PHARMACOTHERAPY OF HELMINTIC INFECTIONS



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Clinical History

Patient 38-year-old Indian farmer.

Chief Complaint

None. The patient was asymptomatic; however, a routine complete blood count (CBC) was done as an immigration requirement.



Image 1_Patient's peripheral blood smear, illustrating the presence of the microfilarial organism, *Wuchereria bancrofti* (Leishman stain;

Test	Patient's Result	Reference Range	
Hematology			
WBC count	9.8	4.0-11.0 x 10 ³ /L	
Hemoglobin	12.4	12.0-16.0 g/dL	
Platelet count	150	150-400 x 10 ³ /L	
Differential: Neutrophils	48	40-80%	
Lymphocytes	14	20-40%	
Eosinophils	35	2-6%	
Monocytes	3	1-6%	
Absolute eosinophil count	3.43	0.02-0.5 x 10 ⁹ /L	
PBS findings	Microfilaria present with numerous nucle		
_	throughout the body of the organism that		
	stop well short of the	e tip of the tail (Image 1)	

Table 1_Principal Laboratory Findings

What is the diagnosis and pharmacological management?

The same patient developed fever, urticaria, swollen and tender lymph nodes tachycardia, hypotension, and abdominal pain within seven days of treatment.

A. What is this known as ?

B. Why this has happened and how would you manage this patient

At the end of the lecture, the students will be able to..

- List out the drugs for pharmacotherapy of Nematodes, Trematodes and Cestodes.
- 2. Explain the mechanism of action of the drugs
- Enumerate the pharmacological actions, uses and adverse effects of the drugs

CI	assification	of Helmir	nths	2
	Nematodes (roundworms)	Cestodes (tapeworms)	Trematodes (flukes)	
Shape	Cylindrical	Segmented plane	Unsegmented plane	
Body cavity	Yes	No	No	
Digestive tract	Complete	No	Incomplete	
Sex	Male or female	hermaphrodites	hermaphrodites (except Schistosoma)	
	The second		Schistosoma)	波 彩



HELMENTHIASIS

- Helminthiasis is infestation with one or more intestinal parasitic worms(helminth)
- Infected people excrete helminth eggs in their faeces, which then contaminate the soil in areas with inadequate sanitation.
- Other people can then be infected by ingesting eggs or larvae in contaminated food, or through penetration of the skin by infective larvae in the soil





solutign

Drug treatment



Health education



Improved sanitation

1 20



ANTIHELMINTIC DRUGS

Drugs –Vermicide Vermifuge Infesting helmin GOAL

Aim at <u>metabolic targets</u> present in parasite BUT

Should be absent from or have different characteristics than those of the host



CHOICE OF DRUG..



- Wide safety of margin with highest toxicity to worms
- Wide therapeutic index
- **Broad spectrum activity**
- Activity against mature and immature stages
- Lack of side effects/toxicity
- Ease of administration (preferably single) dose)



Low cost.

PHARMACOTHERAPY OF NEMATODES



HOOKWORM DISEASE

- Causative agents: <u>Ancylostoma duodenale</u> (Old World hookworm), <u>Necator americanus</u> (New World hookworm).
- Worm attaches to the intestinal mucosa, causing anorexia, ulcer-like symptoms, and chronic intestinal blood loss that leads to anemia.
 - Treatment is unnecessary in asymptomatic individuals who are not anemic.

ASCARIASIS (ROUNDWORM DISEASE)

- Causative agent: Ascaris lumbricoides.
- Second only to pinworms as the most prevalent multicellular parasite in the United States; approximately one third of the world's population is infected with this worm.
- Ingested larvae grow in the intestine, causing abdominal symptoms, including intestinal obstruction; roundworms may pass to blood and infect the lungs.

