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Antiinfective Agent Dosingin Adults

Dr. D. R. Rama Brahma Reddy[a], G.Y. Srawan Kumar[b], Y. Dedeepya[c], N. Divya[d].

[a]*Principal and professor, Nalanda Institute of Pharmaceutical Sciences, Kantepudi, Sattenapalli, Guntur.*
[b] *Associate professor, Nalanda Institute of Pharmaceutical sciences, Kantepudi, Sattenapalli, Guntur.*
[c,d]*Students, 5th pharm D, Nalanda Institute of Pharmaceutical sciences, Kantepudi, Sattenapalli, Guntur.*

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ABSTRACT: Infectious diseases that are most commonly occurs in tropical and subtropical countries. Infectious disease that they will increase the growth of the infectious cells in the human host, and they will survive continuously in the body. These infectious cells that shows the common symptoms called fever, nausea and vomiting from that chihangs disease may cause the enlargement of lymph glands muscle pain, swelling and chest pain. where as in Africa trypanosomiasis may cause severe headache, irritability, extreme fatigue and swollen lymph nodes. When the infectious disease increases in human host then they may experience several neurological problems. If left untreated, these diseases may cause death in some cases.

Based on the age and type of disease the physician will prescribe the dose to the patient the review highlights were to describe the dose that was given adult in different type of condition based on the disease.

Keywords: Infectious disease,tropical and subtropical Africa trypanosomiasis, chihangs disease, neurological problems, human host.

I. INTRODUCTION:

From the history of human almost infectious diseases causes deaths. By late 20th century infectious that caused mainly by bacterial that make publics fell off is detected in wealthier regions as society. Then the medicine came into use and they also prevented through sanitation, nutrition, immunization and treated through antibacterial agents(1). It is very challenging to upgrade specific antiviral drugs because of the small no of molecular targets in viruses and fast rapid evolution(2).Most of the infections are caused by fungi pathogens but some of the bacterial pathogens also help to the perfidious infections. No specific treatment was available for fungi infections till the drug Amphotericin B was discovered in 1953, followed by flucytosine in 1957, developed by azoles in 1960, later triazoles(3).Billions of people are affected and threatened worldwide by Leishmaniasis, Human African trypanosomiasis and chagas diseases are Neglected Tropical Diseases (NTD's) by the WHO because they are avoided by pharmaceutical industry and they have low public visibility in high income countries. NTD's are the most life-threatening infectious diseases which are found in 149 countries caused by various pathogens such as viruses, bacterial, helmentics and protozoals(4).

Anti-infective agents(5):

Anti-infective agents which are used to describe the drug capacity of inhibiting the spread of infection causing organism or by killing the infectious organism outright.

The categories that are involved in these anti-infective agents are

- Antibiotics
- Antifungals
- Anti helminthics
- Antimalarial
- Antiprotozoal
- Antiparasitic
- Antivirals

Antibiotics:

Antibiotics are the drugs which are used to treat the infections caused by gram positive and gram-negative bacteria such as staphylococcus, streptococcus, or E coli., Antibiotics which act against bacteria to not reproduce (or) growing more. Antibiotics do not act against any antiviral drugs.(6)

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Mode of action[7]:

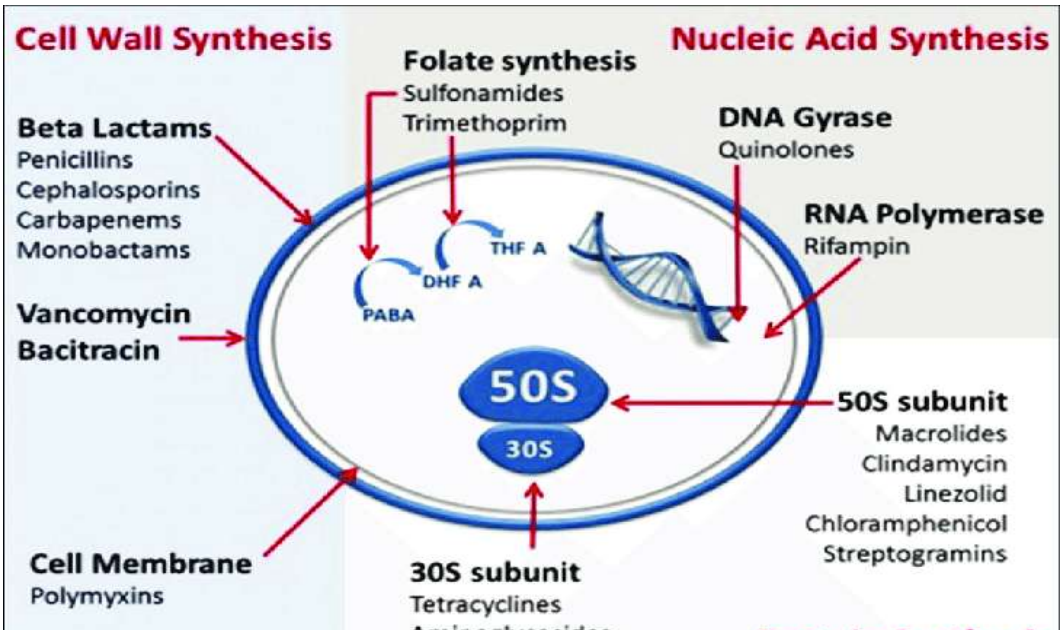

Figure 1: Mechanism of action of antibiotics (courtesy from Garima Kapoor et.al).

