to

isotonic, hypertonic, or hypotonic. These fluids can also correct acidosis and pH of the blood.

- **Nutritional Calculations:** Veterinarians calculate caloric needs based on resting energy requirements (RER), and during recovery 1.5-2 times RER may be needed.
- **Immune Support:** Probiotics restore gut flora post-deworming, while vitamins like iron and B12 aid red blood cell production.

Advances include probiotics and prebiotics, enhancing the animal's ability to fight parasites and their consequences.

### Supportive Therapy in Action

**Canine Heartworm Disease:** It is caused by *Dirofilaria immitis*, a serious condition spread by mosquitoes. Adult worms live in the heart and pulmonary arteries, causing coughing, fatigue, and heart failure. The main treatment, melarsomine injections, kills adult worms but is harsh, risking complications like pulmonary emboli as worms die. Supportive therapy is essential and includes:

- **Cage Rest:** Limiting activity prevents emboli from dislodging worms.
- **Anti-inflammatories:** Drugs like prednisone reduce lung inflammation from dying worms.
- **Diuretics:** Medications like furosemide manage fluid buildup in advanced cases.
- **Anticoagulants:** Heparin or aspirin prevent clots.
- **Oxygen Therapy:** For dogs with breathing difficulties.

**Feline Toxoplasmosis:** It is caused by *Toxoplasma gondii*, affects cats, especially those hunting outdoors. Symptoms include fever, lethargy, and neurological issues like seizures. Clindamycin is the primary treatment, but supportive therapy manages symptoms:

- **Fluids:** To combat dehydration from fever or reduced appetite.
- **Anticonvulsants:** Drugs like phenobarbital control seizures in neurological cases.
- **Nutritional Support:** High-protein diets or tube feeding for cats too weak to eat.

**Puppy Roundworm Infection:** Puppies often contract roundworms *Ancylostoma caninum* from their environment. Symptoms include bloating, diarrhoea, and stunted growth. Dewormers like

pyrantel pamoate are effective, but severe cases can cause anemia.

Supportive therapy includes:

- **Iron Supplements:** To treat anemia from blood loss.
- **Fluids:** To correct dehydration from diarrhoea.
- **High-Calorie Diets:** To support growth.

**Bovine Coccidiosis:** It is caused by *Eimeria* species, affects cattle, especially calves. It causes bloody diarrhoea, dehydration, and weight loss, impacting dairy and beef production. Sulfonamides or amprolium treat the parasite, but supportive therapy is critical.

- **Oral Rehydration Solutions:** Electrolytes and glucose combat diarrhoea-induced dehydration, often saving lives.
- **Antibiotics:** To prevent bacterial overgrowth in damaged intestines.
- **Nutritional Support:** High-energy feeds counteract weight loss.

**Ovine Haemonchosis:** It is caused by *Haemonchus contortus*, the barber's pole worm, a blood-feeding parasite in sheep, causing anemia and weakness. Anthelmintics like ivermectin are used, but resistance is a growing issue, making supportive care vital.

- **Blood Transfusions:** To restore red blood cell counts in severe cases.
- **Iron and Vitamin B12:** To support blood production.
- **Protein-Rich Diets:** To rebuild strength.

**Porcine Ascarid Infection:** *Ascaris suum* in pigs causes respiratory symptoms and growth retardation. Dewormers like fenbendazole are effective, but supportive therapy enhances recovery:

- **Bronchodilators:** To ease breathing in pneumonia-like cases.
- **Nutritional Supplements:** To support growth.
- **Antibiotics:** To prevent secondary infections.

**Avian Malaria:** In zoos, penguins can contract avian malaria (*Plasmodium* species) from mosquitoes, leading to lethargy and anemia. Antimalarials like chloroquine are used, but supportive therapy is essential:

- **Warmth:** To maintain body temperature.

- **Fluids and Nutrition:** To combat weakness.
- **Antibiotics:** To prevent secondary infections.

**Meningeal Worm in Deer:** Meningeal worm (*Parelaphostrongylus tenuis*) affect wild deer, causing neurological damage. In rehabilitation centers, anthelmintics are used, but supportive therapy minimizes stress:

- **Anti-inflammatories:** To reduce brain swelling.
- **Nutritional Support:** To maintain strength during recovery.

### The Science Behind Supportive Therapy: Why It Works

Parasitic diseases disrupt multiple systems, making supportive therapy a cornerstone of recovery.

#### Physiological Impacts of Parasites

- **Gastrointestinal Damage:** Worms like hookworms damage intestinal mucosa, causing bleeding and malabsorption. Protozoa like *Giardia* destroy villi, reducing nutrient uptake.
- **Haematological Effects:** Blood parasites like *Babesia* cause hemolysis, leading to anemia. Ectoparasites like ticks deplete blood volume.
- **Immune Suppression:** Chronic infections weaken immunity, inviting secondary infections.
- **Systemic Stress:** Fever, pain, and organ damage strain the body, potentially leading to shock or organ failure.

Supportive therapy counteracts these effects by stabilizing physiology.