FILARIASIS

- Causative agents: <u>Wuchereria bancrofti</u>, <u>Brugia malayi</u>.
- Worms cause blockage of lymph flow. Ultimately, local inflammation and fibrosis of the lymphatics occurs.
- After years of infestation, the arms, legs, and scrotum fill with fluid, causing elephantiasis.

STRONGYLOIDIASIS (THREADWORM DISEASE)

- Causative agent: <u>Strongyloides stercoralis</u>.
- Relatively uncommon compared with other intestinal nematodes; a relatively benign disease in normal individuals that can progress to a fatal outcome in immunocompromised patients.

ONCHOCERCIASIS (RIVER BLINDNESS)

- Causative agent: Onchocerca volvulus.
- Common in areas of Mexico, South America, and tropical Africa.
- Characterized by subcutaneous nodules, a pruritic skin rash, and ocular lesions often resulting in blindness.

ENTEROBIASIS (PINWORM DISEASE)

- Causative agent: Enterobius vermicularis.
- Most common helminthic infection in the United States.
- Pruritus ani occurs, with white worms visible in stools or perianal region.

TRICHURIASIS (WHIPWORM DISEASE)

- Causative agent: Trichuris trichiura.
- Infection is usually asymptomatic; however, abdominal pain, diarrhea, and flatulence can occur.

TRICHINOSIS

- Causative agent: <u>Trichinella spiralis</u>.
- Usually caused by consumption of insufficiently cooked meat, especially pork.



MEBENDAZOLE

Benz-imidazole - congener of thiabendazole

Broad-spectrum anthelmintic activity.



MOA



Affected parasites are expelled in feces.

Pharmacokinetics

Marmov [®]	100 m	1(
Verrion	dazol	
shondazole / mébendazore / Meben	CILLO	

anthelminticum / anthelminthique / Anthelmintikum

6	tabletten oraal gebruik
0	comprimés voie prale
	Tabletten zum Einnehmen

Less than 10% of orally administered drug is absorbed

Absorption increases with fatty meal.

Absorbed drug is 90 % protein bound

Converted to inactive metabolites .

Half-life of 2-6 hours

Excreted mostly in urine .

USES

The dose and duration of treatment is the same for children above 2 years as for adults; $\frac{1}{2}$ dose for 1–2 yr age.

DADDY BUM B

IS ITCH

Roundworm Hookworm	100 mg twice a day for 3 consecutive days		
Whipworm	7 days		
Pin worm	100 mg single dose, repeated after 2–3 weeks (to kill the ova that have developed later).		
Trichinosis	200 mg BD for 4 days		

Deworming infants, children and women for better health

Intestinal parasitic worms (soil-transmitted helminths) are spread through soil, contaminated by human faeces.

Worm infections interfere with children's nutritional uptake and can result in malnourishment, anaemia, and stunted growth.



World Health Organization

Periodic treatment of at-risk populations reduces the intensity of infection. No individual diagnosis is needed.



Free deworming medicines such as albendazole or mebendazole

Why treat everyone?



To reduce ill health (malnutrition, anaemia, impaired growth); To prevent others from acquiring severe infection



Who should be treated?

Preschool, school-age children and women of reproductive age

Where can treatment be sought?

Schools and community health centres





Incidents of expulsion of Ascaris from mouth or nose have occurred,

- Allergic reactions, loss of hair and granulocytopenia
- Increased liver enzymes→ Prolonge treatment

Albendazole Ivermectin Mebendazole Thiabendazole



Avoid in pregnancy



Trichuriasis - inferior to mebendazole.

- Strongyloidosis- more effective than Mebendazole
- Weak microfilaricidal action
- Marcutaneous larva migrans.
- MOA is similar to that of Mebendazole

Larvicidal in hydatid ,cysticercosis , ascariasis and hook worm infections.

Ovicidal in ascariasis ,hookworm , trichuriasis

PK

Absorption- Well absorbed but inconsistent, Enhanced when taken with fatty meal

- First pass metabolism
- Sulfoxide metabolite which has potent anthelmintic action.
- Albendazole sulfoxide is widely distributed in the body, enters brain,CSF
- Excreted in urine
- If t1/2 of 8.5 hours.

