

➤ ANTIFUNGAL AGENT

Define: An antifungal agent is a drug that selectively eliminates fungal pathogens from a host with minimal toxicity to the host.

CLASSIFICATION:

(A) Antifungal Antibiotics:-

1. Polyene antibiotics:

Eg. Amphotericin B, nystatin

2. Heterocyclics benzofuran:

eg. Griseofulvin

(B) Antimetabolite:

eg. Flucytosine

1. Imidazole:

eg. clotrimazole and econazole

2. Triazoles

eg. Fluconazole

(C) Allylamine:

eg. Terbinafine.

(D) Other topical agents:

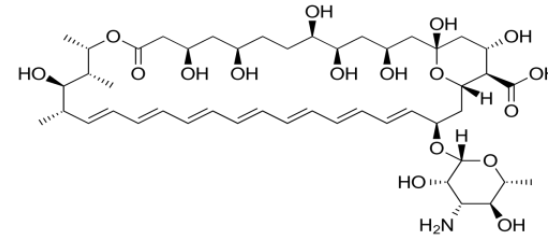
eg. Tolnaftate, benzoic acid

(1) ANTIFUNGAL ANTIBIOTICS:

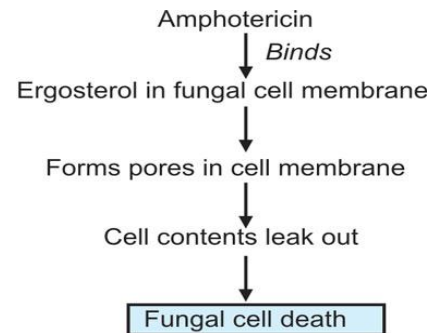
Antifungal medicines are use to treat fungal infection is called as antifungal antibiotics.

Example-

(a) Amphotericin-B:



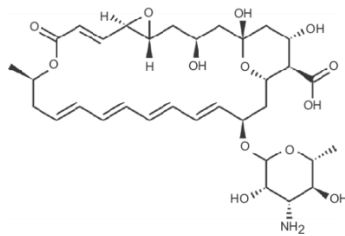
MECHANISM OF ACTION:



USES:

- it is used to treat mucomycosis, invasive aspergillosis, extra cutaneous sporotrichosis and cryptococcosis.

(b) Natamycin:



Mechanism of action:

binds to ergosterol in fungal membrane causing membrane to become leaky. The 26-membered polyenes cause both K leakage and cell lysis at same concentration.

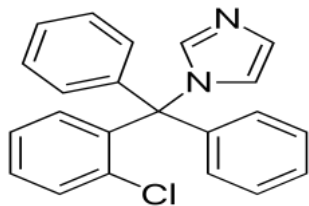
Uses:

- it is used to treat some types of fungus infection of the eye.

➤ **Synthetic antifungal agents:**

Example-

(a) Clotrimazole:



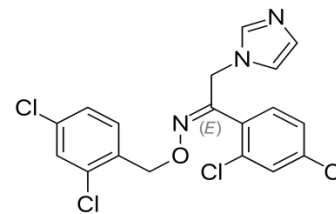
Mechanism of action:

Clotrimazole is an imidazole derivative which works by inhibiting the growth of individual candida or fungal cells by altering the permeability of the fungal cell wall.

uses:

-It is used in the treatment of skin fungal infection, dermatophyte and yeast infections such as athlete's foot, jock itch, ringworm.

(b) Oxiconazole:



Mechanism of action:

oxiconazole inhibit ergosterol biosynthesis, which is required for cytoplasmic membrane integrity of fungi. It acts to destabilize the fungal enzyme as lanosterol 14- demethylase. This is vital in the cell membrane structure of the fungus.

Uses:

-it is used for the treatment of dermal fungal infection such as athlete's foot, ring worth and jock itch.

➤ ANTI-PROTOZOAL AGENTS:

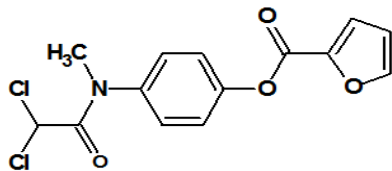
Antiprotozoals drug, any agent that kills or inhibits the growth of organisms known as protozoans.

