

WELCOME TO



This is an Education Platform

We Provide PDF Notes for Pharmacy Students

Web Site <http://www.fdspharmacy.in/>

You tube <https://www.youtube.com/c/FDSpharmacy>

Telegram <https://t.me/Fdspharmacy>

App <https://play.google.com/store/apps/details?id=com.FDSPharmacyMedia.FDSPharmacy>

E-mail fdspharmacyinfo@gmail.com

Bachelor of Pharmacy Biopharmaceutics and Pharmacokinetics

NOTES

- ✓ Unit 1 **All Unit**
- ✓ Unit 2 **in**
- ✓ Unit 3 **One PDF**
- ✓ Unit 4
- ✓ Unit 5

Visit our Website
WWW.fdspharmacy.in



Bachelor of Pharmacy Herbal Drug Technology

NOTES

- ✓ Unit 1 **All Unit**
- ✓ Unit 2 **in**
- ✓ Unit 3 **One PDF**
- ✓ Unit 4
- ✓ Unit 5

Visit our Website
WWW.fdspharmacy.in



Bachelor of Pharmacy Medicinal Chemistry III

NOTES

- ✓ Unit 1 **All Unit**
- ✓ Unit 2 **in**
- ✓ Unit 3 **One PDF**
- ✓ Unit 4
- ✓ Unit 5

Visit our Website
WWW.fdspharmacy.in



Bachelor of Pharmacy Pharmaceutical Biotechnology

NOTES

- ✓ Unit 1 **All Unit**
- ✓ Unit 2 **in**
- ✓ Unit 3 **One PDF**
- ✓ Unit 4
- ✓ Unit 5

Visit our Website
WWW.fdspharmacy.in



Bachelor of Pharmacy Pharmacology III

NOTES

- ✓ Unit 1 **All Unit**
- ✓ Unit 2 **in**
- ✓ Unit 3 **One PDF**
- ✓ Unit 4
- ✓ Unit 5

Visit our Website
WWW.fdspharmacy.in



Bachelor of Pharmacy Quality Assurance

NOTES

- ✓ Unit 1 **All Unit**
- ✓ Unit 2 **in**
- ✓ Unit 3 **One PDF**
- ✓ Unit 4
- ✓ Unit 5

Visit our Website
WWW.fdspharmacy.in





D.Pharma B.Pharma

- 👉 PDF Notes
- 👉 Practical Manual
- 👉 Important Questions
- 👉 Assignment etc

 Download Now



www.fdpharmacy.in

MEDICINAL CHEMISTRY - III

UNIT 4

TOPIC :

- **Anthelmintics** : *Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin.



Anthelmintics

- Anthelmintics are drugs used to destroy or expel parasitic worms (helminths) from the human body.
- They are used in the treatment of nematode (roundworm), cestode (tapeworm), and trematode (fluke) infections.

Classification

A. Drugs Acting Against Nematodes (Roundworms)

- Albendazole, Mebendazole
- Levamisole, Pyrantel pamoate
- Ivermectin, Piperazine

B. Drugs Acting Against Cestodes (Tapeworms)

- Praziquantel, Niclosamide, Albendazole

C. Drugs Acting Against Trematodes (Flukes)

- Praziquantel, Bithionol

Mechanism of Action

Albendazole / Mebendazole

- Inhibit microtubule formation
- Decrease glucose uptake
- Worms die due to energy depletion
- Wormicidal

Levamisole

- Acts as nicotinic receptor agonist
- Causes spastic paralysis of worms
- Worms expelled by peristalsis

Pyrantel Pamoate

- Depolarizing neuromuscular blocker
- Causes paralysis of worms

Ivermectin

- Increases chloride ion permeability
- Causes flaccid paralysis

Praziquantel

- Increases calcium ion influx
- Causes paralysis and dislodgement

Spectrum of Activity

Drug	Effective Against
Albendazole	Ascaris, Hookworm, Tapeworm
Mebendazole	Pinworm, Roundworm
Ivermectin	Strongyloides, Onchocerca
Praziquantel	Schistosoma, Tapeworm