Ascaris, hookworm, Enterobius and Trichuris:	 A single dose of 400 mg Three day treatment may be needed in heavy trichuriasis.
strongyloidosis:	•400 mg daily for 3 consecutive days.
Trichinosis	•Three day treatment expels the adult worm from intestine, but has limited effect on larvae that have migrated to muscles. They are not killed but symptomatic relief occurs. Corticosteroids are added if systemic manifestations are severe
• Filariasis due to Wuchereria bancrofti,	 Adjuvant Added to diethylcarbamazine (DEC) or ivermectin, treating lymphatic filariasis

Side effects

- Well tolerated;
- Gastrointestinal side effects
- Dizziness, Insomnia
- Prolonged use, as in hydatid or in cysticercosis, has caused headache, fever, alopecia, jaundice and neutropenia.



Precaution

- No prior preparation, no fasting after the drug and no laxatives required
- Administered on an empty stomach for intra luminal worms but with fatty meals for tissue parasites

<u>CI</u>

Pregnancy, Children< 2yrs</p>

Drug Interaction

✤Glucocorticoids and Praziquantel 个albendazole sulfoxide

THIABENDAZOLE

Benzimidazole

Chelating agent and form stable complexes with metals including iron, but does not bind with calcium.

I PK

- Rapidly absorbed
- Half- life of 1-2 hrs
- Completely metabolized in liver
- 90% is excreted in urine (Glucuronide)
- Can also absorbed through skin
- Mechanism Of Action
 - Similar to other benzimidazoles. It is ovicidal for some parasites



USES

 Should be given after meals and tablets should be chewed Strongyloidal infections & cutaneous larva migrans Skeletal muscle symptoms produced by migration of Trichinella spiralis larvae to muscle Thiabendazole cream

is applied topically or drug can be given orally for 2 days.

A/E

More toxic than other benzamidazoles

•GI disturbances

•Pruritus, headache,

drowsiness,

psychoneurotic symptoms.

•Irreversible liver failure.

•Fatal

•<u>Stevens</u>–Johnson syndrome

•Not used in young children , pregnancy,

PYRANTEL PAMOATE

- Efficacy against Ascaris, Enterobius and Ancylostoma is high and comparable to that of mebendazole.
- Lower cure rates (about 60%) Necator infestation.
- Less active against Strongyloides
- Inactive against Trichuris and other worms.

PK

•Only 10–15% of an oral dose is <u>absorbed</u>

Partly <u>metabolized</u>
 Excreted in urine

•Excreted in urine

MOA

Depolarizing, neuromuscular- blocking agent,



USES	A/E
Ascaris,,Ancylostoma	 Infrequent mild transient GI
and Enterobius:- a single	disturbance
dose of 10 mg/kg	•Drowsiness, headache,
Necator and for	insomnia, rash, fever
Strongyloides - 3 days	 Should be used with
•No fasting, purging or other	caution in liver dysfunction.
preparation of the	
patient is needed.	



CI- Pregnancy Children under 2 years

PIPERAZINE

Ascaris and Enterobius; achieves 90– 100% cure rates.

Roundworm4 g once a day
for 2for 2consecutive
daysPinworms50 mg/kg (max.
2 g) once a day
for 7 days

Well absorbedPartly metabolized in liver and excreted in urine.

Nausea, vomiting, abdominal discomfort and urticaria
Dizziness and excitement occur at high doses
Toxic doses produce convulsions
Death is due to respiratory failure

It is contraindicated in renal insufficiency and in epileptics,

Safe in the pregnant.

Hyperpolarisation due to opening of **CI** channels

Contraction and depresses responsiveness to contractile action of ACh

Flaccid paralysis

Worms expelled alive

Purgative (senna) is given with it

Benzimadazole that..

