Anthelmintic Drugs

By

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Helminthes

- Cestodes
- Nematodes
- Trematodes
Types of Common Helminthes:

1. Worms live in hosts GIT.

2. Worms or larvae live in other tissues of hosts' body like muscles, viscera, meninges, lungs, subcutaneous tissues.

1. Gastrointestinal worms

A- TAPE WORMS (CESTODES)

- Taenia saginata (Beef)
- Taenia solium (Pork),
- Diphyllobothrium latum (Fish)

- Humans infected by eating raw or undercooked meat containing larvae or encysted in infected animal muscles.
1. Tapeworms (Cestodes)

- *T. saginata* (Beef tapeworm)
- *T. solium* (Pork tapeworm)
- *Diphyllobothrium latum* (fish tape)

- In case of *D. latum* infections by eating raw or undercooked fish

- In some conditions this larvae may develop causing cysticercosis (i.e. larvae gets encysted in muscle, or more seriously in brain or eye)
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<tr>
<th>Cestode</th>
<th>Definitive Host</th>
<th>Approved Treatments</th>
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<td>Dipylidium caninum</td>
<td>Dog, cat</td>
<td>Epsiprantel, Praziquantel</td>
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<tr>
<td>Taenia taeniaeformis</td>
<td>Cat</td>
<td>Epsiprantel, Praziquantel, Fenbendazole</td>
</tr>
</tbody>
</table>
Hydatid tape worm

- Echinococcus granulosus.

- These are cestodes, primary in canines (dogs) and sheep as intermediate host.

- Humans can act intermediate host in which larvae develop to hydatid cyst within the tissue.
Life cycle of *Echinococcus granulosus*
2- INTESTINAL ROUND WORMS (NEMATODES)

- Ascaris lumbricoides (common round worm)
- Enterobius vermicularis (pin worm)
- Trichuris trichuria (whip worm)
- Strongyloids stercoralis (thread worm)
- Ankylostoma duodenale (hook worm)

B. TISSUE ROUND WORMS

Trichinella spiralis
Ascaris lumbricoids (Comm R.W.)

Hook worm
Ancylostoma duodenale

Whipworm

Tricuris tricura

PINWORM MALE, FEMALE

Dr. Nehal Afifi

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3- TREMATODES
(Schisotomuses, FLUKES)

Schistosoma → SCHISTASOMIASIS , BILHARZIA

Flukes(Leaf Like)

Lung fluke: larvae move from intestine to Bl. & settle in lungs
<table>
<thead>
<tr>
<th>Helminths</th>
<th>Diseases</th>
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</table>
| **1. Cestodes** | **Taenia saginata**  
**Taenia solium**  
**Diphyllobothrium latum** | **Beef tapeworm**  
**Pork taperworm**  
**Fish tapeworm** |
| **Larval tissue cysts** | **Taenia solium**  
**Echinococcus granulosus** | **Cysticercosis**  
**Hydatid disease** |
| **2. Nematodes**  
**Tissue worms**  
**Intestinal nematodes** | **wuchereria bancrofti**  
**Enterobius vermicularis**  
**Ascaris lumbricoides**  
**Trichuris trichiura**  
**Ancylostoma duodenale**  
**Strongyloides stercoralis** | **Filariasis**  
**pin worms**  
**Round worms**  
**Whipworm**  
**Hookworm** |
| **3. Trematodes**  
**Blood flukes**  
**Intestinal / hepatic** | **Schistosoma species**  
**Fasciola hepatica** | **Schistosomiasis** |
Anthelmintic Drugs

- **Anti**: against & helminthes: worms

- Drugs kill or expel the internal parasitic worms infesting GIT & other tissues of man and animals

- **Ideal Anthelmintic drug:**
  1. A wide therapeutic index; the ratio of the therapeutic dose to the maximum tolerated dose. Wide safety margin of at least 1:6 with highest toxicity to worms, but lesser toxic to the host
  2. Broad spectrum of activity against mature & immature larval worms of most types of parasites.
Ideal Anthelmintic drug

3- Easily administered to animal and have a pleasant taste.
4- Effective Orally.
5- Effective in a single dose.
6- Leave No or low tissue residues & have a short residence time in Milk when used for treating food producing animals.
7- Economic (inexpensive)
8- compatible with other drugs.
9- inhibit reinfection for extended periods.
Anthelmintics