Classification: -

- A. Drugs used in amoebiasis:
 - 1. Ipecac alkaloids- e.g. emetine
 - 2. 5-nitroimidazole derivative- e.g. metronidazole
 - 3. 8-quinolinol derivatives- e.g. Iodoquinol
 - 4. Amide derivatives- e.g. diloxanide
 - 5. Napthaquinone derivatives- e.g. atovaquone
 - 6. Miscellaneous agents- e.g. tetracycline
- B. Drugs used in trypanosomiasis:
e.g., pentamidine isethionate
- C. Drugs used in leishmaniasis e. g. sodium stibogluconate

Example-

- 1) diloxanide:



Mechanism of action:

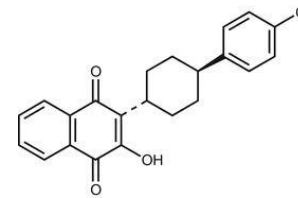
Diloxanide acts as a luminal amebicide, however the mechanism of action of diloxanide is unknown. Diloxanide destroys the trophozoites of *E. histolytica* that eventually form into cysts. The

cysts are then excreted by persons infected with asymptomatic amebiasis.

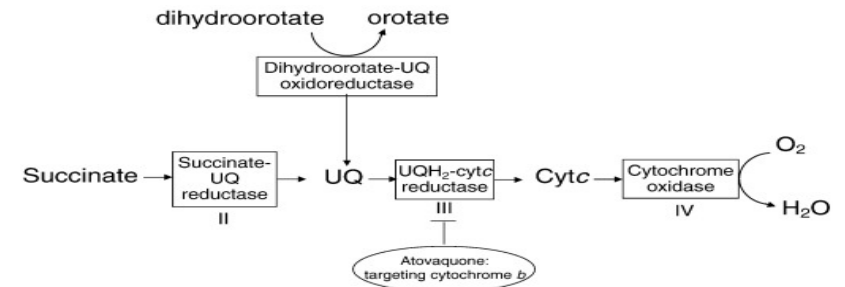
Uses:

Diloxanide furoate has been used in the treatment of asymptomatic carries of *E. histolytica*.

- 2) Atovaquone:



Mechanism of action:



Atovaquone is highly lipophilic drug that closely resembles the structure.its inhibitory effect being comparable to ubiquinone atovaquone acts by selectively blocks the mitochondrial electron transport at complex III of the

respiratory chain of protozoa, there by inhibiting pyrimidine synthesis, preventing DNA synthesis and leading to protozoal death.

➤ Anthelmintics:

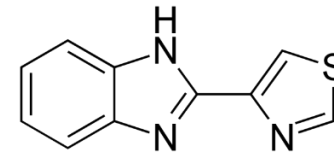
Anthelmintics drugs are used to treat parasitic infections due to worms.

Classification:

1. Piperazines derivatives:
E.g.piperazine, diethylcarbazine
e.g. albendazole, mebendazole
2. benzimidazoles derivatives:
e.g. albendazole, mebeandazole.
3. hererocycles derivatives:
e.g. oxamniqine.
4. natural products:
e.g. invermectin, avermectin.
5. vinyl pyrimidines derivatives:
e.g., pyrantel, oxantel.
6. amide derivatives:
Eg. Niclosamide.

Example:

- 1) thiabendazole:



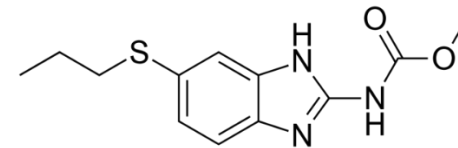
Mechanism of action:

It inhibits the helminth-specific mitochondrial enzyme fumarate reductase, thereby inhibiting the citric acid cycle, mitochondrial respiration and subsequent production of ATP, ultimately leading to heminth's death.

Uses:

-It has broad-spectrum anthelmintic activity. It is used to treat enterobiasis, strongyloidiasis, ascariasis, uncinariasis and trichuriasis.