Therapeutic Uses

- ▲ Ascariasis
- ▲ Hookworm infection
- ▲ Enterobiasis (pinworm)
- ▲ Strongyloidiasis

Adverse Effects

Common

- + Nausea
- + Abdominal pain
- + Diarrhea
- + Headache

Serious

- + Hepatotoxicity (albendazole)
- + Bone marrow suppression (long-term use)
- + CNS effects (ivermectin in heavy infection)

Contraindications

- ▲ Pregnancy (especially albendazole, mebendazole)
- ▲ Liver disease
- ▲ Children below 1 year (some drugs)

Resistance

- ▲ Mutation in tubulin
- ▲ Reduced drug binding
- ▲ Efflux mechanisms

Diethylcarbamazine Citrate (DEC)

- Diethylcarbamazine citrate (DEC) is a synthetic piperazine derivative used as an anti-filarial agent.
- It is primarily used for lymphatic filariasis caused by *Wuchereria bancrofti*, *Brugia malayi*, and *Brugia timori*.
- DEC works by immobilizing microfilariae and altering their surface structure, making them more susceptible to host immune clearance.

Classification

Based on Chemical Class

- ▲ Piperazine derivative
- ▲ Synthetic anti-filarial agent

Based on Action

- ▲ Microfilaricidal – kills circulating microfilariae
- ▲ Immunomodulatory effect – enhances host clearance of parasites

Based on Use

- ▲ Oral therapy – tablets or suspension

Structure

- ❖ Piperazine ring with diethylcarbamoyl substitution

Molecular formula: $C_{10}H_{21}N_3 \cdot C_6H_8O_7$ (citrate salt)

Structural Characteristics

- Water-soluble citrate salt → better oral absorption
- Piperazine nucleus → essential for antifilarial activity
- Formulated as tablets or syrup

Nomenclature

- Diethylcarbamazine citrate → generic name
- Brand names: Hetrazan, Banocide
- Formulations: oral tablets, oral suspension

Mechanism of Action

- ◇ DEC paralyzes microfilariae, making them immobile.
- ◇ Alters the surface membrane of microfilariae, exposing them to host immune system.
- ◇ Facilitates phagocytosis and immune-mediated destruction.
- ◇ Minimal effect on adult worms (macrofilariae) at standard doses.
- ◇ Hence, DEC is primarily microfilaricidal.

Spectrum of Activity

- ⇒ *Wuchereria bancrofti* – lymphatic filariasis
- ⇒ *Brugia malayi* and *B. timori* – lymphatic filariasis
- ⇒ *Loa loa* – microfilariae (used with caution)

Uses

- Treatment of lymphatic filariasis (microfilarial stage)
- Mass drug administration (MDA) programs for filariasis control
- Adjunct therapy in co-infection with other helminths

Adverse Effects

- ▲ Mazzotti reaction – fever, headache, myalgia, rash due to dying microfilariae
- ▲ Gastrointestinal: nausea, vomiting, abdominal pain
- ▲ Rare: hypotension, dizziness, lymphadenitis
- ▲ Generally well tolerated at recommended doses

Chemical Degradation

- Stable under normal storage conditions
- Store in cool, dry place
- Citrate salt → improves stability and solubility

Structure–Activity Relationship (SAR)

- Piperazine ring → essential for paralysis of microfilariae
- Diethylcarbamoyl group → enhances binding to parasite receptors
- Citrate salt → improves solubility and oral absorption
- Activity is specific to circulating microfilariae; limited effect on adult worms

Thiabendazole

- Thiabendazole is a broad-spectrum synthetic benzimidazole antihelminthic.
- It is used to treat intestinal helminth infections, including *Strongyloides stercoralis*, *Trichinella spiralis*, and cutaneous larva migrans.
- Thiabendazole works by inhibiting microtubule formation in parasites, leading to impaired glucose uptake, energy depletion, and death.

