PIONEER
ACADEMIC PUBLISHING LIMITED

Current Research in Medical Sciences
ISSN 2958-0390
www.pioneerpublisher.com/crms
Volume 3 Number 3 September 2024

Overview on Some Drugs Act on DNA and RNA Other than Anti-Viral Drugs — The Direct Cholinomimetics and Cholinergic Blocking Agents Depend on Stereo Specificity of Cholinergic Receptors

Rezk R. Ayyad[1], Ahmed M. Mansour[2], Ahmed M. Nejm[1], Yasser Abdel Allem Hassan[3] & Ahmed R. Ayyad[4]

[1] Pharmaceutical Medicinal Chemistry Department, Faculty of Pharmacy, ALAZHAR University, Cairo, Egypt
[2] Pharmacology and Toxicology Department, Faculty of Pharmacy, ALAZHAR University, Cairo, Egypt
[3] Pharmaceutics and Pharmaceutical Technology Department, Faculty of Pharmacy, Delta University for Science and Technology, Gamasa, Addaqahlya, Egypt
[4] Faculty of Medicine, Asfendiyarov Kazakh National Medical University (KazNMU), Almaty, Kazakhstan
Correspondence: Rezk R. Ayyad, Pharmaceutical Medicinal Chemistry Department, Faculty of Pharmacy, ALAZHAR University, Cairo, Egypt.

doi:10.56397/CRMS.2024.09.04

Abstract

This article contains some drugs which inhibit the nucleic acids in versatile groups e.g., anti-parasites (metronidazole, chlorproguanil, quinolines, oxamniquine (anti-bilharzial)).

Anti-bacterial (quinolones, actinomycins, doxorubicin, nitrofurantoin), some of them act on protein synthesis inhibition via DNA e.g., aminoglycosides antibiotics, tetracyclines, chloramphenicol, lincosamides, macrolides, fusidic acid, ketolides, streptomycin, also RNA polymerase inhibitor and DNA coiling granules inhibitor, in addition to flucytosine as anti-fungal, coumarins used as nucleic acid inhibitor, later on indirect nucleic acid via inhibition some enzymes e.g., azaserine inhibit enzyme which responsible for nucleotide formation, 6-diazo-5-oxo-l-norleucine as anti-tumor, hadacidin, mycophenolic acid which inhibits DNA and RNA guanine formation, 6-mercapto purine, 5-fluro uracil which act as anti-cancer by inhibition of nucleoside phosphorylation, ethidium, actinomycin-D, echinomycin, daunorubicin, netropsin, bleomycin, anthramycin, neocarzinostatin, most of them anti-biotic anti-cancer drugs.

Keywords: anti-biotics, nucleic acids inhibitors, anti-fungal, anti-cancer, anti-coagulants

1. Introduction

Many of drugs in different classes of pharmacology and medicinal chemistry, which act as inhibitors of nucleic acids e.g., anti-bacterial (aminoglycosides, streptomycin), folic acid inhibitors which required for microorganisms via inhibition of tetrahydrofolate for nucleic acids formation, anti-fungal (flucytosine), anti-malarial (quinolines).

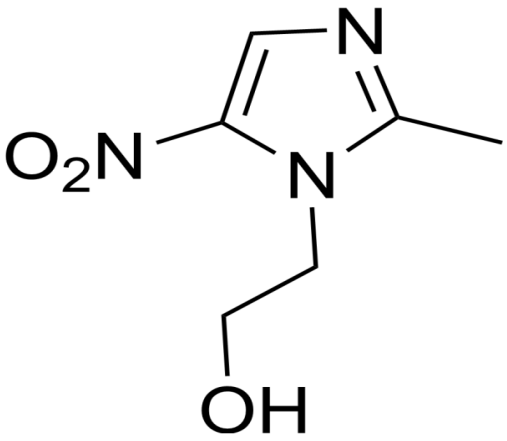
N.B. Quinolones anti-bacterial act on gyrase enzyme and inhibit relaxation of DNA supercoiling.

Anti-flagellates (metronidazole), coumarins also may be inhibit the nucleic acids of some cells which aggregate of the blood.

The most important drugs which act on nucleic acid inhibition which used in treatment of tumors e.g., azaserine, hadacidin, actinomycin-D, daunorubicin, bleomycin.