Dosing of antibacterial agents[8]:

Drug	Adult	Dosage	
	Oral	**Parenteral**	**Serious infection**
Amikacin	N/A	15mg/kg IV once/day Or 7.5 mg/kg every 12hours	15mg/kg IV Once/day Or 7.5mg/kg IV every 12hours
Cefadroxil	0.5-1g every 12hours	N/A	N/A
Cefazolin	N/A	1-2g IV every 8hours	2g IV every 8 hours
Cefaclor	0.25-0.5g every 8hours	N/A	N/A
Cefprozil	0.25g every 12hours Or 0.5g every 12-24 hours	N/A	N/A
Cefuroxime	0.125-0.5g every 12 hours	0.75-1.5g IV every 6-8 hours	1.5g IV every 6 hours
Cefotaxime	N/A	1g every 12 hours to 2g IV every 4 hours	2g IV every 4 hours
Cefpodoxime	0.1-0.4g every 12 hours	N/A	N/A
Ceftriaxone	N/A	1-2g IV every 24 hours	2g IV every 24 hours
Cefepime	N/A	1-2g IV every 8-12 hours	2g IV every 8 hours

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Amoxicillin	0.25-0.5g every 8 hours or 0.875g every 12 hours	N/A	N/A
Amoxicillin /Clavulanate	0.25-0.5g every 8 hours Or 0.875 g every 12hours	N/A	N/A
Ampicillin	N/A	0.5-2.0 g IV every 4-6 hours	2g IV every 4 hours
Penicillin G	0.25-0.5g every 6-12 hours	1-4 million units IV every 4-6 hours	4 million units IV every 4 hours
Piperacillin /tazobactam (2.25g= 2.0g piperacillin +0.25g tazobactam)	N/A	3.375g IV every 6 hours	3,375 g IV infused over 4 hours every 8 hours or 4.5 g IV every 6 hours
Meropenem	N/A	1g IV every 8 hours	2g IV every 8 hours
Ciprofloxacin	0.5-0.75g every 12 hours	0.2-0.4 g IV every 8-12 hours	0.4 g IV every 8 hours
Levofloxacin	0.25-0.75g every 24 hours	0.25-0.75g IV every 24 hours	0.75 g IV every 24 hours
Norfloxacin	0.4g every 12 hours	N/A	N/A
Ofloxacin	0.2-0.4g every 12 hours	0.4g IV every 12 hours	0.2-0.4 g IV every 12 hours
Azithromycin	0.5g on day 1, then 0.25g every 24 hours for 4 days	0.5 g IV every 24 hours	0.5 g IV every 24 hours
Clarithromycin	0.25-0.5 g every 12 hours extended release: 1g every 24 hours	N/A	N/A
Erythromycin	0.25-0.5g every 6 hours	N/A	N/A
Sulfamethoxazole	1g every 8-12 hours	N/A	N/A
Trimethoprim	0.1g every 12 hours Or 0.2 g every 24 hours	N/A	N/A
Trimethoprim/sulfamethoxazole	0.16/0.8g every 12 hours	3-5mg TMP/kg IV Every 6-8 hours	5mg TMO/kg IV every 6 hours
Doxycycline	0.1g every 12 hours	0.1 g IV every 12 hours	0.1 mg IV every 12 hours
Tetracyclin	0.25-0.5g every 6	N/A	N/A

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e	hours		
Clindamycin	0.15-0.45g every 6 hours	0.6 g IV every 6 hours to 0.9 IV g every 8 hours	0,9 g IV every 8 hours
Linezolid	0.6 g every 12 hours	0.6 g IV every 12 hours	0.6 g IV every 12 hours
Nitrofurantoin	100mg every 12 hours	N/A	N/A
Vancomycin	125mg every 6 hours (only effective for C. difficile-induced diarrhoea)	15mg/kg IV every 12 hours (often 1g every 12)	25 mg/kg once, then 15-20 mg/kg IV every 8-12 hours

Mg- milligrams; mg/kg- milligram per kilogram; IV- Intravenous; N/A- Not available; g- grams

Antifungals:

Antifungals are the drugs that are most commonly used to treat the skin diseases because the fungi that most commonly effects on skin. Antifungals main work is to damage the cell wall of the fungus, that may lead to the death of fungi cell wall. They are different types of antifungals such as solutions, creams, lotions, tablets that mainly designed for vagina, shampoos, injections, medications by mouth.[9]