Classification

Based on Chemical Class

- Benzimidazole derivative
- Synthetic antihelminthic

Based on Action

- Ovicidal, larvicidal, and vermicide – effective against eggs, larvae, and adult worms
- Mechanism: inhibits tubulin polymerization → disrupts microtubules

Based on Use

- Oral therapy – tablets or suspension
- Topical therapy – cream for cutaneous larva migrans

Structure

⇒ Benzimidazole ring with thiazole substitution

Molecular formula: $C_{10}H_7N_3S$

Structural Characteristics

- Lipophilic → good tissue penetration
- Inhibits parasite tubulin polymerization
- Formulated as oral tablets, suspension, and topical cream

Nomenclature

- ◇ Thiabendazole → generic name
- ◇ Brand names: Mintezol, Tresiben
- ◇ Formulations: oral tablets, oral suspension, topical cream

Mechanism of Action

- ⇒ Thiabendazole binds to parasite β -tubulin.
- ⇒ Inhibits tubulin polymerization, preventing microtubule formation.
- ⇒ Disrupts glucose uptake, nutrient absorption, and energy metabolism.
- ⇒ Leads to paralysis and death of helminths.
- ⇒ Hence, thiabendazole is vermicide, larvicide, and ovide.

Spectrum of Activity

- ▲ *Strongyloides stercoralis* – intestinal threadworm
- ▲ *Trichinella spiralis* – trichinosis
- ▲ *Ancylostoma* spp., *Necator* spp. – hookworm (less effective)
- ▲ Cutaneous larva migrans – topical application
- ▲ Limited activity against systemic helminths

Uses

- Intestinal strongyloidiasis
- Trichinosis – especially early larval stage
- Cutaneous larva migrans – topical therapy
- Alternative for ascariasis and hookworm infections

Adverse Effects

- Gastrointestinal: nausea, vomiting, abdominal pain
- Neurological: dizziness, headache
- Rare: hypersensitivity reactions, liver enzyme elevation
- Topical use: local irritation or rash

Chemical Degradation

- ✚ Stable under normal storage conditions
- ✚ Store in cool, dry place, protected from light
- ✚ Avoid high temperatures and moisture

Structure–Activity Relationship (SAR)

- ❖ Benzimidazole ring → essential for tubulin binding
- ❖ Thiazole substitution → enhances vermicide activity
- ❖ Lipophilicity → aids tissue penetration and absorption
- ❖ Effective against larval and adult helminths due to microtubule disruption

Mebendazole

- Mebendazole is a broad-spectrum synthetic benzimidazole antihelminthic.
- It is widely used for intestinal helminth infections such as *Ascaris lumbricoides*, *Trichuris trichiura*, hookworms, and *Enterobius vermicularis*.
- Mebendazole works by inhibiting microtubule formation in parasites, leading to impaired glucose uptake, depletion of energy stores, and death of the worms.

Classification

Based on Chemical Class

- Benzimidazole derivative
- Synthetic antihelminthic

Based on Action

- Ovicidal, larvicidal, and vermicide – effective against eggs, larvae, and adult worms
- Mechanism: binds to parasite β -tubulin → disrupts microtubules → inhibits energy metabolism

Based on Use

- Oral therapy – tablets or chewable formulations

Structure

⇒ Benzimidazole ring with carbamate substitution

Molecular formula: $C_{16}H_{13}N_3O_3$

Structural Characteristics

- Poorly water-soluble → oral absorption is low (less than 10%)
- Lipophilic → acts locally in the intestinal lumen
- Formulated as tablets, chewable tablets, and suspension

Nomenclature

- ◇ Mebendazole → generic name
- ◇ Brand names: Vermox, Ovex, Antiox
- ◇ Formulations: oral tablets, chewable tablets, oral suspension

Mechanism of Action

- ⇒ Mebendazole binds selectively to β -tubulin in helminths.
- ⇒ Inhibits tubulin polymerization, preventing microtubule formation.
- ⇒ Disrupts glucose uptake and energy metabolism.
- ⇒ Causes paralysis and death of worms.
- ⇒ Hence, mebendazole is vermicide, larvicide, and ovicide.