- 1) Has a potent metabolite \rightarrow ??
- 2) Has more incidence of SJS \rightarrow ??
- \blacksquare 3) Is the DOC of whipworm \rightarrow

LEVAMISOLE, TETRAMISOLE



_					
	 Stimulation of ganglia → tonic paralysis → Expulsion of worms Inhibition of fumarate reductase 		Ascariasis		Single dose 150 for adults, 100 mg for children 20–39 kg body weight, 50 mg for 10–19 kg.
→interference in carbohydrate metabolism			Ancylostomias is	ר וו	Two doses at 12 hour ntervals
	Immunomodulator restores depressed T cell function	DM/ mali aph ulce Rec	ARD in RA ignancies, thous ers and current herpes		 Well tolerated Nausea,abdominal pain, giddiness, fatigue, drowsiness or insomnia
		$ \longrightarrow $			

DIETHYLCARBAMAZINE(DEC)

First drug for filariasis caused by the nematodes Wuchereria bancrofti (90% cases) and Brugia malayi.-1948

	Mf	Adults
Wuchereria bancrofti	Peripheral blood (2mg/kg TDS in 7 days) • (Transudates and nodules)•	Slow macrofilaricidal - prolonged treatment
Brugia malayi.	+	+
Loa loa and	+	+
Onchocerca volvulus	+	-

MOA

- Alteration of organelle membranes of the Mf promoting celL death
- Dislodgement d/t <u>alteration in</u> <u>muscular</u> <u>activity</u> of Mf and adult worms
- Make them susceptible to host defense mechanism

PK

- Well absorbed ,better with meals
- Distributed all over the body (V = 3–5 L/kg)
- Metabolized in liver
- Excreted in urine.
- Plasma t¹/₂ of usual clinical doses is 4–12 hours

MAZZOTTI'S REACTION

Minimized by starting with a low dose (0.5 mg/kg). temporarily withheld <u>Antihistaminics and/or</u> <u>corticosteroids given.</u>

dizziness

Febrile reaction with rash, pruritus, enlargement of lymph nodes, bronchospasm and fall in BP due to mass destruction of Mf and adult worms.

 Leukocytosis and mild albuminuria

Filariasis: - first line drug: Yearly treatment with a combination of DEC (6 mg/kg) and albendazole (400 mg) single dose on mass scale	 2 mg/kg TDS - rapid symptomatic relief; Mf disappear from blood and patient becomes noninfective to mosquitoes in 7 days Adult worm survives in the lymphatics and gives rise to intermittent microfilaraemia and symptoms. Radical cure- Prolonged treatment with different schedules A total dose of 72–126 mg/kg spread over 12 days to 3 weeks More than one course may be needed with a gap of 3–4 weeks Elephantiasis due to chronic lymphatic obstruction un -affected by because fibrosis of lymphatics is irreversible.
Tropical pulmonary eosinophilia	2–4 mg/kg TDS) for 2–3 weeks
Loa loa and O. volvulus	Give small (25–50 mg) test dose initially which avoids severe reaction

IVERMECTIN

- Extremely potent semisynthetic derivative of the antinematodal principle obtained from *Streptomyces avermitilis.*
- Microfilaricidal but not macrofilaricidal

Onchocerciasis and Strongyloidosis	DOC	
W.bancrofti and brugian filaria		
Cutaneous Iarva migrans	DOC	
Ascariasis	\checkmark	
Enterobius and Trichuris	Moderately effective	

Tonic paralysis

Hyperpolarisation

Opens glutamate gated CI channel

- Flukes and tapeworms- unaffected by ivermectin
- 2. Potentiation of <u>GABAergic transmission</u> in the worm
- Low affinity for mammalian GABA receptors and its exclusion from the brain, by P-glycoprotein mediated efflux at the blood-brain barrier.

PK

- Well absorbed orally,
- Widely distributed in the body, <u>but does</u> <u>not enter CNS</u>,
- Sequestrated in liver and fat
- CYP3A4
- Terminal t¹/₂ of 48–60 hours.