Mode of action[10]:

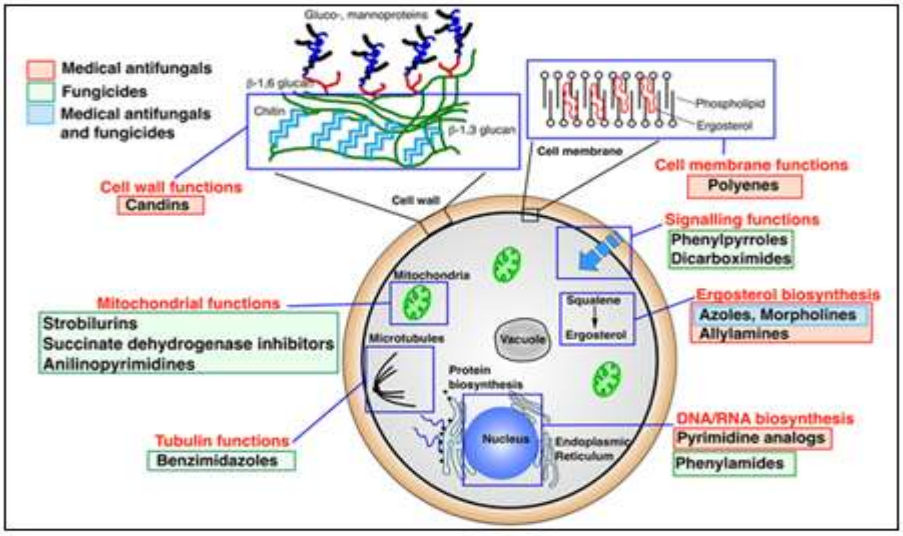

Figure2: Mode of Action of Antifungal Drugs (courtesy from Dominique Sanglard et.al)

Drugs for antifungals:

Drug	Dosage
Fluconazole	50-200mg once a day[11]
Griseofulvin	500mg-1gmdaily [12]
Itraconazole	200mg twice a day upto 1week[13]
Ketoconazole	200mg once a day[14]
Terbinafine	250mg once a day for 6 weeks[15]

Mg- milligrams.

Antivirals:

Almost all viral diseases were caused due to viral agents. The disease except human immune deficiency virus that do not have any specific antiviral treatment. Now currently the available antiviral drugs are about 3 main groups of viruses: Influenza viruses, Herpes and Hepatitis except the antisense molecule fomivirsen, which acts as a

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competitive substrate for viral DNAthat inhibits the replication of virus[16]. The first described virus was tobacco mosaic virus in 1892 by Dmitri Ivanov sky. From then about 5000 viruses has been described and used in many ways to treat viral infection. Virus are different from microorganisms as they contain only one type of nucleic acid and do not have ribosomes or other cellular organisms. Hence, they demand a host cell to multiply and they are inactive outside of the host cell.[17]

- Viruses with double-stranded DNA → Adenovirus, herpes virus, poxvirus, vaccinia Virus.
- Viruses with single-stranded DNA → some bacteriophages.
- Viruses with double-stranded RNA → Retrovirus.
- Viruses with single-stranded RNA → Polio virus, Influenza virus, HIV, RNA, Oncogenic[17].

The multiplication cycle of virus consists of 4 main parts[18]