Spectrum of Activity

- ▲ *Ascaris lumbricoides* – roundworm
- ▲ *Trichuris trichiura* – whipworm
- ▲ *Ancylostoma duodenale*, *Necator americanus* – hookworm
- ▲ *Enterobius vermicularis* – pinworm
- ▲ Effective mainly against intestinal helminths, not systemic parasites

Uses

- Intestinal helminthiasis – roundworm, whipworm, hookworm, pinworm
- Mass deworming programs in endemic areas
- Adjunct therapy in mixed helminth infections

Adverse Effects

- Gastrointestinal: abdominal pain, diarrhea, nausea
- Rare: headache, dizziness, mild hypersensitivity reactions
- Safe for short-term use; high doses may cause liver enzyme elevation

Chemical Degradation

- ✚ Stable under normal storage conditions
- ✚ Store in cool, dry place, protected from light
- ✚ Avoid moisture to maintain tablet stability

Structure–Activity Relationship (SAR)

- ❖ Benzimidazole ring → essential for tubulin binding and microtubule inhibition
- ❖ Carbamate substitution → enhances vermicide activity
- ❖ Lipophilic → limited systemic absorption → acts mainly in intestinal lumen
- ❖ Effective against larvae and adult helminths due to disruption of energy metabolism

Albendazole

- Albendazole is a broad-spectrum benzimidazole antihelminthic.
- It is used for intestinal and tissue helminth infections, including ascariasis, trichuriasis, hookworm, strongyloidiasis, and cysticercosis.
- Albendazole works by inhibiting microtubule polymerization in parasites, causing impaired glucose uptake, depletion of glycogen stores, and death.

Classification

Based on Chemical Class

- Benzimidazole derivative
- Synthetic antihelminthic

Based on Action

- Ovicidal, larvicidal, and vermicial – effective against eggs, larvae, and adult worms
- Mechanism: binds to parasite β -tubulin → disrupts microtubules → inhibits energy metabolism

Based on Use

- Oral therapy – tablets, chewable tablets, suspension

Structure

- Benzimidazole ring with carbamate and methylthio substitutions

Molecular formula: $C_{12}H_{15}N_3O_2S$

Structural Characteristics

- ⇒ Poor water solubility → oral absorption is enhanced with fat-containing meals
- ⇒ Lipophilic → allows penetration into systemic tissues
- ⇒ Formulated as tablets, chewable tablets, and suspension

Nomenclature

- Albendazole → generic name
- Brand names: Albenza, Zentel, Wormnil
- Formulations: tablets, chewable tablets, oral suspension

Mechanism of Action

- ❖ Albendazole binds selectively to parasite β -tubulin.
- ❖ Inhibits microtubule polymerization, disrupting structural integrity of intestinal and tissue cells.
- ❖ Impairs glucose uptake and energy metabolism.
- ❖ Leads to death of worms, larvae, and eggs.
- ❖ Hence, albendazole is vermicide, larvicide, and ovicide.