Diethylcarbamazineaccelerate blindness and cause severe Mazzotti reactions

USES

- Filariasis10-15mg+ 400mg Albendazole -
- Strongyloidosis-0.2 mg/kg
- Onchocerciasis ,River blindness– One dose every 6-12 months replaced DEC
- Only Mf
- Scabies and
 Pediculosis_ 0.2
 Albendazole
 Mebendazole
 Thiabendazole



A/E

- Mild—pruritus, giddiness, nausea, abdominal pain, constipation, lethargy and transient ECG changes
- Mazzottis's reaction due to degeneration products of the Mf
- Fever, headache, dizziness, somnolence, and hypotension)



PHARMACOTHERAPY OF TREMATODES



Blood Fluke



Intestinal fluke



Lung Fluke

- Blood flukes (schistosomiasis)
- Liver flukes (clonorchiasis)
- Intestinal flukes (fasciolopsiasis)
- Lung flukes (paragonimiasis)

PRAZIQUANTEL

Paragonimiasis

- This disease is caused by <u>Paragonimus</u> westermani (lung fluke). The organisms move from the gastrointestinal tract to the lung, which is the primary site of damage. Secondary bacterial infections can result in a cough that produces bloody sputum.
- The disease is transmitted by eating raw crab meat.
- Paragonimiasis is diagnosed by identifying eggs in the sputum and stool.
- Therapy: Praziquantel.

Clonorchiasis

- This disease is caused by <u>Clonorchis</u> <u>sinensis</u> (Oriental liver fluke). The primary site of infection is the biliary tract, where the resulting inflammatory response can cause fibrosis and hyperplasia.
- The disease is transmitted by eating raw freshwater fish.
- Clonorchiasis is diagnosed by identifying eggs in the stool.
- Therapy: Praziguantel.

Schistosomiasis (New World)

- This disease is caused by <u>Schistosoma</u> mansoni and <u>Schistosoma japonicum</u>. The primary site of infection is the gastrointestinal tract. Damage to the intestinal wall is caused by the host's inflammatory response to eggs deposited at that site. The eggs also secrete proteolytic enzymes that further damage the tissue.
- Clinical presentation includes GI bleeding, diarrhea, and liver damage.
- The disease is transmitted by direct skin penetration.
- This form of schistosomiasis is diagnosed by identification of characteristic eggs in the stool.

Schistosomiasis (Old World)

- This disease is caused by <u>Schistosoma</u> <u>haematobium</u>. The primary sites of infection are veins of the urinary bladder, where the organism's eggs can induce fibrosis, granulomas, and hematuria.
- The disease is transmitted by direct skin penetration.
- This form of schistosomiasis is diagnosed by identifying characteristic eggs in the urine or bladder wall.
- Therapy: Praziquantel.



PK	USES	A/E	
 Rapidly 	1. Schistosomes:	 No systemic 	
absorbed from	All 3 species can	toxicity.	B B B B B B B B B B B B B B B B B B B
intestines;absorptio	be treated	 Nausea and 	ନ୍ତ୍ର
n is enhanced if it	with 40–75 mg/kg	abdominal pain-	
is ingested with	given once	bitter taste	202 CC
food.	2. All flukes except	 Headache, 	E
 High first pass 	Fasciola	dizziness and	Real and a second secon
metabolism in	hepatica- 75	sedation.	
liver	mg/kg	 Reaction to 	BR M
 Induction of 		destruction by	
metabolism –by		parasites - Itching,	
		urticaria, rashes,	R. S.
		fever and	
shutterstock		bodyache	R
failure			
 Crosses BBB 			
 Excreted in urine 			
•Plasma t ¹ / ₂ is short			200
(1.5 hours).			