Vermicide

Vermifuge
Classification of Anthelmintics

- According to the type of action:
  1. **Vermicide**: Drugs that kill worms (Bunamidine, Praziquante)
  2. **Vermifuge**: Expel infesting worms alive (Piperazine, Santonine)

- According to the spectrum of activity:
  1. **Narrow spectrum Anthelmintics**
  2. **Broad spectrum Anthelmintics**
  3. **Endectocides**

- **Narrow spectrum Anthelmintics** as: Nitroxynil (active only against adult liver flukes) & Piperazine (against Ascarids Only)
- **Broad spectrum Anthelmintics:**
  - Active against GI nematodes, tape worms and/or flukes, as
  - **Benzimidazoles** (Thiabenzazole, Albendazole & Mebendazole)
  - **Organophosphates** (Dichlorvos & Trichlorphon).
  - **Tetrahydropyrimidines** (Morantel, Pyrantel & Oxantel).

- **Endectocides:**
  - Drugs effective against both arthropodes & nematodes as both:
  - **Avermectins** (Ivermectin, Abamectin, Doramectin) and
    **Milbemycins** (Moxidectin & Milbemycin D).

- **According to the type of worms:**
  - Anticestodals - Antinematodals - Antitrematodals.
General Mechanisms of Action (MOA)

1. Inhibiting energy production in the parasite by:
   - Inhibiting activity of fumarate reductase enz. in parasite (Albendazole,)
   - Inhibiting mitochondrial phosphorylation process in parasite (Rafoxanide)
   - Inhibiting process of glycolysis in parasite as Clorsulon, Phenothiazin

2. Causing muscular paralysis of the worm by:
   - Inhibiting cholinergic nerves of worm as nicotine sulphate.
   - Acting as GABA agonist so cause paralysis of worm as Piperazine.
   - Muscle hyperpolarization & paralysis of worm as Levamisole.

3. Other mechanism: Disruption of tegument (outer skin) Bunamidine.
Anticestodal drugs

- Drugs kill or expel tape worms infesting man & animals.
- Classification of Anticestodals:
- I- Organic of plant origin:
  - Arecoline:
    - Alkaloid from Areca nut seeds given orally as vermifuge.
    - Effective against Taenia species infesting dogs and cats.
    - MOA: by inducing muscular paralysis of worms so lose their attachment with intestinal mucosa & increase intestinal motility of host (as a neuromuscular purgative) → expel detached worms alive
  - Kamala powder:
    - A red powder act as vermifuge due to its irritant effect so expels worms alive.
    - Given orally and effective against cestodes infesting poultry
II- Synthetic drugs: Niclosamide (Mansonil®)

- A salicylanilide derivative.
- Vermicide for treatment of tape worm infestation in dogs & cats, beef tape worm, pork tape worm and fish tape worm.
- Has also activity against intestinal flukes as paramphistomes in ruminants.
- Not effective against cysticercosis or hydatic disease.
- MOA: worm killed by inhibit the mitochondrial phosphorylation process thus → inhibiting energy production in adult worms.
- Pharmacokinetic: Niclos poorly absorbed & very rapidly excreted.
- Given in a single dose on empty stomach → purgative use after 2 hrs.
- Has a safety margin 5 to 7 folds.
It effective against cestodes infesting man – T.saginata, T.sollium, D.latum, H.nana, thread worm.

It **safe** during pregnancy

**Mech. Of action**

- Inhibit oxydative phosphorylation in mitochondria
- Interfere with anaerobic generation of ATP by the tapeworm
- Cause injury & partly digested in the intestine
2- Bunamidine:

- Used as Effective remedy for tape worms infesting dogs & cats.
- **MOA:** act as vermicide by disruption of the tegument (outer skin) of worms and kill the worms.
- Used for a long time as effective ttt for *Echinococcus* in pets
- **Adverse Effects:** Diarrhea & vomition. sudden death in dogs may happen as drug cause myocardial sensitization to catecholamine.