Spectrum of Activity

- ⇒ Intestinal helminths: *Ascaris lumbricoides*, *Trichuris trichiura*, hookworm, *Enterobius vermicularis*
- ⇒ Tissue helminths: *Strongyloides stercoralis*, *Taenia solium* (cysticercosis), *Echinococcus* spp.
- ⇒ Effective against both intestinal and systemic parasitic infections

Uses

- ▲ Intestinal helminthiasis – roundworm, whipworm, hookworm, pinworm
- ▲ Mass deworming programs in endemic areas
- ▲ Strongyloidiasis and trichostrongyliasis

Adverse Effects

- Gastrointestinal: nausea, vomiting, abdominal pain
- Headache, dizziness
- Rare: liver enzyme elevation, neutropenia, hypersensitivity reactions

Chemical Degradation

- Stable under normal storage conditions
- Store in cool, dry place, protected from light

Structure–Activity Relationship (SAR)

- ❖ Benzimidazole ring → essential for tubulin binding and microtubule inhibition
- ❖ Carbamate group → enhances vermicide activity
- ❖ Methylthio substitution → improves lipophilicity and tissue penetration
- ❖ Effective against intestinal and tissue helminths due to energy metabolism disruption

Niclosamide

- Niclosamide is a synthetic antihelminthic drug.
- It is primarily used for the treatment of tapeworm infections (cestodes) such as *Taenia saginata*, *Taenia solium*, and *Diphyllobothrium latum*.
- Niclosamide acts by inhibiting energy metabolism in the worm, leading to paralysis and death of adult worms in the intestine.
- It is poorly absorbed systemically, so it acts mainly in the intestinal lumen.

Classification

Based on Chemical Class

- Chlorinated salicylanilide derivative
- Synthetic anti-cestodal agent

Based on Action

- Cestocidal – kills adult tapeworms
- Mechanism: inhibition of oxidative phosphorylation and ATP production

Based on Use

- Oral therapy – tablets or suspension

Structure

- Salicylanilide nucleus with para-chloro substitution

Molecular formula: $C_{13}H_8Cl_2N_2O_4$

Structural Characteristics

- Poorly soluble in water → acts locally in the intestine
- Lipophilic moieties → inhibit mitochondrial energy metabolism
- Formulated as oral tablets

Nomenclature

- ◇ Niclosamide → generic name
- ◇ Brand names: Niclocide, Yomesan
- ◇ Formulations: oral tablets, chewable tablets

Mechanism of Action

- ⇒ Niclosamide uncouples oxidative phosphorylation in tapeworm mitochondria.
- ⇒ Reduces ATP production, depriving the worm of energy.
- ⇒ Disrupts glucose uptake and glycogen metabolism.
- ⇒ Causes paralysis and death of adult tapeworms, which are then expelled in feces.
- ⇒ Hence, niclosamide is cestocidal but not effective against larval forms.

Spectrum of Activity

- Taenia saginata – beef tapeworm
- Taenia solium – pork tapeworm
- Diphylobothrium latum – fish tapeworm
- Ineffective against larval stages or systemic infections

Uses

- ▲ Intestinal tapeworm infections – Taenia and Diphylobothrium species
- ▲ Alternative for patients intolerant to praziquantel

Adverse Effects

- Gastrointestinal: nausea, vomiting, abdominal discomfort
- Mild headache or dizziness
- Rare: hypersensitivity reactions, rash
- Safe due to minimal systemic absorption

Chemical Degradation

- Stable under normal storage conditions
- Store in cool, dry place, protected from light
- Avoid moisture to maintain tablet integrity

Structure–Activity Relationship (SAR)

- Salicylanilide nucleus → essential for mitochondrial uncoupling
- Para-chloro substitution → enhances cestocidal activity
- Poor systemic absorption → acts locally in intestinal lumen
- Effective only against adult tapeworms, not larval or tissue stages

Oxamniquine

- Oxamniquine is a synthetic anti-schistosomal drug.
- It is primarily used for the treatment of *Schistosoma mansoni* infections, one of the causative agents of intestinal schistosomiasis.
- Oxamniquine works by paralyzing adult worms, causing them to detach from the mesenteric veins, and inducing death.

