Anthelmintic Resistance
-Current Problem with future perspectives

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Anthelmintic Resistance- Current Problem with future perspectives

1. Anthelmintic Resistance and its impact on animal Health

2. Anthelmintic Resistance in poultry

3. Mechanism of Anthelmintic Resistance

4. Methods to detect Anthelmintic Resistance

5. Strategies to combat Anthelmintic Resistance

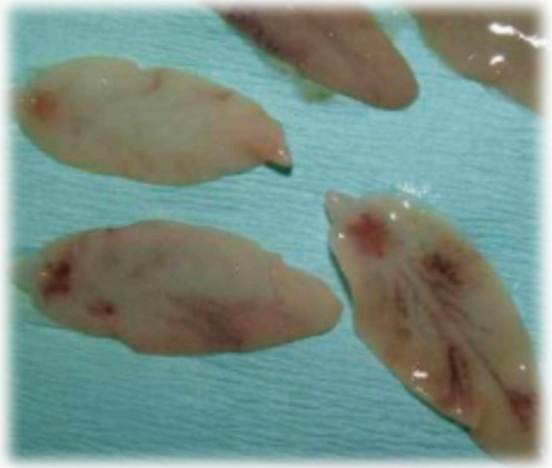
Anthelmintic Resistance and its impact on Animal Health

- Helminths
- Anthelmintics
- Classification of Anthelmintics
- Mode of action of Anthelmintics
- Anthelmintic Resistance
- Impact of Anthelmintic Resistance
  - -Health
  - -Production
  - -Reproduction of Animals
  - -Socioeconomic Impact

Helminths

- **Helminths** are group of worms like trematodes (flukes), Cestodes (tapeworms) and Nematodes (roundworms) which cause disease and health problems in animals

Liver fluke



Tapeworm

Roundworm

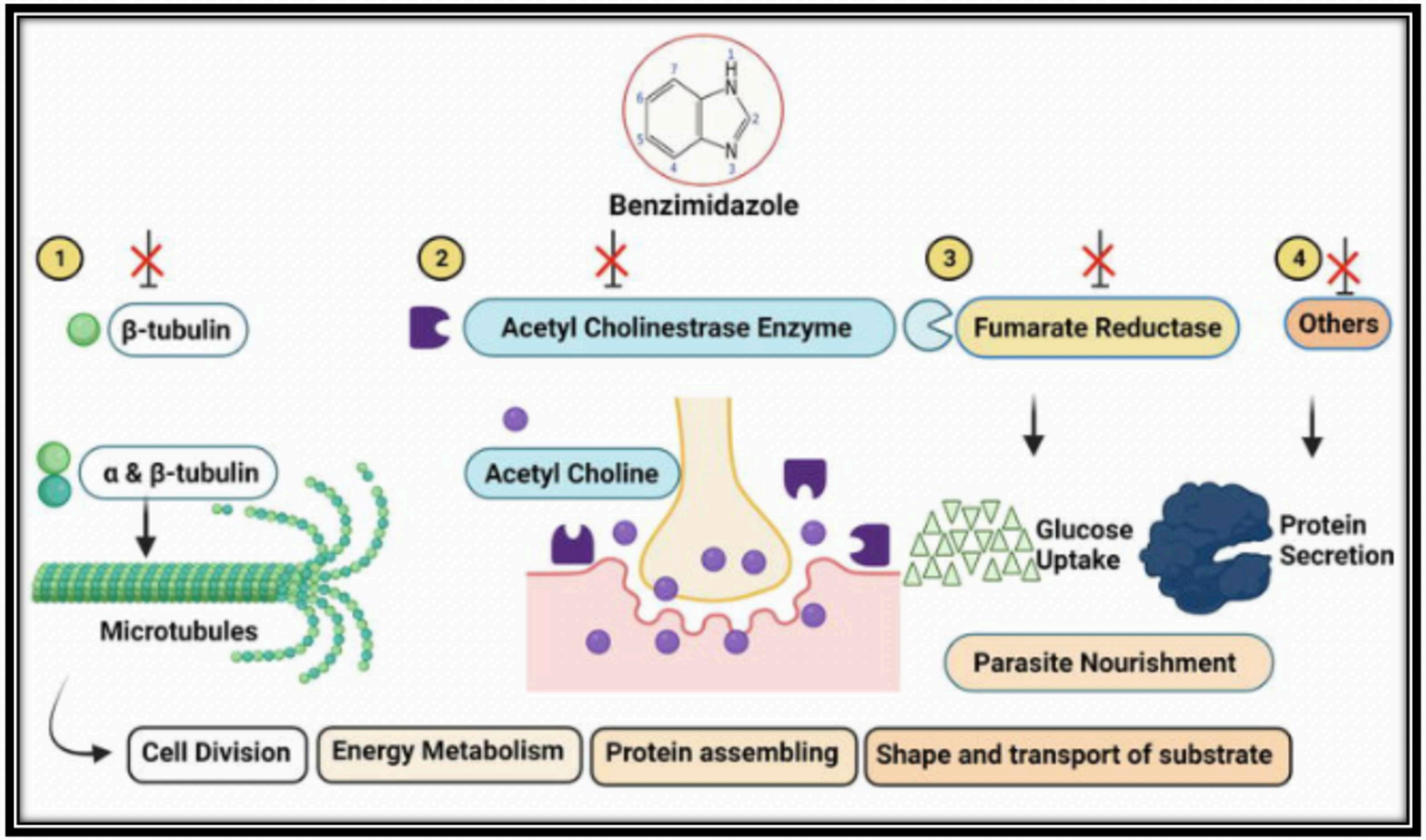
- **Anthelmintics** are drugs that are used to Kill/ destroy the helminth worms