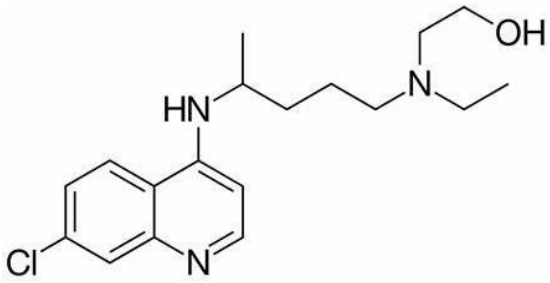
2. Chemistry and Medicinal Uses

METRONIDAZOLE.



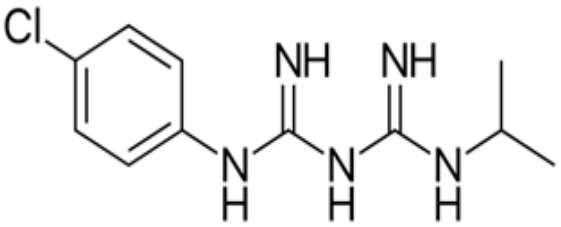
The nitro group of metronidazole is reduced, the reduced form of metronidazole interacts with DNA, resulting in breakage of helical DNA structure, hence loss of its function and cause death of amoebae.

QUINOLINES.



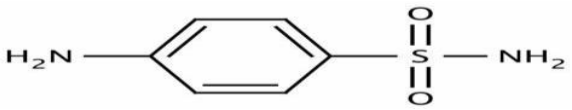
In spite quinolines act via chelation of metal ions (iron of the parasite, they also act via inhibition nucleic acids of malaria).

CHLOROGUANILE.



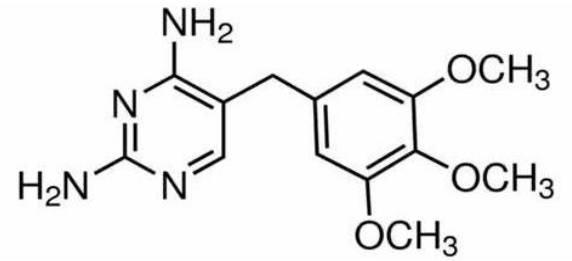
It is anti-malarial compound act via inhibition of nucleic acids of the parasite.

SULFANILAMIDE.



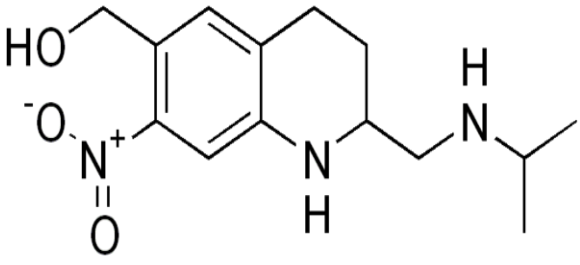
Sulfanilamide is the first member of sulfa drugs, which inhibit dihydrofolate reductase enzyme.

TRIMETHOPRIME.



It is inhibiting the tetrahydrofolate reductase enzyme, the sulfa and trimethoprim they are participate in inhibition of nucleic acids.

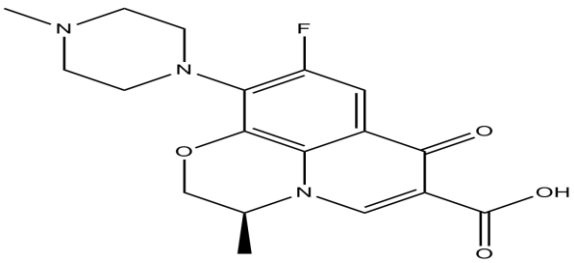
OXAMNIQUINE.



This drug was used in treatment of bilharziasis especially *Schistosoma mansoni* (intestinal bilharziasis), which inhibit DNA and RNA and protein synthesis in *Schistosoma.*

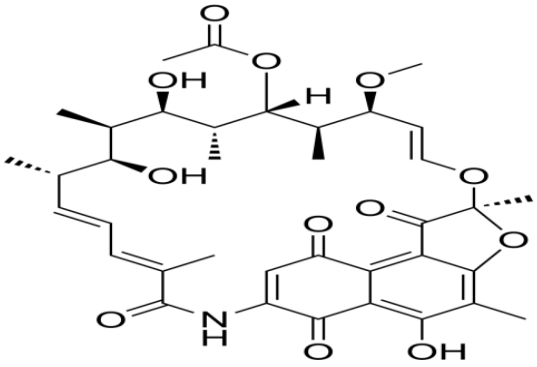
N.B. the hydroxymethyl group at 6-position is important for the activity (when it is oxidized become inactive drug).

QUINOLONES.