Classification

Based on Chemical Class

- Thiazine derivative
- Synthetic anti-schistosomal agent

Based on Action

- Schistosomicidal – kills adult *Schistosoma mansoni*
- Mechanism: induces DNA damage and inhibits RNA/protein synthesis

Based on Use

- Oral therapy – single-dose administration

Structure

- ⇒ Thiazine nucleus with substituted amine groups

Molecular formula: $C_{14}H_{20}N_2O_2S$

Structural Characteristics

- ◇ Lipophilic → good tissue penetration
- ◇ Active mainly against adult worms in mesenteric veins
- ◇ Formulated as oral tablets

Nomenclature

- Oxamniquine → generic name
- Brand names: Vansil, Mansil
- Formulations: oral tablets

Mechanism of Action

- ⇒ Oxamniquine enters adult *Schistosoma mansoni* worms.
- ⇒ Intercalates with DNA, causing inhibition of RNA and protein synthesis.
- ⇒ Paralyzes worms → they detach from mesenteric veins.

⇒ Host immune system then eliminates the dead worms.

Spectrum of Activity

- *Schistosoma mansoni* – intestinal schistosomiasis
- Less effective against *S. haematobium* or *S. japonicum*
- Mainly active against adult worms, not larvae (schistosomula)

Uses

- ▲ Treatment of intestinal schistosomiasis caused by *S. mansoni*
- ▲ Single-dose therapy for mass treatment programs in endemic areas
- ▲ Alternative to praziquantel in specific cases

Adverse Effects

- Gastrointestinal: nausea, vomiting, abdominal pain
- Dizziness, headache, drowsiness
- Rare: hypersensitivity reactions
- Usually well tolerated with single-dose therapy

Chemical Degradation

- Stable under normal storage conditions
- Store in cool, dry place, protected from light
- Avoid moisture to maintain tablet stability

Structure–Activity Relationship (SAR)

- Thiazine nucleus → essential for DNA binding and schistosomicidal activity
- Lipophilic substitutions → enhance tissue penetration and worm uptake
- Active mainly against adult worms due to targeted DNA interaction
- Single-dose efficacy depends on high worm concentration and host immune clearance

Praziquantel

- Praziquantel is a broad-spectrum antihelminthic used for trematode and cestode infections.
- It is the drug of choice for schistosomiasis (*S. mansoni*, *S. haematobium*, *S. japonicum*) and taeniasis (*Taenia* spp.).
- Praziquantel works by increasing the permeability of parasite cell membranes to calcium ions, causing muscle contraction, paralysis, and death of the worm.

Classification

Based on Chemical Class

- Isoquinoline-pyrazine derivative
- Synthetic antihelminthic

Based on Action

- Trematocidal and cestocidal – kills flukes and tapeworms
- Mechanism: disrupts membrane integrity via calcium influx → paralysis → immune-mediated death

Based on Use

- ▲ Oral therapy – tablets or suspension
- ▲ Sometimes parenteral use in research or special cases

Structure

- ▲ Isoquinoline-pyrazine fused ring system with substituted carbonyl and aromatic groups

Molecular formula: $C_{19}H_{24}N_2O_2$

Structural Characteristics

- + Lipophilic → absorbed orally and distributed to tissues
- + Active against both adult worms and some larval stages
- + Formulated as oral tablets, chewable tablets, and suspension

Nomenclature

- Praziquantel → generic name
- Brand names: Biltricide, Cesol, Distocide
- Formulations: tablets, chewable tablets, oral suspension

Mechanism of Action

- ❖ Praziquantel increases permeability of parasite membranes to Ca^{2+} ions.
- ❖ Causes rapid muscular contraction and spastic paralysis.
- ❖ Paralysis leads to detachment from host tissues.
- ❖ Exposes worms to host immune response, resulting in death.
- ❖ Hence, praziquantel is trematocidal and cestocidal.