2) Albendazole:



Mechanism of action:

as a vermicide, albendazole caused degenerative alterations in the intestinal cells of the worth by binding to the colchicine –sensitive site of B-tubulin,thus inhibiting its polymerization or assembly into microtubules

Uses:

- It is used in treatment of infection of *Acaris lumbricoides* *Ancylostoma duodenalw* *necator americanus* *enterobius vermicularis* and *Trichiura*.

➤ Synthetic anti- infective agents

Anti-infective are drugs that can either kill an infectious agents or inhibit it from spreading.

1) Sulphonamides

Classification =

1) Based on their duration of action

- A) Short acting sulphonamide = e.g sulphadiazines
- B) Intermediate acting sulphonamide= e.g sulphaphenazole
- C) Long acting sulphonamide = e.g sulphaphenazole

2) Based on their pharmacological action

- A) used in systemic infection =e.g sulphadiazine
- B) Used in eye infection =e.g sulphaetamide
- C) used in intestinal infection =e.g sulphapyridine
- D) used in urinary tract infection

Historical development =

Sulphonamide story began in 1935 when it discovered that a red dye called protosil had antibacterial properties . it was found that the dye was metabolized by bactriapresent in the test animals small intestine and broken down into a product sulphonamide

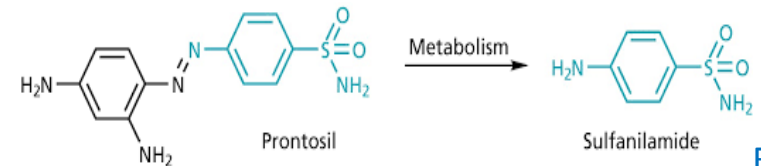
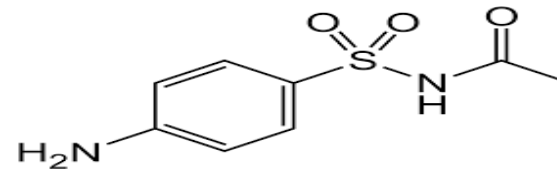


Fig ;

conversion of protosil to sulfonamide

A) Sulfacetamide



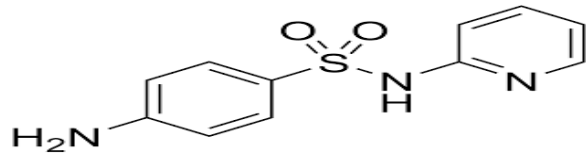
Mechanism of action =

Sulfacetamide is a competitive inhibitor of bacterial para aminobenzoic acid (PABA) , which is essential for bacterial growth this inhibited reaction is necessary in these organism for follic acid synthesis

Uses =

it is used for treat bacterial vaginitis,keratitis ,acute conjunctivities , and blepharitis .

B) Sulphapyridine



Mechanism of action =

Sulphapyridine is a competitive inhibitor of bacterial dihydropteroate synthetase enzyme. This inhibited reaction is necessary in this organism for folic acid synthesis by processing this substrate paraaminobenzoic acid (PABA) dihydropteroate synthetase activity is required in the synthesis of folate

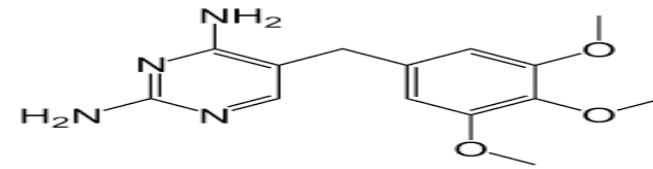
Uses =

sulphapyridine is used for the treatment of dermatitis herpetiformis

2) Folate reductase inhibitors

A dihydro folate reductase inhibitor is a molecule that inhibits the function of dyhydro folate reductase

A) Trimethoprim



Mechanism of action =

Trimethoprim inhibits dihydrofolate reductase enzyme and prevents the conversion of dihydrofolic acid (DHF) tetrahydrophilic (THF) in thymidine synthesis pathway . the affinity of its action on bacterial dihydrofolate reductase is thousand time mores than that on human dihydrofolate reductase .