BITHIONOL

Drug of choice for the treatment of fascioliasis (sheep liver fluke)

 PK: It is orally administered and excreted in urine.
 A/E:GI disturbance (N., V., D., A.) Dizziness, headache Skin rashes, urticaria, Leucopenia
 C/I and precautions: Hepatitis, leucopenia Used with caution in children under 8 years of age.



Triclabendazole

Narrow spectrum benzimidazole

DOC for fascioliasis(10mg /kg single dose)

Paragonimus skrjasbini(10mg/kg orally daily for 3 days)

No significant side effects

Metrifonate

Organophosphorous compound

Alternative for S.hematobium

Not effective against S.mansoni, S.japonicum

Dose 7.5-10 mg TDS at intervals of 2 weeks

A/E

Cholinergic side effects

C/I

Pregnancy, Recent insecticides exposure, with Succinyl choline

Oxamniquine

S.Mansoni

Not effective against S.hematobium, S.japonicum

A/E

Drowsiness, Dizziness, Seizures

Pruritus, Urticaria

Dose 15-20mg/kg single dose

C/I

Pregnancy, Epilepsy



PHARMACOTHERAPY OF CESTODES



Beef Tapeworm



Fish Tapeworm



Pork tapeworm



Dwarf Tapeworm

- · Beef tape worms (taenia saginata)
- · Pork tape worms (taenia solium)
- Fish tape worms (diphyllobothrium latom
- Dwarf tape worms (hymenolepis nana)

Cysticercosis Taeniasis Echinococcosis Diphyllobothriasis

Echinococcosis

- This disease (also called hydatid disease) is caused by Echinococcus granulosus (dog tapeworm). Infection produces large, hydatid cysts in the liver, lung, and brain. Anaphylactic reaction to worm antigens can occur if the cyst ruptures.
- The disease follows ingestion of eggs in dog feces. Sheep often serve as an intermediate host.
- Echinococcosis is diagnosed by CT scan or biopsy of infected tissue and is treated by surgical excision of cysts.
- Therapy: Albendazole.

Taeniasis

- This form of the disease is caused by the adult <u>Taenia solium</u> (pork tapeworm). Intestines are the primary site of infection, where the organism can cause diarrhea. Most of these infections, however, are asymptomatic.
- The disease is transmitted by larvae in undercooked pork or by ingestion of tapeworm eggs.
- Taenlasis is diagnosed by detection of proglottids in stools.
- Therapy: Praziquantel.

Cysticercosis

- This disease is caused by Taenia solium larvae. Infection produces cysticerci in the brain (causing seizures, headache, and vomiting) and in the eyes.
- The disease follows ingestion of eggs from human feces.
- Cysticercosis is diagnosed by CT scan or biopsy.
- Therapy: Praziquantel, albendazole, and/or surgery.

Taeniasis

- This disease is caused by the larval form of Taenia saginata (beef tapeworm). The organism primarily infects the intestines and does not produce cysticerci. Most infected individuals are asymptomatic.
- The disease is transmitted by larvae in undercooked or raw beef.
- Taeniasis is diagnosed by detection of proglottids in stools.
- Therapy: Praziguantel.

Diphyllobothriasis

- This disease is caused by <u>Diphyllobothrium latum</u> (fish tapeworm). The adult worm in a host's intestine can be as long as 15 meters.
- The disease is transmitted by larvae in raw or undercooked fish.
- Diphyllobothriasis is diagnosed by detection of characteristic eggs in stools.
- Therapy: Praziguantel or niclosamide.