3- Dichlorophen:

- A narrow spectrum anthelmintic against *Taenia* & *Dipylidium* spp. in dogs, but ineffective against *Echinococcus*.
- **MOA:** as taenicide by inhibiting phosphorylation process in mitochondria of worms so inhibit energy production.
4- Prazeugentel

- A broad Spectrum (Novel Anthelmintic)
- Actives against Cestodes – Schistosomes – Trematodes.
- Effective against all adult Cestodes & their larval forms in dogs & cats
- A potent schistosomicide with a high activity against Bl. flukes causing bilharziasis in man.
- Active on Trematodes as the lung and gut flukes in animals, but not effective against liver flukes

- MO A: Act as vermicide by 1- interfering with ionic balance due to leakage of IC Ca. from membrane causing rapid muscular contraction 2. causing vacuolation → disruption of worm tegument & death.

- kinetics: Praziquantel given orally or (S/C).
- Rapidly absorbed & metabolized
- its safety margin reaches 1:40 of the recommended dose.
 Novel anthelmintic

 Active against Schistosomes, Trematodes & Cestodes

**Mech. Of action**

Acts by causing leakage of IC Ca from the membrane

Contracture & Paralysis

Worm loses its grip in gut & expelled out
5- Epsiprantel

- A very potent, safe and novel tape worm remedy.
- Given orally for treatment of cestodes of dogs & cats.
- Safer than praziquantel as its safety margin is 1: 90
- Not active against schistosomes.
- MOA: anticestodal in a similar manner of praziquantel

6- Nitroscanate:

- Like dichlorophen, but more safer (safety margin 1: 40)
- A broad spectrum anthelmintic against cestodes & nematodes of dogs but not used for cats.
- MOA: Taenicide by inhibiting phosphorylation process in mitochondr of worms so inhibit energy production.
Antinematodal drugs

- Drugs kill or expel round worms (nematodes) infesting man & animals

**Classification of Antinematodals:**

I- Organic of plant origin:

1- **Nicotine sulphate:**
- Alkaloid obtained from *Nicotiana tobacco* plant
- Used orally as a drench as nicotine sulphate salt
- Acts as a vermifuge for *Ascaris* & *Trichostrongylus* worms of ruminants.

**MOA:** By causing inhibition of the cholinergic nerves of worms leading to muscular paralysis and expelling of worms.
2- Santonine:

- A pale yellow powder obtained from *Artemisia* plant
- Santonine given orally to expel *Ascarids worms of dogs & pigs*.
- Acts as a *vermifuge* due its *irritant* effect on worms.
- A purgative given after it for rapid expelling of worms.

3- Chenopodium oil:

- A pale yellow volatile oil obtained from *American wormseed* plant
- Oil contain a mixture of volatile subs. & active principle (*Ascaridol*)
- Ascaridol acts as a *vermifuge* by causing muscular paralysis of worms and expel them outside
- The oil active against *Strongylus worms* in horses and *Ascardis worms* in pigs, dogs & cats.
- Oil given orally in soft gelatinous capsules.
II- Synthetic drugs:

1- Benzimidazoles

- Benzimidazoles (Albendazloe, Thiabendazloe, Triclabendazole, Mebendazole, Oxfendazole, Fenbendazole & Flubendazole).

- A good activity against GIT nematodes & lung worms + their larvae.

- The recent drugs Mebendazole & Oxfendazole are highly effective against both nematodes & cestodes (broad spectrum).

- Albendazole active against adult liver flukes, cestodes & GIT nematodes larvae (broad spectrum, vermicide, oral anthelmintic).

- On contrast, Tricalbendazole is highly active against liver flukes (fasciolicide), but has no activity against nematodes & cestodes.
- **MOA:** Benzimidazoles act as vermicide by inhibiting energy production via inhibition of the activity of fumarate reductase enz.

- Benzim. are very safe anthelmintics; a wide safety margin from 1: 20 for albendazole to 1: 100 for fenbendazole (very safe).

- Cambendazole, Oxfendazole & Parbendazole have embryotoxic & teratogenic effects → not given to pregnant animals.

- **Albendazole** leave tissue residues therefore 10 days from the last dosing of sheep and 14 days from the last dosing of cattle must be elapsed before slaughtering animals.

- Cows producing milk for human should Not treated with Albendazole.

- **Fenbendazole** withdrawal time = 14 days for meat & 3 d. for milk

- **Tricla** withdrawal time = 28 days & Not use to animals providing milk.
Clinical uses of Albendazole

- Albendazole is the drug of choice for treatment of intestinal round worms as *Ascaris*, hook worm (*Ankylostoma*), thread worm (*Strongyloides*), pin worms (*Enterobius*) & whip worm (*Trichuris trichuria*) infestations, as a single dose repeated after 3 weeks.