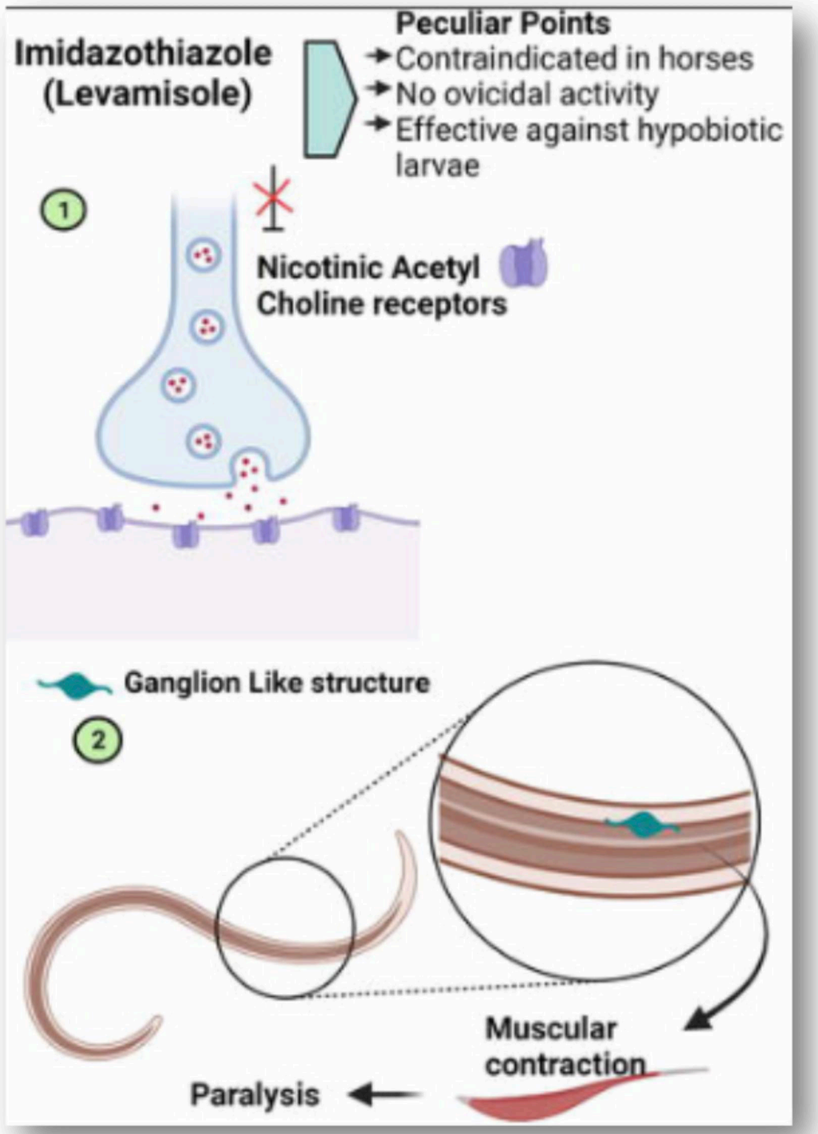
CLASSIFICATION OF ANTHELMINTIC DRUGS

Group	Examples
Benzimidazoles and Benzimidazole prodrugs	Albendazole, Fenbendazole, Mebendazole, Triclabendazole, Flubendazole, Thiabendazole Febentel
Halogenated Salicylanilides	Niclosamide, Rafoxanide, Closantel
Imidazothiazole derivatives	Levamisole, Tetramisole
Macrocyclic lactones	Ivermectin, Moxidectin, Selamectin, Epirnomectin Melbimycin
Heterocyclics: Quinolines and Isoquinolines	Praziquantel
Piperazines	Piperazine, Diethylcarbamazine citrate (DEC)
Tetrahydropyrimidines	Pyrantel, Morantel

