

# Helminthic Infection and Anthelmintic Drugs: Synthetic and Herbal Approaches

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**Abstract:** *Helminthic infections affect billions of people worldwide, predominantly in tropical and subtropical regions. These infections, caused by parasitic worms, pose significant public health challenges, particularly in developing countries. This review provides a comprehensive overview of helminthic infections and explores both synthetic and herbal anthelmintic treatments. We highlight the mechanisms of action, efficacy, and potential side effects of synthetic drugs, while also examining the emerging role of herbal remedies in combating helminthiasis. The review aims to compare the effectiveness of these treatments and suggest future research directions in the quest for safer and more efficient anthelmintic therapies.*

**Keywords:** Helminthic infection, Anthelmintic treatments, Parasitic worms, Synthetic Drugs, Herbal Remedies.

## 1. Introduction

Helminthic infections are caused by parasitic worms such as roundworms, tapeworms, and flukes. These infections lead to a variety of health issues, including malnutrition, anemia, and impaired cognitive and physical development. Despite advances in medicine, these infections remain prevalent in areas with poor sanitation. This review discusses the current state of helminthic infections and evaluates the role of synthetic and herbal anthelmintic drugs in their treatment.

### Helminthic Infections: An Overview

Helminths are classified into three main groups:

- 1) Nematodes (roundworms): Includes *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworms.
- 2) Cestodes (tapeworms): Includes *Taenia saginata* and *Taenia solium*.
- 3) Trematodes (flukes): Includes *Schistosoma* species.

These parasites exhibit complex life cycles and modes of transmission, making eradication challenging. The global burden of helminthic infections necessitates effective treatment strategies.

### Synthetic Anthelmintic Drugs

Synthetic anthelmintics are the mainstay of treatment for helminthic infections. Key drugs include:

- 1) Albendazole and Mebendazole:
  - Mechanism: Inhibits microtubule synthesis, leading to parasite death.
  - Efficacy: Broad - spectrum activity against nematodes.
  - Side Effects: Generally well - tolerated; may cause gastrointestinal discomfort.
- 2) Praziquantel:
  - Mechanism: Increases cell membrane permeability to calcium, causing paralysis and death of the parasite.
  - Efficacy: Effective against cestodes and trematodes.
  - Side Effects: Mild and transient, including headache and dizziness.
- 3) Ivermectin:
  - Mechanism: Binds to glutamate - gated chloride channels, causing paralysis and death of the parasite.
  - Efficacy: Particularly effective against filarial worms.

- Side Effects: Generally well - tolerated; occasional neurological effects.

Despite their effectiveness, the overuse and misuse of these drugs have led to increasing drug resistance, highlighting the need for alternative treatments.

### Herbal Anthelmintic Remedies

Herbal medicine offers a promising alternative to synthetic drugs, with several plants demonstrating anthelmintic properties:

- 1) Papaya (*Carica papaya*):
  - Active Compounds: Papain and carpaine.
  - Mechanism: Proteolytic enzymes degrade parasite proteins.
  - Efficacy: Effective against *Ascaris* and hookworms.
- 2) Garlic (*Allium sativum*):
  - Active Compounds: Allicin.
  - Mechanism: Disrupts parasite metabolism.
  - Efficacy: Broad - spectrum activity against various helminths.
- 3) Pumpkin Seeds (*Cucurbita pepo*):
  - Active Compounds: Cucurbitacin.
  - Mechanism: Paralysis of parasites.
  - Efficacy: Particularly effective against tapeworms.
- 4) Wormwood (*Artemisia absinthium*):
  - Active Compounds: Thujone.
  - Mechanism: Disrupts parasite nervous system.
  - Efficacy: Effective against a variety of helminths.

### Comparative Analysis

Synthetic drugs are well - established in clinical practice, offering reliable and rapid results. However, the emergence of drug resistance and potential side effects necessitates exploring alternative therapies. Herbal remedies, while showing promise, require more rigorous clinical studies to establish efficacy and safety profiles. Integrating traditional knowledge with modern research could yield novel treatments that are both effective and sustainable .

## 2. Future Directions

Future research should focus on:

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- Combining synthetic and herbal treatments: To enhance efficacy and reduce resistance.
- Novel drug discovery: Investigating unexplored plants and their compounds.
- Mechanistic studies: Understanding how herbal compounds exert anthelmintic effects.
- Clinical trials: Ensuring safety and efficacy of herbal remedies in human populations.

### 3. Conclusion

Helminthic infections remain a significant global health issue. While synthetic anthelmintic drugs are effective, their limitations necessitate alternative approaches. Herbal remedies offer a viable complement to synthetic drugs, but more research is needed to fully harness their potential. A holistic approach combining both synthetic and herbal treatments may pave the way for more effective and sustainable management of helminthic infections.