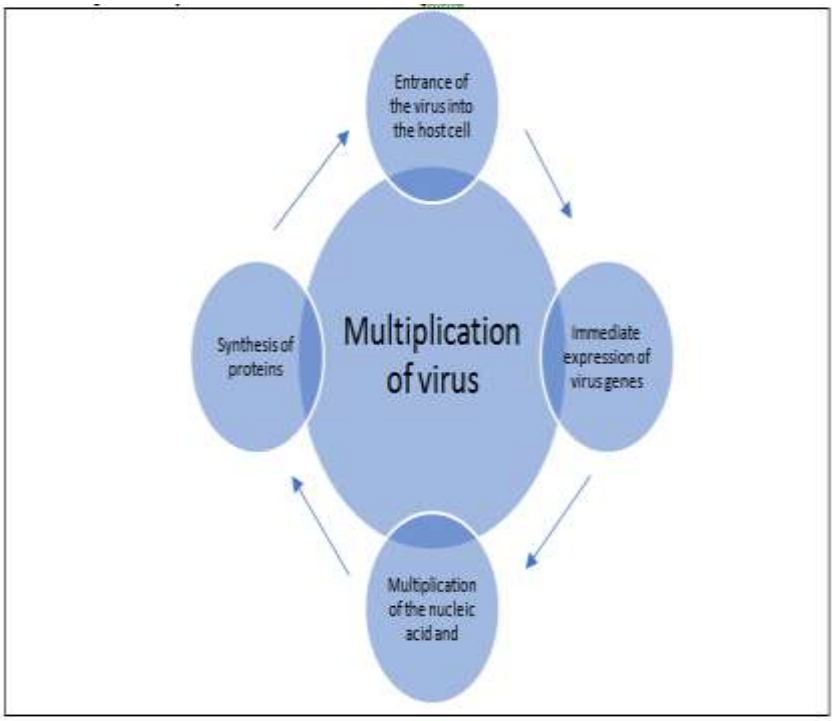

Figure: 3 Multiplication of virus

The cycle follows. New virions are formed and realsed from the host by cell lysis. Many anti viral drugs have been discovered sine years which help us to deal with many viral infections. Most of them are effectively used , while new substances are tested to produced new , safer and more efficient drugs.

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Mode of action[19]:

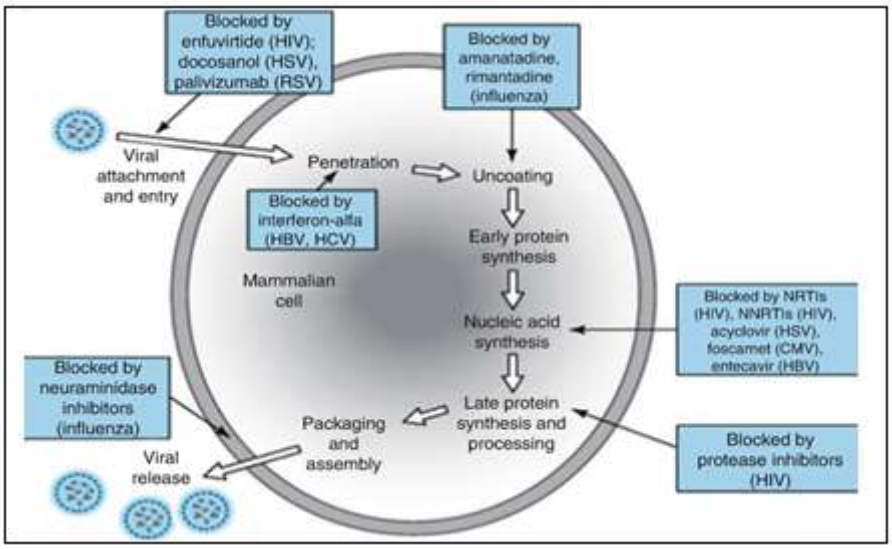

Figure 4: Possible general mechanism of action of antivirals (courtesy fromKatzung& Trevor's et.al)

Drugs for antivirals[20]:

Antiretroviral	**Dosage**
NRTI	
Zidovudine(AZT, ZDV, Retrovir)	200 mg tid , 250 mg bid, 300 mg bid
Didanosine (ddl, Videx); ddl-EC (Videx EC)	If< 60 kg; ddl 125 mg bid or ddl- EC 250 mg qd If ≥ 60 kg; ddl 200mg bid or ddl EC 400 mg qd
Stavudine (d4T, Zerit)	If< 60 kg; 30 mg bid If≥ 60kg; 40 mg bid
Lamivudine(3TC, Epivir)	150 mg bid; 300mg bid
Emtriotabine (FTC. Emitriva)	200 mg qd
Abacavir(ABC, Ziagen)	300mg bid; 600 mg qd
Tenofovir (TDF, Viread)	300 mg qd
NNRTI	
Nevirapine(NVP, Viramune)	200 mg bid
Elanirenz (EFV, Stocrin, Sustiva)	600mg; 200mg and 400 mg bid
PI	
Hard gel Saquinavir (SQV-HGC, Invirase)	1000mg bid (taken with RTV 100mg;) 1600mg qd (taken with RTV 100 mg)
Ritonavir (RTV, Norvir)	600mg bid
Indinavir(IDV, Crixivan)	800mg q8h (800 mg+ RTV 100 to 200 mg) q12h
Nelfinavir	750mg tid, 1250mg bid
Kaletra capsule (Lopinavir 133 mg/ RTV 100 mg); Kaletra (Meltrex formulation) tablet (lopinavir 150 mg/ RTV 50 mg)	3 Capsules bid; 6 capsules qd (naïve patients) 2 tablets bid; 4 tablets qd (naïve patients)
Fosamprenavir (FPV, Lexivat, Telzir)	700mg with RTV 100 mg bid
Atazanovir (ATV, Reyataz)	400mg qd, 300 mg qd when boosted with RTV 100 mg
Tipranavir (IPV, Aptivus)	500mg with RTV 200 mg bid

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mg- milligrams; tid – three times a day; bid- twice a day; ddl- dear doctor letter; EC- enteric coating; kg- kilogram; qd- quarter a day;q8h- every 8 hours; q12h- every 12 hours; AZT- azidothymidine; ZDV- zidovudine; Videx- brand name for didanosine; ddl- dear doctor letter; EC- enteric coating; d4t – give with or without food;3TC- Lamivudine; FTC- Failure to cope; ABC- Abacavir; TDF- Tenofovir; NVP- Nevirapine; EFV- Elanirenz; RTV- Ritonavir; IDV- Indinavir; FPV- Fosamprenavir; ATV- Atazanovir; IPV- Tipranavir.