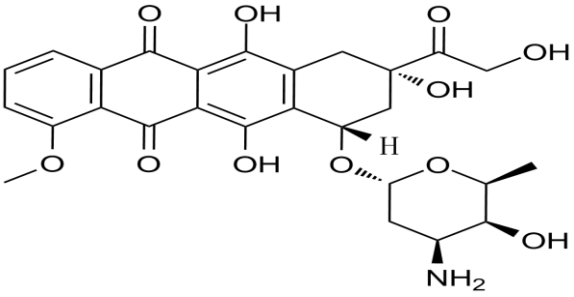


Levofloxacin is more active enantiomer of ofloxacin, which inhibit DNA gyrase enzyme, hence inhibition DNA.

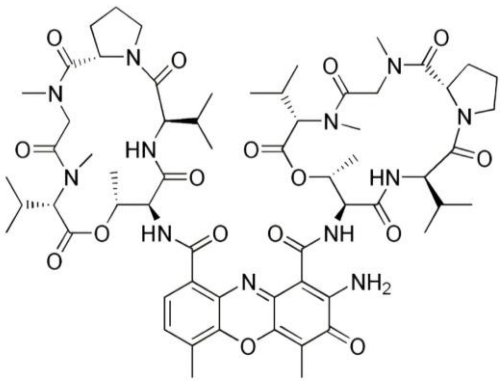
RIFAMYCIN.



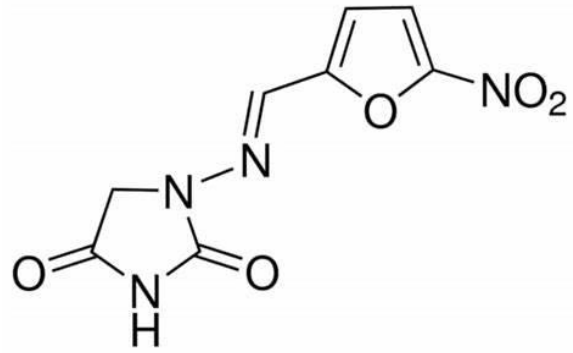
DOXORUBCIN.



ACTINOMYCIN-D.

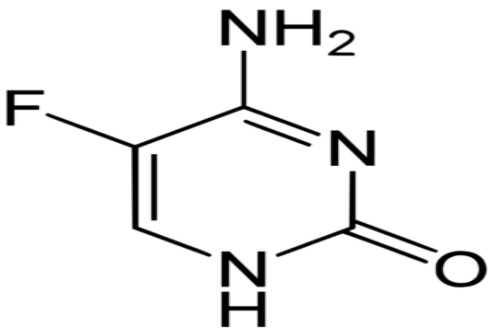


NITROFURANTOIN.



Rifamycin and nitrofurantoin inhibit RNA polymerase enzyme, so inhibit Nucleic acids of microorganisms, doxorubicin and actinomycin-D are anti-biotics anti-cancer which intercalate into DNA helical and inhibit tumor growth.

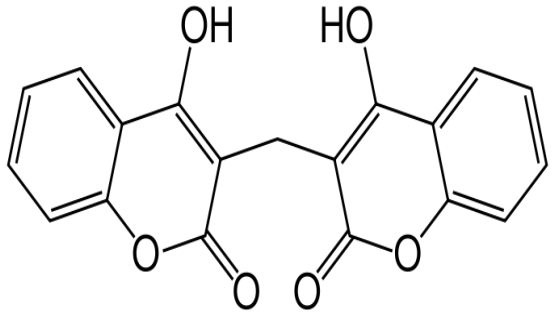
FLUCYTOSINE.



This is an anti-fungal drug anti-metabolite, flucytosine itself is not cytotoxic, i.e., it is pro drug which enter to cell through cytosine specific permease an enzyme which is not found in mammalian cells, so the flucytosine metabolized to 5-flurouracil by fungal deaminase and converted to

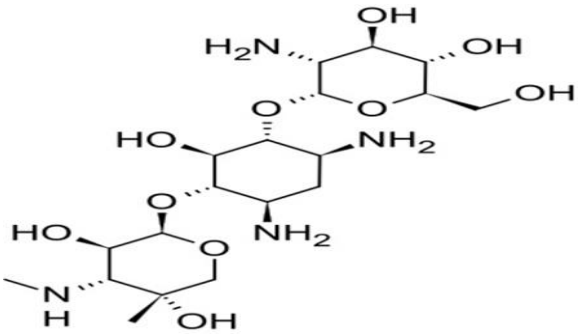
5-flurodeoxyuridylic acid triphosphate, which inhibit thymidylate synthetase, hence prevention formation of thymidylic acid which essential for DNA.