- Albendazole is the main drug for Hydatid disease (dog tapeworm) twice / day for 1 month & repeat after 2-3wks if required up to 3 courses.

- Used for treatment of tissue round worm (*Trichnella spiralis*) for 3 days.
2- Tetrahydropyrimidine derivatives (Morantel, Pyrantel and Oxantel)

- **Morantel**: effective against GIT nematodes, but not against lung worms in ruminants.
- Used as a drench or "protect bolus" to provide prolonged protection for 90 days (slowly released).
- **Pyrantel pamoate**: A broad spectrum anthelmintic, highly effective against adult & larval nematodes of horse and dogs.
- Not active against lung worms and whipworms.
- **Oxantel**: Narrow spectrum (only active against whipworm) dogs
- **MOA**: Pyrantel is a depolarizing neuromuscular blocking agent cause release of acetylcholine & inhibition of cholinesterase enz. leading to muscular paralysis & death (Vermicide).
**Mech. Of Action**

Activation of nicotinic cholinergic receptors in worm

- Persistent Depolarization

- Contracture & Spastic Paralysis of worm
Pyrantel  Clinical uses :

- Pyrantel is very safe remedy for horses and dogs
- Pyrantel given to pregnant or lactating animals.
- Pyrantel given orally with or without food.
- For Pin worm, Ascariasis & Hookworm as a single dose and repeated after 2 wks.
- Morantel is a very safe remedy and no withdrawal period is required for the bolus, but a withdrawal period of 3 days is required for the drench.
3- Levamisole & Tetramisole

- **Levamisole**: Effective against mature & immature larval GI round and lung worms both orally & parenterally in ruminants & poultry.
- Used with limited success against heartworm microfilaria in dogs.
- Very rapid action & expel worms within 24 hrs.
- Rapid absorbed from GIT- Metabolized by liver- Half life 3-4 hr.
- Levamisole acts also as an immunostimulant drug.
- Neither embryotoxic nor teratogenic if given to pregnant animals.
  - **MOA**: $N_N$ agonist stimulate nicotinic ganglia in worms causing muscular paralysis & death of the worms (vermicide).
  - Interfere with carbohydrate metabolism.
4- Piperazine

- Commonly used antinematodal drug against only *Ascaris* and *Oxyuris* worms in man and animals.
- Not recommended for other helminthes infestation.
- Administered as citrate or phosphate salts and given orally as a drench or added to drinking water for poultry.
- MOA: act as vermifuge by its GABA agonist effect so it prevents neural transmission in the worm causing muscular paralysis and expelling of the worms alive.
- A very safe drug for man and animals during pregnancy
- Moderate oral absorption & excreted unchanged in urine.
It highly active drugs against ascaris, enterobius.

- It safe during Pregnancy.

Mech. Of action

- Gaba agonistic action opening Cl- channels

- Hyperpolarization & Relaxation of ascaris muscle

- Flaccid paralysis & Expels alive worms
5- Diethyl Carbamazinex (DEC)

- A highly soluble piperazine derivative → rapidly absorbed & distributed throughout the body.
- Drug of choice for treatment of Filariasis.
- Highly selective effect on microfilaria.
- Enhances cell mediated immunity
- Used for control of heartworm larvae in dogs.
- Safe for use in pregnant & young animals (Not teratogenic).
- **MOA:** DEC disrupt the microtubules & inhibit microtubules polymerization in microfilaria.
• **MOA:** 1- DEC Immobilize microfilaria & alter their membrane structure displacing them from tissues & making them susceptible to destruction by host defense mechanism.

• 2. Alternation of microfilaria membrane → phagocytosed by fixed tissue monocytes.

• 3. Affect muscular activity and cause hyper polarization due to piperazine moiety.

• The drug should be given after meals.
6- Ivermectin (Ivomec®)

- One of Avermectins that commonly used in Vet. Med.
- Highly effective against all nematodes in animals & arthropods as mange mites, lice & ticks (Endectocide).
- has no activity against cestodes and flukes.
- Given S/C at very low doses (0.2mg /kg for cattle, horse & sheep)
- MOA: act as vermicide causing paralysis of worms by intensifying the action of the inhibitory transmitter GABA at neuromuscular junction → paralysis and death of the worms.
IVERMECTIN  Pharmacokinetics

- Rapidly absorbed & widely distributed.
- Does not cross BBB
- Half-life 2-3 days & Excretion mainly in feces.
- Very safe remedy for ruminants, with withdrawal period = 28 days
- Not used in dairy cows providing milk for human consumption.