Spectrum of Activity

- ⇒ Trematodes (flukes): *Schistosoma mansoni*, *S. haematobium*, *S. japonicum*, *Fasciola* spp., *Clonorchis* spp.
- ⇒ Cestodes (tapeworms): *Taenia saginata*, *T. solium*, *Diphyllobothrium latum*
- ⇒ Less effective against larval tissue stages, except in some cestode infections

Uses

- Taeniasis – *T. saginata*, *T. solium* infections
- Clonorchiasis and opisthorchiasis – liver fluke infections
- Cestode infections – including *Diphyllobothrium latum*

Adverse Effects

- Gastrointestinal: nausea, vomiting, abdominal pain
- Neurological: dizziness, headache, fatigue

Chemical Degradation

- ✚ Stable under normal storage conditions
- ✚ Store in cool, dry place, protected from light
- ✚ Sensitive to high heat and moisture

Structure–Activity Relationship (SAR)

- ❖ Isoquinoline-pyrazine ring system → essential for calcium ion permeability effect
- ❖ Lipophilic substitutions → enhance oral absorption and tissue penetration
- ❖ Active against both trematodes and cestodes due to muscle paralysis and immune exposure

- ❖ Single-dose efficacy depends on high local concentration and host immune response

Ivermectin

- Ivermectin is a broad-spectrum antiparasitic agent belonging to the avermectin class.
- It is used for both human and veterinary parasitic infections.
- Ivermectin works by paralyzing and killing nematodes and arthropods through interference with neurotransmission in parasites.

Classification

Based on Chemical Class

- Macrocyclic lactone derivative (avermectin)
- Synthetic antiparasitic

Based on Action

- Nematocidal and ectoparasitocidal – kills nematodes and arthropods
- Mechanism: activates glutamate-gated chloride channels → hyperpolarization → paralysis

Based on Use

- ▲ Oral therapy – tablets or suspension
- ▲ Topical therapy – creams or lotions (for ectoparasites)

Structure

⇒ Macrocyclic lactone ring with oleandrose sugar moiety

Molecular formula: $C_{48}H_{74}O_{14}$

Structural Characteristics

- Highly lipophilic → good tissue distribution
- Acts selectively on invertebrate chloride channels
- Formulated for oral or topical administration

Nomenclature

- ◇ Ivermectin → generic name
- ◇ Brand names: Stromectol, Mectizan
- ◇ Formulations: oral tablets, topical lotion/cream

Mechanism of Action

- ⇒ Ivermectin binds to glutamate-gated chloride channels in nematodes and arthropods.
- ⇒ Causes increased chloride ion influx, leading to hyperpolarization of nerve and muscle cells.
- ⇒ Results in paralysis and death of the parasite.
- ⇒ Does not affect human chloride channels at therapeutic doses, providing safety.
- ⇒ Hence, ivermectin is nematocidal and ectoparasitocidal.

Spectrum of Activity

- Nematodes: *Onchocerca volvulus* (river blindness), *Wuchereria bancrofti*, *Strongyloides stercoralis*
- Ectoparasites: Scabies (*Sarcoptes scabiei*), head lice (*Pediculus humanus*)
- Limited activity against cestodes or trematodes

Uses

- ▲ Onchocerciasis – microfilaricidal
- ▲ Lymphatic filariasis – mass drug administration (MDA) programs
- ▲ Strongyloidiasis – intestinal nematode infection

Adverse Effects

- Mazzotti-type reaction in filariasis: fever, headache, dizziness, rash
- Gastrointestinal: nausea, diarrhea, abdominal pain

Chemical Degradation

- Stable under normal storage conditions
- Store in cool, dry place, protected from light

Structure–Activity Relationship (SAR)

- ✚ Macrocyclic lactone ring → essential for binding to glutamate-gated chloride channels
- ✚ Oleandrose sugar moiety → improves lipophilicity and bioavailability
- ✚ Selective for invertebrate chloride channels → safety in humans
- ✚ Effective against microfilariae, intestinal nematodes, and ectoparasites