COUMARINE.



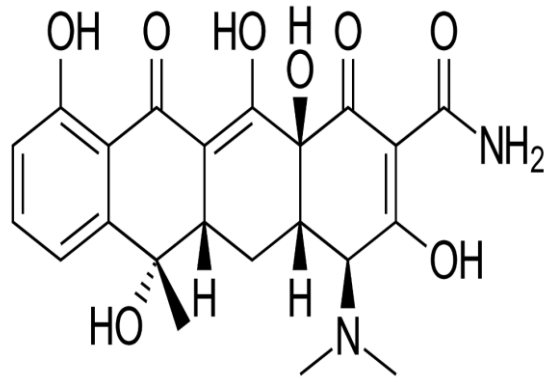
The dicumarol reduces intracellular hepatitis B virus RNA and DNA, where inhibit replication of nucleic acids of them.

AMINOGLYCOSIDES.

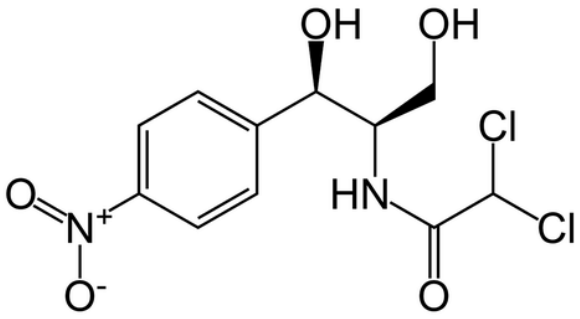


Gentamicin as example of aminoglycoside which used in respiratory infection.

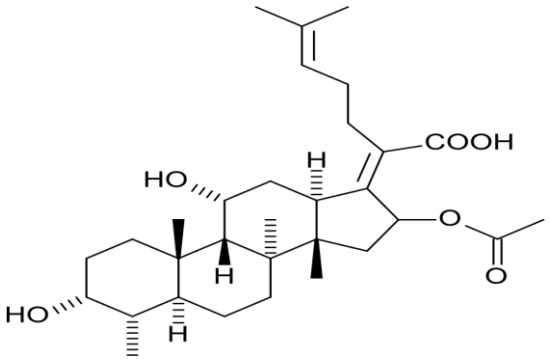
TETRACYCLINE.



CHLORAMPHENICOL.

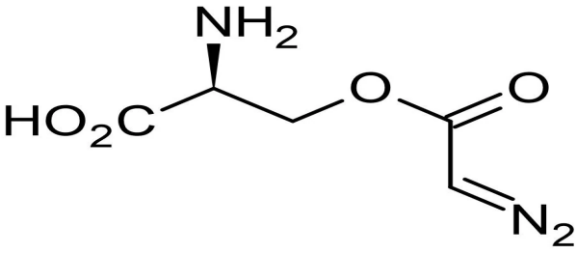


FUCIDIC ACID.



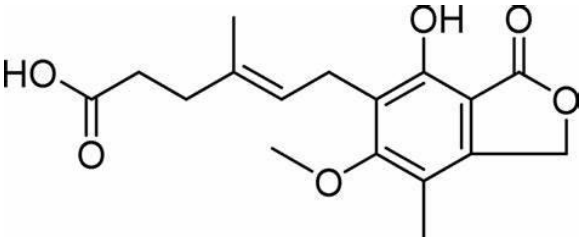
Gentamicin, tetracycline, chloramphenicol, lincosamide, macrolides and fusidic acid all are anti-biotics act through protein synthesis inhibition, hence DNA inhibition.

AZASERINE.



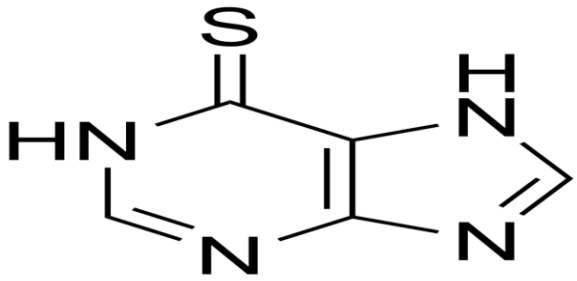
It is an anti-cancer which inhibit the enzymes required for DNA formation of tumor cell by 6-diazo-5-oxo-l-norlucein.

MYCOPHENOLIC ACID.