**Contraindication:**

- Pregnancy.
- Concurrent use with other drugs that enhance GABA e.g Barbiturates, valproaic acid & bnezodiazepines.
7- Organophosphate compounds

- Organophosphates as diclorvos, haloxon, & trichlorphon.
- Effective against GI nematodes infesting animals.
- **MOA:** Organophosphates inhibit the acetylcholinesterase of the worms leading to their paralysis and death.
- Nowadays, they are less commonly used because of their high toxicity to the host.
III– Antitrematodal drugs (Antiflukes)

- Drugs kill liver flukes (Fasciola hepatica & gigantica), rumen & abomasums flukes (Paramphestomes) & Bl. flukes (Schistosomes) infesting man and animals.

Classification:

I- Old fasciolicides:

1-Carbon tetrachloride (Ccl 4):

- Used for treating haemonchosis in ruminants, strongylosis in horses, ancylostomiasis in dogs, fascioliasis in sheep & cattle.
- Ccl 4 given either orally (as drench or in capsules) or (I/M).
- Only kills adult flukes & not effective against immature flukes → repeated after 3-4 weeks.
- MOA: Ccl 4 acts as fasciolicide by inhibiting the metabolic enzymes present in mature flukes.
• **Toxic symptoms of Ccl4**: drowsiness, muscular incoordination or convulsion, diarrhea and hypocalcaemia.
• To reduce its toxic effects, premedication of animals with calcium salts as calcium borogluconate (I/V) should be done.

• **2- Hexachloroethane (C2cl 6):**
• Effective for treating liver fascioliasis in cattle, sheep & goats.
• **MOA:** kills the mature flukes by inhibiting the metabolic enzymes present in the mature worms only.
• The dose of C2cl 6 should repeated after 3 weeks (immature not aff
• **C2cl 6** is less toxic than Ccl 4.
• **Toxic Symptomes in cattle loss of appetite & mild diarrhea.**
II- Modern fasciolicides:

(A) Substituted phenols as:

1- Nitroxynil:
- Used for treating fascioliasis in cattle and sheep.
- Nitroxynil only active by S/C injection & Not given orally due to rumen microflora cause reduction of nitro group → loss anthelmintic activity.
- Effective against adult liver flukes & Bl. sucking nematodes.
- A withdrawal period of 30 days before slaughtering the animal.
- Should not dosed to cows producing milk for human consumption.

2- Diamphenethide:
- Active against mature & immature liver flukes in sheep, inactive in cattle.
- MOA: fasciolicide by causing rupture of fluke tegument → muscular paralys.
- Must not dosed to sheep producing milk for human consumption.
- Has a 7 days withdrawal period for meat and its safety margin is 1:4.
(B) Salicylanilide derivatives:
1- Rafoxanide    2- Closantel    3- Oxyclonozane

1- Rafoxanide:
- Active against **mature & immature liver flukes** in both cattle & sheep, as well as blood sucking nematodes.
- **MOA:** Rafoxanide acts as fasciolicide by inhibiting the process of phosphorylation in mitochondria of worms.
- Given orally or by S/C injection & has a safety margin of 1:6.
- Rapidly absorbed, but slowly excreted → 28 days withdrawal period required for meat.
- Rafoxanide not used for cows producing milk.
2- Closantel:
- A broad spectrum Anthelmintic active against mature & immature flukes, Bl. sucking nematodes, and tape worms.
- Closantel also active against external parasit (mange, mites & ticks)
- Closantel given orally or by S/C injection to sheep and cattle.
- Has a six -fold safety margin.

3- Oxyclozanide:
- Effective oral fasciolicide in sheep and cattle,
- Active against adult liver flukes only.
- withdrawal time = 14 days for meat and zero for milk.
- Dosed to lactating cows ( not excreted in milk)
(C) Sulphonamide derivatives:

- **Clorsulon:**
  - Act as oral or injectable (S/C) fasciolicide in sheep and cattle.
  - Clorsulon active against mature and immature flukes.
  - **MOA:** by affecting the worm energy production via inhibiting two enzymes (phosphoglycerate kinase & phosphoglycerate mutase) which essential for glucose metabolism (glycolysis) in worms.
  - Its therapeutic index is 1: 25.