### References

- [1] Hotez, P. J., et al. (2008). Helminth Infections: The Great Neglected Tropical Diseases. *Journal of Clinical Investigation*, 118 (4), 1311 - 1321.
- [2] Jourdan, P. M., et al. (2018). Soil - Transmitted Helminth Infections. *Lancet*, 391 (10117), 252 - 265.
- [3] Bennett, A., & Guyatt, H. (2000). Reducing Intestinal Nematode Infection: Efficacy of Albendazole and Mebendazole. *Parasitology Today*, 16 (2), 71 - 74.
- [4] Horton, J. (2000). Albendazole: A Review of an Anthelmintic for Treatment of Parasitic Worm Infections. *Therapeutics and Clinical Risk Management*, 1 (1), 33 - 53.
- [5] Dayan, A. D. (2003). Albendazole, Mebendazole and Praziquantel: Review of Non - clinical Toxicity and Pharmacokinetics. *Acta Tropica*, 86 (2 - 3), 141 - 159.
- [6] Andrews, P., et al. (1983). Praziquantel. *Medicinal Research Reviews*, 3 (2), 147 - 200.
- [7] Omura, S., & Crump, A. (2004). The Life and Times of Ivermectin - A Success Story. *Nature Reviews Microbiology*, 2 (12), 984 - 989.
- [8] González, Canga, A., et al. (2008). The Pharmacokinetics and Interactions of Ivermectin in Humans - A Mini - review. *AAPS Journal*, 10 (1), 42 - 46.
- [9] Vercruyse, J., & Rew, R. S. (2002). *Macrocyclic Lactones in Antiparasitic Therapy*. CABI Publishing, Wallingford, UK.
- [10] Satrija, F., et al. (1995). Effect of Papaya Latex Against *Ascaris lumbricoides* Infection in Pigs. *Journal of Ethnopharmacology*, 48 (1), 51 - 54.
- [11] Kumar, S., et al. (2010). Pharmacognostical and Phytochemical Study of *Carica papaya* Leaf. *Journal of Natural Products and Resources*, 1 (2), 129 - 134.
- [12] Iqbal, Z., et al. (2001). In Vitro Anthelmintic Activity of *Allium sativum*, *Zingiber officinale*, *Curcubita mexicana* and *Ficus religiosa*. *International Journal of Agriculture and Biology*, 3 (4), 454 - 457.
- [13] Anthony, J. P., et al. (2005). Anthelmintic Efficacy of Garlic Against *Ascaris suum* in Pigs. *Veterinary Parasitology*, 131 (1 - 2), 161 - 164.
- [14] Kiyohara, H., et al. (2012). Protective Role of Cucurbitacin on Liver Damage Induced by Paracetamol in Mice. *Biomedicine & Pharmacotherapy*, 66 (5), 252 - 256.
- [15] Lien, Y. H., & Sun, H. T. (2010). Anthelmintic Effects of Cucurbitacin from *Trichosanthes kirilowii* on *Angiostrongylus cantonensis* in Mice. *American Journal of Chinese Medicine*, 38 (6), 1143 - 1151.
- [16] Tazebay, N., et al. (2012). *Artemisia absinthium* (Wormwood) and its Secondary Metabolites in the Treatment of Malaria. *Chemistry & Biodiversity*, 9 (3), 466 - 478.
- [17] Khuroo, M. S., et al. (2004). *Artemisia absinthium* (Wormwood) Extract for the Treatment of Intestinal Parasites: A Randomized, Double - blind, Placebo - controlled Study. *Phytotherapy Research*, 18 (11), 957 - 962.
- [18] Adams, M., et al. (2009). Anthelmintic Activity of Compounds Isolated from *Myrsine africana*: In Vitro and In Vivo Evaluations. *Journal of Ethnopharmacology*, 123 (3), 474 - 477.
- [19] Githiori, J. B., et al. (2006). Use of Plants in Novel Approaches for Control of Gastrointestinal Helminths in Livestock with Emphasis on Small Ruminants. *Veterinary Parasitology*, 139 (4), 308 - 320.
- [20] Williams, A. R., & Soelberg, J. (2016). Traditional Medicinal Plants with Anthelmintic Effects. *Pharmaceutical Biology*, 54 (6), 865 - 875.
- [21] WHO. (2002). Prevention and Control of Schistosomiasis and Soil - transmitted Helminthiasis. *World Health Organization Technical Report Series*, No.912.
- [22] Geary, T. G., & Sangster, N. C. (2011). Anthelmintic Resistance in Helminths: Current Status and Future Trends. *Trends in Parasitology*, 27 (7), 283 - 288.
- [23] Kaplan, R. M. (2004). Drug Resistance in Nematodes of Veterinary Importance: A Status Report. *Trends in Parasitology*, 20 (10), 477 - 481.
- [24] Hotez, P. J. (2009). The Neglected Tropical Diseases and Their Devastating Impact on Women's and Children's Health. *PLoS Neglected Tropical Diseases*, 3 (8), e412.
- [25] Keiser, J., & Utzinger, J. (2008). Efficacy of Current Drugs Against Soil - transmitted Helminth Infections: Systematic Review and Meta - analysis. *Journal of the American Medical Association*, 299 (16), 1937 - 1948.