Systemic use of drugs:

Generic name (brand name)	Suggested dosages× duration (days)
Acyclovir (Zovirax)	400mg Tid×7
Famciclovir(Famvir)	125mg Bid×5
Valacyclovir(Valtrex)	500mg Bid×5

TID- Three times a day; BID- twice a day; mg- milligrams.

Topical Use Drugs:

Generic name (brand name)	Suggested dosage×duration(days)
Penciclovir(Denavir)	cream 1% Every 2 hours
Acyclovir(Zonirax)	cream 5% Every 2 hours
Docosonol cream,	10%(Abreva) Every 3 hours

Antiparasitic:

Antiparasitic agents are the drugs that are used to treat the infections that are caused by the parasites. The parasites that include the tapeworms, ring worms, flukes. They also includes the categories of[21]

1. Antiprotozoals
2. Antimalarials
3. Antihelmentics

Mode of action[22]:

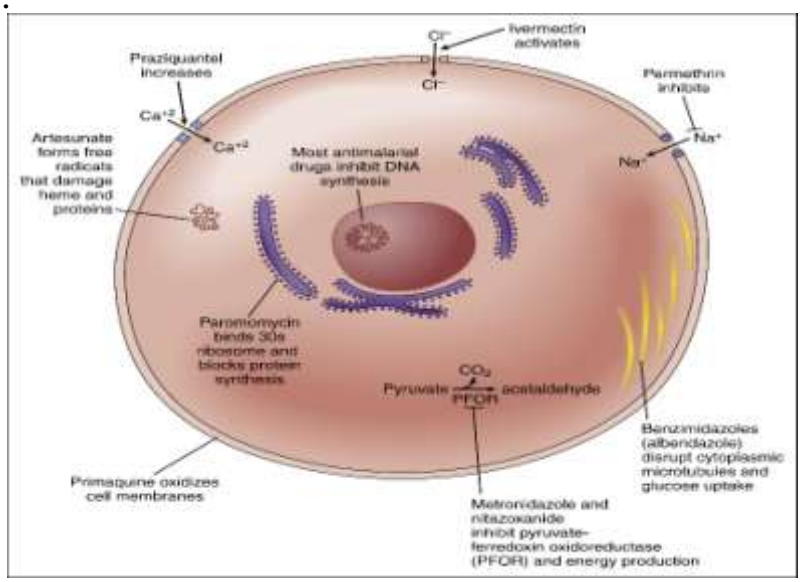

Figure5:Sites of action and mechanisms of antiparasitic drugs: The sites and mechanisms of antiparasitic agents include cell membranes and ion channels, energy metabolism enzymes, cytoplasmic microtubules, DNA synthesis, ribosomal protein synthesis, and free radical damage.(courtesy from William C. Shiel Jr et.al.).

Antiprotozoals:

Antiprotozoals are the agents that wipe out (or) suppress the growth of organisms known as protozoans.[23] They are most analogous to plants

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and animals that have a clearly defined cell nucleus and they are eukaryotes which are typically (or) microscopic.Most commonly used antibiotics which are efficacious in inhibiting bacteria are not showing much effective against the protozoans. A few protozoa that causes infection in human include plasmodium which cause malaria, entamoeba histolytica which cause the amebiasis amoebic dysentery, trichomonas vaginal which cause of vaginal infection, pneumocytis carinil,which is the most common cause of pneumonia immunodeficient person.[24] Most commonly caused protozoal infections are malaria, giardiasis,trichomoniasis pneumonitis, amoebiasis, trypanosomiasis, taxoplasmosis.[25]

Mode of action[26]:

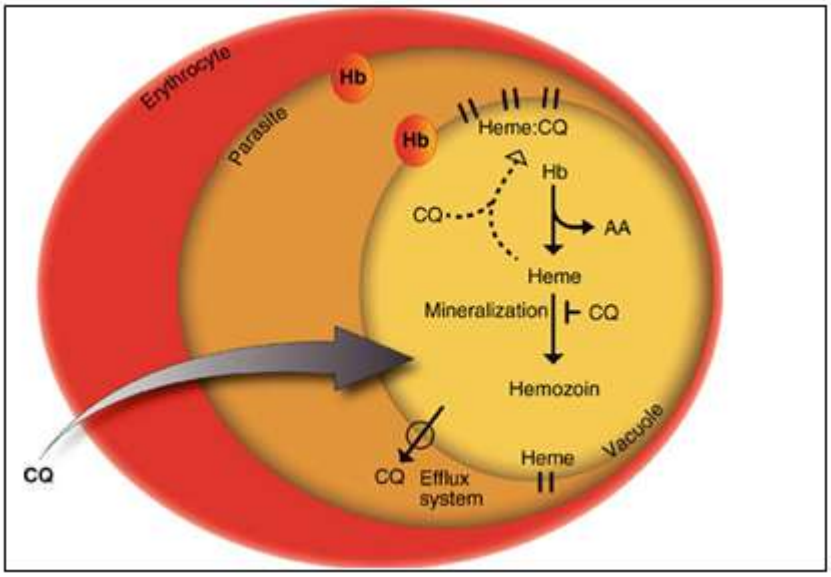

Figure 6: Mechanism of action of Antiprotozoal agents (courtesy from Stefan offermanns et.al)

Antimalarials:

Antimalarials are the naturally derived , antiparasitic chemical agent that can be mainly used to treat (or) prevent malaria most commonly in two main groups of children (young) and pregnancy women . Malaria is a consequential ailment that be lethal if not diagnosed and treated fast. The main risk is in the groups of pregnant women,babies,young children and the elder persons. The main parasite that cause the highest mortality rate was plasmodium falciparum that cause more symptoms. It will take hours (or) days first symptoms to show the complications in the person who are suffering with severe malarial.[27][28]
plasmodium species that causes infection in human.
plasmodium vivax (Tertian)
plasmodium ovale (Tertian)
plasmodium (Tertian)
plasmodium malariae (quartan) [29]

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Mode of action[30]:

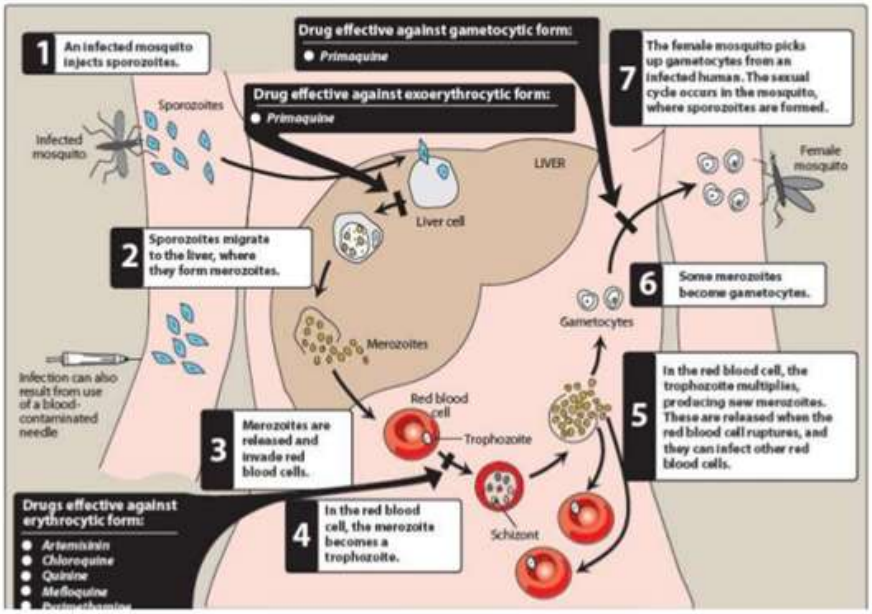

Figure6: mode of action of anti malarials (courtesy from Michael Delves et.al).

Drugs for antimalarials[31]:

Drug	Dosages
Amodiaquine	**Tablet:** 153mg or 200 mg (as hydrochloride). **.** To be used in combination with artesunate 50mg.
Artemether	**Oily injection:** 80mg/ml in 1ml ampoule **.**For using the management of severe malaria.
Artemether+ lumefantrine	**Tablet:** 20mg+ 120mg **Tablet:(dispersible):**20mg+120mg *****Not recommended in the first trimester of pregnancy or in children below kg.
Artesunate	**Injection:**ampoules,containing 60mg anhydrous artesunic acid with a separate ampoule of 5%sodium bicarbonate solution. For use in management of severe malaria. **Rectaldosage form:**50mg[**c**];100mg**[c]**;200mg capsules (for pre-referral treatment of severe malaria only;patients should be taken to an appropriate health facility for follow-up care) **Tablet:**50mg. *To be used in combination with either amodiaquine,mefloquine **or** sulfadoxine + pyrimethamine.
Artesunate + amodiaquine	**Tablet:**25mg+67.5mg;50 mg +135 mg; 100 mg+ 270mg. *other combinations that deliver the target doses required such as 153 mg **or** 200mg (as hydrochloride) with 50 mg artesunate can be alternatives.
Artesunate + mefloquine	**Tablet:**25mg+ 55 mg;100 mg + 220 mg.
Artesunate + pyronaridine	**Tablet:** 60mg + 180mg