Anthelmintic drugs	Mode of Action
Benzimidazoles and Benzimidazole prodrugs	Impairment of microtubule polymerization and microtubule mediated transport of secretory vesicles in parasite's absorptive tissues
Halogenated Salicylanilides	Uncoupling of oxidative phophorylation from electron transport inhibiting ATP production
Imidazothiazole derivatives	Nicotinic actylcholine receptor agonist causes worm paralysis
Macrocyclic lactones	Binding glutamate gated chloride channels in the membranes of the nerve and muscle cells causing increased permeability to chloride ions, cellular hyperpolarization and paralysis and death
Heterocyclics: Quinolines and Isoquinolines	Impairment of glucose uptake. Inhibition of mitochondrial respiration complex 1 and suppression of the unfolded protein response
Piperazines	Binding muscle membrane GABA receptors causing hyperpolarization of nerve endings and worm flaccid paralysis
Tetrahydropyrimidines	Interference with acetylcholine receptors at autonomic ganglion and neuromuscular junctions causing paralysis

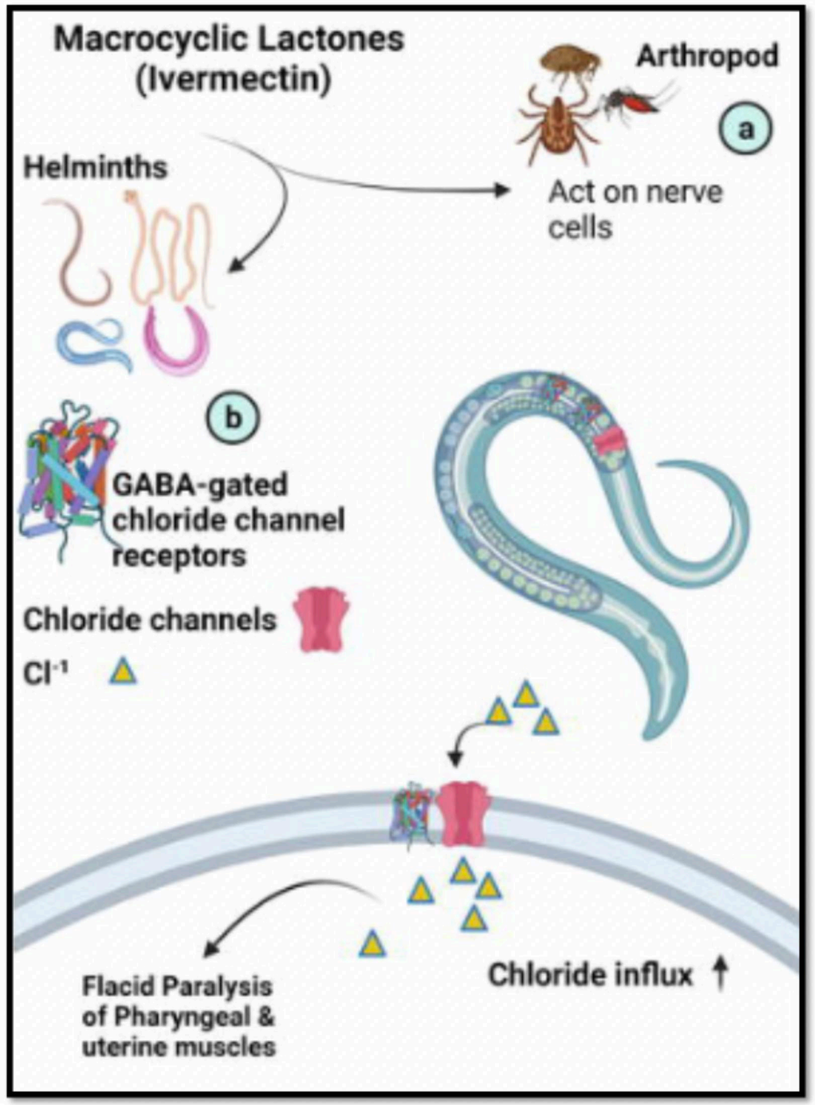
Mode of Action of Benzimidazoles (Malik et al. 2022)





Mode of Action of Imidazothiazole (Malik et al. 2022)

Mode of Action of Macrocyclic Lactones (*Malik et al. 2022*)



Anthelmintic resistance

- **Anthelmintic resistance (AR) is the genetic ability of parasites to survive treatment with an anthelmintic that has generally been effective against those parasites in the past (OIE).**

- **AR is inherited and all anthelmintic exposed worms will develop resistant gene**

- **Once resistance is established it can not be reversed or loss of resistance is not possible**

Impact of helminth parasites on animal health

- Direct tissue damage and dysfunction of affected Organs
- Diversion of energy and protein resources of host from production
- Reduced feed intake and feed conversion efficiency

Impact on growth and production

- Decreased appetite
- Anemia
- Diarrhoea
- Poor immune response and susceptibility to infections
- Negative energy balance and protein loss
- Decreased weight gain
- Decreased milk yield
- Decreased wool production

Impact on reproduction

- Delayed puberty
- Decreased conception rates
- Increased inter-calving periods

Socioeconomic Impact on rural economy

- Mortality due to severe helminth infection
- Cost of drugs and veterinary service charges
- Affect the Socioeconomic status of farming communities.
- Because of Anthelminthic Resistance, control the helminth parasites has become difficult, thereby aggravates and further worsen the impact of helminth infections

Thank you