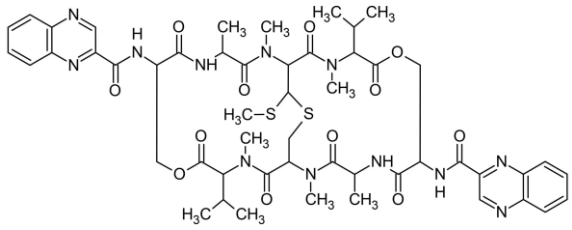
Mycophenolic acid it is an anti-cancer drug, where it inhibits guanine formation, hence inhibit DNA and RNA.

6-MERCAPTO PURINE.

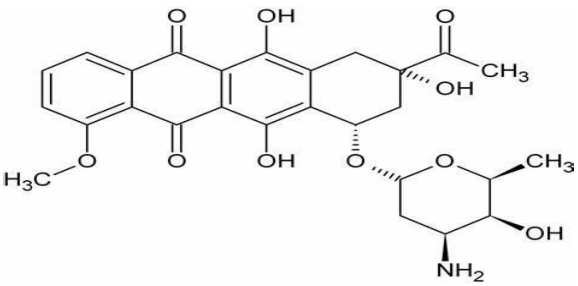


6-mercaptopurine act as nucleic acid inhibitor of tumor cell.

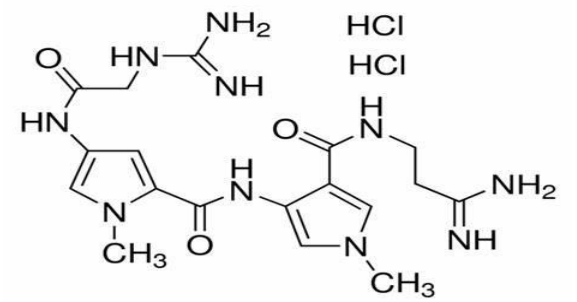
ECHINOMYCIN.



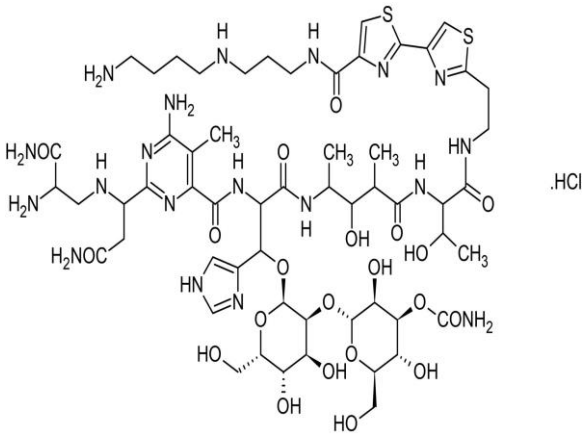
DAUNORUBCIN.



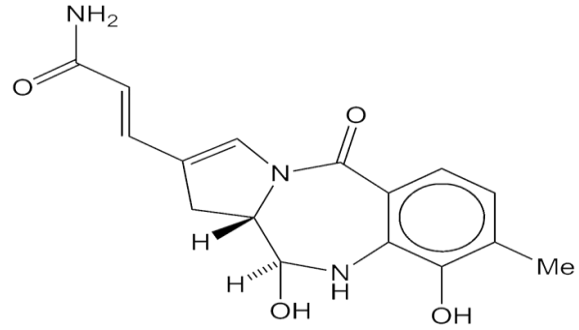
NETROPSIN.



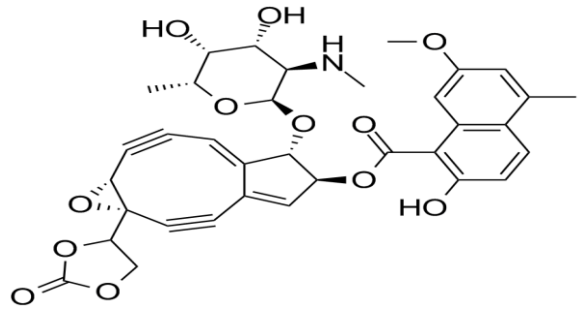
BLEOMYCIN.



ANTHRAMYCIN.



NEOCARZINOSTATIN.



Actinomycin-D, echinomycin, daunorubicin, netropsin, bleomycin, anthramycin, neocarzinostatin all of these anti-biotics anti-cancer drugs are DNA and RNA inhibitors by indirect action where prevent the phosphorylation of nucleosides of DNA and RNA which required for the synthesis of DNA and RNA.

3. Conclusion

From the previous mentioned we resulted that importance of many drugs which used as nucleic acid inhibitors in important classes of medicine for example anti-cancer the importance one and many of chemotherapeutic

agents.

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