#### Fluid Therapy: Restoring Balance

Dehydration is common in parasitic diseases. Diarrhoea, vomiting, and blood loss reduce fluid volume, causing electrolyte imbalances and acidosis. Fluid therapy restores homeostasis:

- **Crystalloids:** Solutions like lactated Ringer's or saline correct dehydration and pH. For a 20-kg dog, 1-2 liters daily may be needed, based on dehydration severity.
- **Colloids:** In hypovolemic shock (e.g., severe hookworm anemia), colloids like Hydroxyethyl starch (HES/HAES), provide rapid volume expansion.

- **Oral Rehydration:** In livestock, oral solutions with glucose and electrolytes are cost-effective.

#### Nutritional Support: Fueling Recovery

Parasites steal nutrients, causing malnutrition. Nutritional therapy is tailored:

- **Caloric Needs:** Resting energy requirements (RER) (kcal/day) are calculated as  $70 \times (\text{body weight in kg})^{0.75}$ . During recovery, 1.5-2 times RER is provided. For a 50-kg cow, this might mean 10,000 kcal/day via fortified feed.
- **Micronutrients:** Iron, B12, and vitamin A support blood production and tissue repair.
- **Tube Feeding:** For anorexic animals, nasogastric or esophageal tubes deliver liquid diets.

#### Pain and Inflammation Management

Parasites cause pain through tissue damage or allergic reactions. NSAIDs like meloxicam reduce inflammation, while opioids like buprenorphine manage severe pain. In heartworm disease, corticosteroids reduce pulmonary inflammation from dying worms.

#### Combating Secondary Infections

Damaged tissues are prone to bacterial or fungal infections. Antibiotics like doxycycline or antifungals like itraconazole are used based on the infection type. In mange, topical antibiotics prevent skin infections.

**Advanced Interventions:** Emerging therapies include:

- **Probiotics:** To restore gut flora post-deworming, improving digestion.
- **Stem Cell Therapy:** Experimental for tissue repair in severe damage.
- **Immunomodulators:** Drugs like levamisole boost immunity, though side effects limit use.

#### Challenges in Implementing Supportive Therapy

Supportive therapy faces following hurdles:

- **Cost:** In developing regions, fluids, transfusions, and drugs are expensive. Farmers may avoid treatment.
- **Access:** Rural areas often lack veterinary facilities, delaying care.
- **Ethical Dilemmas:** In severe cases, euthanasia may be more humane than prolonged suffering, especially in wildlife.

- **Resistance:** Growing resistance to antiparasitics makes supportive therapy more critical, as primary treatments may fail.

Animals used in therapy programs, like dogs in animal-assisted interventions, must be parasite-free to prevent zoonotic transmission, requiring rigorous health checks.

#### **Prevention: The Ultimate Supportive Strategy**

Preventing parasitic diseases reduces the need for supportive therapy. Key strategies include:

- **Regular Deworming:** It is helpful in the minimizing the morbidity and/ or mortality of the animals.
- **Vaccines:** Available for some parasites, like *Theileria annulata*.
- **Vector Control:** Insecticides, repellents, and environmental management (e.g., removing standing water) reduce tick and mosquito populations.
- **Hygiene:** Regular faeces removal and clean bedding prevent reinfestation.
- **Education:** Awareness about parasite risks and prevention benefits pet owners and farmers.

#### **Ethnoveterinary Practices: Traditional Support**

Traditional remedies complement modern therapy in many cultures:

- **Neem:** In India, neem oil repels fleas and ticks.
- **Garlic:** In small doses, believed to deter worms in livestock.
- **Papaya Seeds:** Frequently used as dewormer in goats.

These methods, while less studied, support conventional treatments, especially in resource-poor settings.

#### **Future Directions: Innovations in Supportive Therapy:**

The fight against parasitic diseases is evolving, with supportive therapy at the forefront:

- **Nanotechnology:** Targeted drug delivery enhances antiparasitic efficacy, reducing the need for aggressive supportive care.
- **Gene Editing:** CRISPR-based approaches may create parasite-resistant animals, though ethical concerns remain.
- **AI and Diagnostics:** Artificial intelligence can predict outbreaks and optimize supportive protocols.

- **Climate Adaptation:** As warming climates expand parasite ranges, supportive therapy must adapt to new species and vectors.
- **Probiotics and Microbiome Research:** Tailored probiotics show promise in restoring gut health post-infection.

#### **Conclusion**

Supportive therapy is an important part of treating animals with parasitic diseases. It helps turn serious health problems into stories of healing. Whether it's a puppy sick with roundworms or a cow recovering from coccidiosis, this care helps animals get their strength and energy back. It also shows how dedicated vets, farmers, and pet owners are to animal health. Today, parasites are becoming more common because of climate change, travel, and resistance to medicines. That's why supportive therapy is more important than ever. Pet owners should take their animals for regular check-ups and use preventive treatments. Farmers need to keep animals' living spaces clean and act quickly when they see signs of illness. Veterinarians should use a complete approach, combining parasite treatments with supportive care to help animals recover fully. By working together, we can keep animals healthy, protect our food supply, and reduce the chance of diseases spreading to people. Supportive therapy is more than just treatment, it's a lifeline that helps animals survive and thrive in a world full of hidden dangers.