NICLOSAMIDE

Infestations due to Taenia sa Diphyllobothrium latum and I well as pin worm

MOA –

T.Solium \rightarrow Ova released from digestion develops into larvae \rightarrow VISCERAL CYSTICERCOSIS

- Inhibition of mitochondrial phosphorylation of adenosine diphosphate (ADP) in the parasite → ATP is not generated → lethal for the cestode's scolex and segments but not for the ova.
- Inhibition of Anaerobic metabolism

Partly digested in intestine

<u>TAPEWORM</u> - 0.5 g tab

- After a light breakfast, 2 tablets are to and swallowed with water, followed to tablets after 1 hr (total 2 g);
- Saline purge is given 2 hours after the line to wash off the worm.
- The scolex should be searched in the scole sure that the worm will not grow again
- M. <u>H. nana</u>→ 2 g dose is repeated daily for 5 days. -This is needed because cysticerci of H. nana (which are not affected by niclosamide) develop in the jejunal villi of the same host and worms appear in the intestinal lumen after 4 days.
- Praziquantel is now preferred due to single dose treatment.

•No systemic toxicity

occurs.

•Minor abdominal symptoms

Malaise, pruritus and

th light headedness are rare.



PRAZIQUANTEL

Taeniasis- T. saginata, T. solium	 •90–100% cure •10 mg/kg single dose in the morning. • It is especially valuable in case of <i>T. solium, because it kills the tapeworm</i> <i>larvae</i> within the cysts and there are no chances of systemic cysticercosis developing.
H. nana, D. latum:	 15–25 mg/kg single dose in the morning., better than Niclosamide
Neurocysticercosis:.	50 mg/kg daily in 3 divided doses for 15–30 days kills the larvae lodged in brain and other tissues

ALBENDAZOLE

- Primary therapeutic application- treatment of cestodal infestations,
- 1) Hydatid disease- 400 mg BD for 4 weeks, repeat after 2 weeks (if required), up to 3 courses.- the preferred treatment given before and after surgery as well as to inoperable cases (3 months)- has a risk of hepatotoxicity and, rarely, agranulocytosis or pancytopenia.
- 2) Neurocysticercosis- anthelmintic of choice Usually 8–15 days course of 400 mg BD (15 mg/kg/day)
- 3) Cysticercosis of other tissues (muscles, subcutaneous area) also responds, but no drug should be given for ocular cysticercosis—blindness can occur due to the reaction.
- A/E is associated with inflammatory responses to dying parasites in the CNS, including headache, vomiting, fever, and seizures.
- 4) Tapeworms 400 mg daily for 3 consecutive days

MEBENDAZOLE

Hydatid disease: 200–400 mg BD or TDS for 3–4 weeks; less effective than albendazole.



SUMMARY

MANIPAL PD

Mebendazole Albendazole Niclosamide Ivermectin Praziquantel A Levimasole

Pyrantel Pamoate Diethyl Carbamazine



a. Drugs affecting energy production

- Inhibitors of fumarate reductase and glucose uptake, binding of tubulin in mitochondria.
- ii. Inhibitors of (mitochdrial) phosphorylation
- iii. Inhibitors of glycolysis
- b. Drugs causing paralysis
- i. Cholinergic agents
- ii. GABA agonists
- iii. Muscle hyperpolarizer
- iv. Acetyl cholinesterase inhibitors
- v. Acetylcholine mimic

NEMATODES		
Ascaris (round worm)	Albendazole	
Ankylostoma (hookworm)	Albendazole	
. Trichura (whipworm)	Albendazole	
Enterobius (pinworm)	Mebendazole	
Strongyloides(thread worm)	Ivermectin	
Trichinella	Albendazole/Mebendazole	
Onchocerca	Ivermectin	
Cutaneous larva migrans	Albendazole	
Visceral larva migrans	Ivermectin	
	CESTODES	
Taenia saginata, solium,	Praziquantel	
Diphyllobothriasis		
TREMATODES		
S hematobium C.Sinensis	Praziquantel	
P. Westermani		
F.hepatica F.Buski		

What is the diagnosis and pharmacological management?

The same patient developed fever, urticaria, swollen and tender lymph nodes tachycardia, hypotension, and abdominal pain within seven days of treatment.

A. What is this known as ?

B. Why this has happened and how would you manage this patient

https://www.youtube.com/watch?v=dd q3ge6XYO0

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Cipex