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tetraphosphate	**Granules:**20mg + 60 mg
Choloroquine	**Oral liquid:** 50 mg (as phosphate**or** sulphate)/5 ml.. **Tablet:**100mg; 150 mg (as phosphate **or** sulphate). *For use only for the treatment of P. Vivax infection.
Dihydroartemisinin + piperaquine phosphate	**Tablet:**20 mg + 160 mg; 40 mg + 320 mg
Doxycycline	**Capsule:**100mg(as hydrochloride **or** hyclate) **Tablet(dispersible):**100 mg (as monohydrate). *For use only in combination with quinine.
Mefloquine	**Tablet:**250 mg(as hydrochloride). *To be used in combination with artesunate 50 mg.
Primaquine	**Tablet:**75 mg; 15mg(as diphosphate). *Only for use to achieve radical cure of P. Vivax and p.ovale infections,given for 14days.
Quinine	**Injection:**300mg quinine hydrochloride/ml in 2-ml ampoule. **Tablet:**300mg (quinine sulphate) **or** 300mg (quinine bisulphate). *For use only in the management of severe malaria, and should be used in combination with doxycycline.
Sulfadoxine + pyrimethamine	**Tablet:** 500mg + 25 mg. *Only in combination with artesunate 50mg.
Proguanil	100mg to 200mg daily
For Prophylaxis	
Amodiaquine – sulfadoxine + pyrimethamine[c]	**CO – Packaged dispersible tablets:** Amodiaquine 76.5 mg (as hydrochloride)and sulfadoxine + pyrimethamine 250mg +12.5 mg.
Chloroquine	**Oral liquid:**50 mg (as phosphate or sulphate)/5mL. **Tablet:**150mg (as phosphate **or** sulphate). *For use only in central American regions,for P.Vivax infections.
Doxycycline	**Solid and dosage form:**100 mg (as hydrochloride **or** hyclate).
Mefloquine	**Tablet:**250 mg (as hydrochloride).
Proguanil	**Tablet:**100mg (as hydrochloride). *****For use only in combination with chloroquine.
Sulfadoxine + pyrimethamine	**Tablet:**250mg + 12,5 mg;500mg +25mg.

*indicates the instructions of the drug; mg- milligram; mg/ml- milligrams per milliliter; ml- millilitre; P. Vivax- Plasmodium Vivax; p.ovale- Plasmodium Ovale.

Drugs for Giardiasis[32]:

Metronidazole (or) Tinidazole	200mg TDS for 5 – 7 days (or) 2g daily for 3 days 600mg daily for 7 days (or) 2g single dose
Nitazoxanide	500mg BD for 3days
Quiniodochlor	250mg TDS for 7days
Paromomycin	500mg TDS for 5 – 7 days
Furazolidone	100mg TDS for 5 – 7 days

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TDS- three times a day; mg- milligrams; g- grams; BD- twice a day.

Drugs for Trichomoniasis[32]:

Metronidazole (or) Tinidazole (or) Secnidazole	400mg TDS for 7days (or) single dose 600mg – OD for 7 days (or) 2g single dose 2g single dose
Intravaginal	
Dihydroxyquin (or) Quiniodochlor (or) Povidone iodine	200mg inserted intravaginally at bedtime for 1 – 2 weeks. 200mg inserted at bedtime for 1 – 3 weeks 400mg – HS for 2 weeks

TDS- three times a day; OD- once daily; mg- milligrams; g- grams; HS- at bedtime.

Drugs for amoebiasis[33]:

Drugs of choice	Alternative drugs
Acute Amaoebic Dysentery	
Metronidazole 400 mg oral TDS × 5-7 days Or Tinidazole 2.0g oral OD × 2-3 days + Luminal amaebicide (as above)	Ornidazole 2.0 g oral daily ×3 days Or Secnidazole 0.5 g oral TDS ×5days Alternative luminal amaebicides Quiniodochlor 250-500 mg oral TDS × 7-14 days Or Iodoquinol 650 mg oral TDS × 7-14 days Or Paramomycin 500mg oral TDS × 7-10 days Or Tetracycline 250 mg TDS ×7-10 days (adjuvant)
Mild intestinal amoebiasis/ Asymptomatic cyst passers	
Metronidazole 400mg oral TDS × 5 – 7 days (or) Tinidazole 2.0g oral OD × 2 – 3 days + Luminal amoebicide (as above)	ornidazole 0.5 g oral BD × 5 – 7 days or Secnidazole 2.0 g oral single dose Alternative luminal amoebicides (as above) Tetracycline 250 mg TDS × 7 – 10 days (adjuvant)
Amoebic liver abscess	
Metronidazole 800mg oral TDS × 10days (in serious cases 500mg slow iv 6 hourly × 10days) Or	*Emetine / Dehydrometine 60 mg IM/SC × 8 – 10 days Followed by /alternatively *Chloroquine 600mg (base) oral daily × 2 days ,followed by 300mg daily for 2 – 3 weeks.