(D) Benzimidazole derivatives:

- 1- Tricalbendazole.
- 2- Albendazole.

  Tricalbendazole has **No antinematodal** activity but active against liver flukes (Fasciola hepatica) in sheep, goats and cattle.
• **Tricalbendalzole** very active against all stages (adult, immature and larvae) of *Fasciola hepatica* from day 1 to adult worms.

• Control & complete eradication of fascioliasis occur by breaking L.C. liver flukes with triclabendazole once every 6-8 months.

• A withdrawal time of 28 days for meat.

• Should not given to animals providing milk for human consumption.

• **2- Albendazole:**

• widely used for combating round worms & liver flukes in ruminants.

• Available as intraruminal bolus for sustained release of Albendaz.

• Active against all nematodes & their larvae, tapeworms & adult liver flukes (broad spectrum anthelmintic).

• A withdrawal period of 10 days in sheep and 14 days in cattle.

• Should not dosed in cows producing milk.
(E) Benzimidazole Pro-drugs: Netobimin

- **Netobimin** is a pro-drug of albendazole.
- When Netobimin dosed to sheep & cattle metabolized to Albendaz then converted to albendazole sulphoxide → excreted
- Netobimin active against GI nematodes & their larvae, tape worms and flukes (broad spectrum anthelmintic).
- Given orally or by injection.
- A withdrawal period for meat = 5 days in sheep & 10 days in cattle.
- A withdrawal period for Milk = 3 days in sheep & 2 days in cattle.
# Clinical uses of Vet. Anthelmintics

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<td>Liver flukes in ruminants</td>
<td>Rafoxanide – Nitroxynil- Clorsulon – Closantel- Albendazole- Oxyclozanide – Triclabendazol</td>
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<td>Round worms in ruminants</td>
<td>Phenothiazine- Morantel- Levamisole Albendazole - Ivermectin- Febantel</td>
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<tr>
<td>Round worms in horse</td>
<td>Ivermectin – Piperazine- Pyrantel- Dichlorvos Albendazole-Oxibendazole-Oxfendazole</td>
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<td>Roundworms in dogs &amp; cats</td>
<td>Nitroscantane- Dichlorvos Levamisole - Ivermectin- Piperazine</td>
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<tr>
<td>Tapeworms in dogs and cats</td>
<td>Niclosamide- Bunamidin-Dichlorophen Epsiprantel- Praziquantel</td>
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Anthelmintic Combinations

- Means finished formulated product has different anthelmintics to increase the spectrum of activity.
- Drug mixtures are truly complementary, e.g. ttt of round worms & flukes in ruminants and round worms & tape worms in dogs.
- Drug mixtures interact with each other e.g. combination of piperazine & phenothiazine (both antinematodal)
- 1- For ruminants:
  - (a) Fasciolicide + antinematodal drug.
  - (b) Fasciolicide + trace element as cobalt or selenium.
- 2- For horses: Antinematodals with Anticestodal or Pesticide.
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<th>Hosts</th>
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<td>Round worm, adult fluke</td>
<td>Sheep, cattle</td>
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<tr>
<td>Thiabendazole + Rafoxanide</td>
<td>Round worm, adult fluke</td>
<td>Sheep, cattle</td>
</tr>
<tr>
<td>Levamisole + Oxyclozanide + Cobalt + Selenium</td>
<td>Round worm, adult fluke, trace element deficiency</td>
<td></td>
</tr>
<tr>
<td>Rafoxanide + Oxibendazole + Cobalt</td>
<td>Round worm, adult fluke, cobalt Deficiency</td>
<td></td>
</tr>
<tr>
<td>Morantel + Diethylcarbamazine</td>
<td>Round worm, lung worm</td>
<td>Sheep, cattle</td>
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<td>Mebendazole + Trichlorphon</td>
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<td>Horse</td>
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<tr>
<td>Thiabendazole + Piperazine</td>
<td>Round worm and ascarids</td>
<td>Horse</td>
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<tr>
<td>Pyrantel + Oxantel</td>
<td>Round worm &amp; whip worm</td>
<td>Dog</td>
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<tr>
<td>Praziquantel + Febantel</td>
<td>Round worm, tape worm</td>
<td>Dog</td>
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