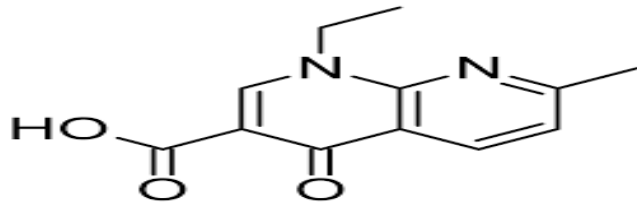
Uses =

trimethoprimis used for the treatment of UTIs , uncomplicated pyelonephritis and mild acute prostatitis .

3)Quinolones =

A quinolone antibiotic is a member of large group of broad spectrum bacteriocidal that share a bicyclic core structure related to the substance 4-quinolone

A) Nalidixic acid



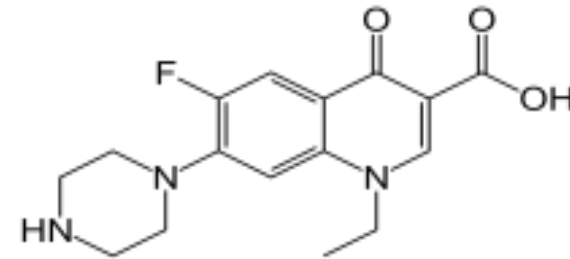
Mechanism of action =

Nalidixic acid and related antibiotics inhibit a subunit of DNA gyrase and topoisomerase iv and induce formation of cleavage complexes . it also inhibit the nicking closing activity on the subunit of DNA gyrase that releases the positive binding stress on the supercoiled DNA .

Uses =

It has historically been used for treating urinary tract infection .

B) Norfloxacin



Mechanism of action =

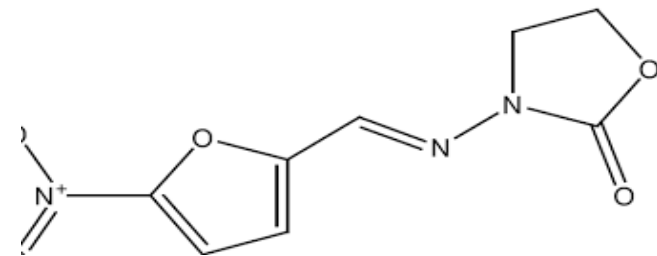
The mechanism of action of norfloxacin involves inhibition of the A subunit of the important bacterial enzyme DNA gyrase , which is essential for DNA replication .

Uses =

Norfloxacin is used to treat a variety of bacterial infection .

D) Miscellaneous

1) Furazolidines



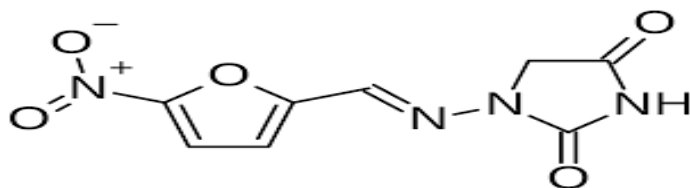
Mechanism of action =

Its bactericidal activity is based upon its interference with DNA replication and protein production . this antimicrobial action minimizes the development of resistant organism furazolidine and its related free radical products are belived to bind DNA and induce cross links.

Uses =

It is used to treat bacterial and protozol infection
It is used in the treatment of diarrohea .

2) Nitrofurantoin =



Mechanism of action =

Nitrofurantoin is activated inside bacteria by reduction via the flavoprotein nitrofurantoin reductase to unstable metabolites which disrupt ribosomal RNA ,DNA and other intracellular components .

Uses =

It is used to treat urinary tract infection

.REFERENCE :

- 1) Essentials of medicinal chemistry III
- 2) Medicinal chemistry III ,By rakesh kumar and neha Tiwari

Prepared by: (63) Thorat payal ,(64) varkute sayali

Mentor : Mr. Chetan p . Pulate

Department :Pharmaceutical chemistry

Subject : Medicinal chemistry III

Class :Third year B pharm

Academic Year – 2021-2022