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Tinidazole 2.0 g oral daily × 3 – 6 days + Luminal amoebicide (as above)	Alternative luminal amoebicides (as above,but no role of tetracycline)

TDS- Three times a day; g- grams; mg- milligrams; OD- once daily; BD- twice a day; iv- intravenous; IM- intramuscular; SC- subcutaneous.

Drugs for trypanosomiasis[32]:

Suramin	100mg – 200mg (test dose) iv then 1g iv on days 1,3,7,14,21[34]
Pentamidine	300mg[35]
Enflornithine	400mg/ kg /day QID iv × 4days. Then 300mg/kg/day po×3 – 4 weeks[36]
Nifurtimox	Adults (>17yeras) with acute infection 8 – 10mg/kg/day in 3 -4 divided doses for 90 days[37]
Melarsoprol	2 – 3.6 mg/kg/day iv for 3 days after 1 week 3.6mg/kg/day iv for 3 days. Repeat after 10 – 21 days 3.6 mg/kg/day[38]
Benznidazole	Adults (>13 years) 5 - 7 mg/kg/day in 2 divided doses for 60 days[39]

IV- Intravenous; QID- quarter in die(four times a day);PO- per oral; mg- milligrams; mg/kg/day- milligram per kilogram per day.

Drugs for taxoplasmosis[32]:

Pyrimethamine	75mg daily followed by 25 – 50 mg daily
Sulfadiazine	2g followed by 0.5 – 1 g orally every 6 hours

mg- milligrams; g- grams.

Antihelmentic Agents:

Antihelmentic agents are the drugs that are used to treat the parasitic infections. They are mainly divided in 3 major groups

1. Nematodes (roundworms)
2. Trematodes(flukes)
3. Cestodes(tapeworms)

Mode of action[40]:

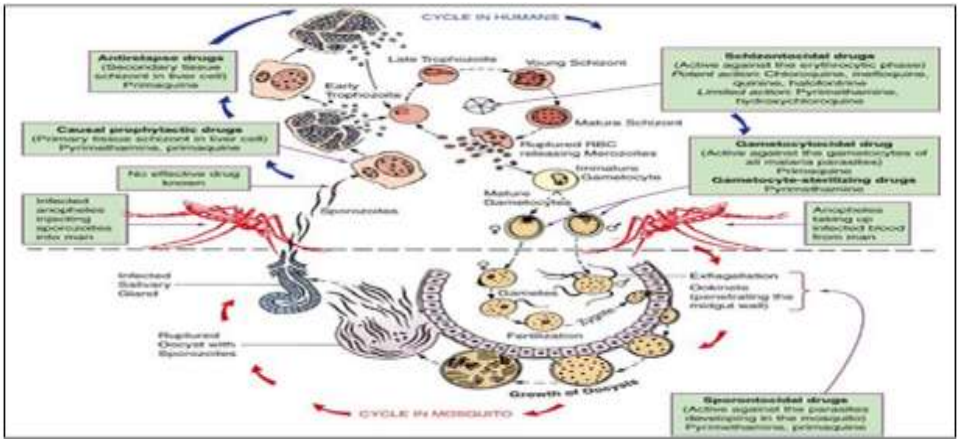

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Figure7:Life Cycle of Plasmodium: Malaria, a protozoan based disease, is transmitted via an arthropod vector. The development of antimalarial drugs focuses on the life cycle in both the mosquito and human hosts. (courtesy from VaneteThomaz- Soccol et.al).

Drugs for Antihelmentics agents[41]:

BENZIMIDAZOLES Oxfendazole(OX) Albendazole	 15mg\kg 400mg(chewable)
IMIDAZOTHIAZOLES Levamisole(LEV)	 7.5mg\kg
MACROCYCLIC LACTONES Ivermectin(IVM) Moxidectin	 0.2mg\kg 0.2mg\kg
SALICILANILIDE Closantel(CLO)	 15mg\kg
MIXTURE (CLO+BZ)Closantel Oxfendazole	 7.5mg\kg 10mg\kg

mg/kg- milligrams per kilogram; mg- milligram; OX- Oxfendazole; LEV- Levamisole; IVM- Ivermectin; CLO- Closantel; CLO+BZ- Closantel+ Benzimidazoles.

II. CONCLUSION:

Infectious diseases are caused by many microorganisms such as bacteria, fungi, virus and parasites they spread by the contaminated food, water and insects. Infectious diseases showsdifferent types of symptoms in different individuals. Based on the symptoms the physician will prescribe the dose from this study we can conclude that the usage of anti-infective agents with doses that avoid the unnecessary use of drugs ,risk, adverse effects, side effects and avoid drug resistance therefore we can provide the rational use of anti-infective agents and it also include the safety and efficacy of the anti-infective agents.

Conflicts of interest:

There are no conflicts of interest among authors.

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