Role of Vitamin B12, Hydroxy Chloroquine, Artesunate, Penicillin and Zinc Drugs in treatment of COVID-19 disease

Indira Vitthalsing Rajput
Lab Scientific Officer, Primary Health Centre, Dhekwad Tal. Dist. Nandurbar, Maharashtra, India

Abstract

An acute respiratory disease caused a novel corona viruse (SARS-COV-2 previously known as 2019-nCOV), the corona viruse disease 2019 (COVID-19) has spread through China received worldwide attention on 30th January 2020, World Health Organisation (WHO) officially declared the COVID-19 pendemic as a public health emergency of internation concern. The clinical symptoms of COVID-19 patients include fever, cough, fatigue, acute respiratory syndrome (ARDS) and Cytokine storm. This article revealed that most of antiviral, antibiotic, antiparacitic drugs are failed in treatment of COVID-19 because these drugs can't able to repure the outermost lipid covering of Corona Viruse Vitamain B12 is able to reptured the Outer lipid covering of Corona Virus, known as lypolitic action. Vitamin B12 also develops blood cells in human body. After the lypolitic actionfew drugs like Hydroxy Chloroquine, Artesunate, Penicillin piperazine degradate the inside protein of corona virus and parasites. Obviously the viability of corona viruse reduces. Artesunate supresses the genome replication. It also acts as antiparacitic drug. Piperazine acts as antiparasitic drug and paralyses the parasites. Zinc drugs increases immunity with production of antibodies. It also protect the cells from bacterial toxins. The proper combination of suitable drugs can be applicable in treatment of COVID-19.

KEYWORDS- COVID-19, Lypolytic, Vitamin B12, Hydroxy Chloroquine, Artesunate, Penicillin, Piperazine, Zinc.

COVID-19 is world crises. Corona Viruse is the common viruse that infect human, typically leading to an upper respiratory infection (URI). It spreads through air by coughing and sneezing. A viruse is micro organism that is smaller than bacteria that can't grow or reproduce apart from living cell. A viruse invades living cells and uses their chemical machinery to keep itself alive and replicate itself. It is made of protein and living in host cells of animals. The outer covering of Corona Viruse is made up of lipid while outer covering of common viruse is made up of protein. Generally most of antiviral, antibacterial and antiparacitical drugs inhibits protein synthesis in virus. So viruse gets kill. Hence such drugs acts as curable drugs in common viruses. Corona viruse is also made up of protein but its outer covering is made up of lipid that is why antiviral, antibacterial and antiparasitical drugs are fail to kill corona viruse. These drugs fails to repair the outer lipid covering of corona viruse. Hence corona viruse remain in host cells and multiplication is fastly going on severe infection of corona viruse observes in patient. The process of lypolitic action may be the milestone in the way of invention of new drug or vaccine against COVID-19.

Till today there is no curable drug is invented regarding COVID-19. However we can use some drugs in group of combination which can cure the COVID-19. The characteristics of every drug depends on its structure, physical, chemical properties, microbiological and biochemical activities and mode of action.

This article through the light on brief study of some drugs regarding COVID-19.

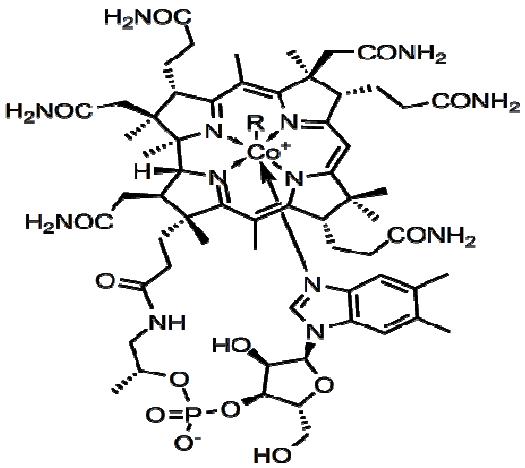
Discussion -

1) Vitamin B12-

Molecular formula- C63H88CoN14O14P

Molar mass - 1355.365 gm/Mole

Structure of vitamin B12-



Vitamin B12 also called as Cobalamin. Bitamin B12 is largest and mostly structurally complex vitamin and it consists of class of chemically related compounds with vitamins. It is water soluble organic compound is essential to number of microorganisms and animals including human being. It contains biochemically rare element Cobalt positioned in the centre of corrin ring, it develops blood cells.

It comprises number of forms including Cyano-, methyl-, deoxyadenosyl- and hydroxy cobalamin. The cyno form which is used in supplements which is found in trace amount in food. [1]. The other form of cobalamine can be converted to methyl- or 5-deoxyadenosyl forms that are required as co-factors for methionine synthase and L-methyl-malonyl-CoA mutase [2]. Vitamin B-12 is important to DNA synthesis and may affect the bone formation. It has been linked to osteoblastic activity in clinical studies and cell culture its deficiency causes Osteroporosis[3].

Mode of action-

Vitamine - B12 contains metallic cobalt ion which hydrolysis and reptured the outer lipid covering of corona virus. Thus cobalt ion place fundamental role in lypolitic action (breakdown of lipids) as the lipid covering of corona virus breaks many antiviral, antibacterial and antiparacitical drugs are available to help in inhibition of protein synthesis in corona virus. Thus life cycle of corona virus breakes and stops.

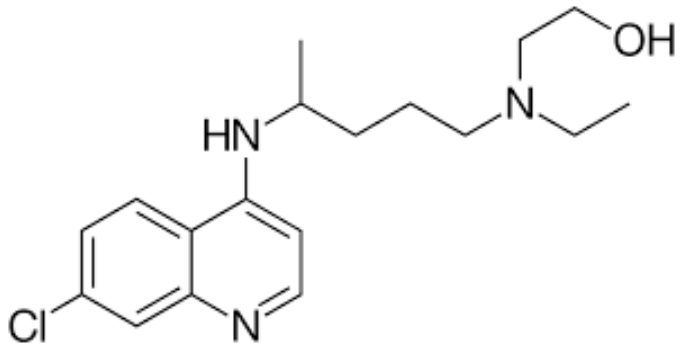
Vitamine-B12 also acts as antiviral agent in combination which antiviral, antiproliferative and antiinflamatory drugs.

2) Hydroxychloroquine -

Molecular formula - C18H26CLN3O

Molar mass - 335.872 gm/mole

Structure of Hydroxychloroquine



The antimalarial hydroxychloroquine and chloroquine have demonstrated antiviral activity against severe acute respiratory syndrome (SARS) Corona Virus-2 (SARS-COV-2) in vitro and in small poorly controlled and uncontrolled clinical studies. [4].

Mode of action-

Hydroxychloroquine increased pH within intracellular involvement and alter process such as protein degradation assembly of micro molecules in endosomes and post translational modification of proteins in Golgi apparatus. Antirheumatic properties of this compound results from their interference with "Antigen processing" in microphases and other antigen presenting cells. Acidic cytoplasmic compartments are required for antigenic proteins to be digested and for peptides to assemble with Alpha and Beta Chains of proteins as a result antimalarial diminish the formation of protein complexes required to stimulate CD4+T cells and result in down regulation of immune response against auto antigenic peptides. This mechanism differs than other antirheumatic drugs, antimalarial drug are well suited to complement other compounds in combination drug therapy.

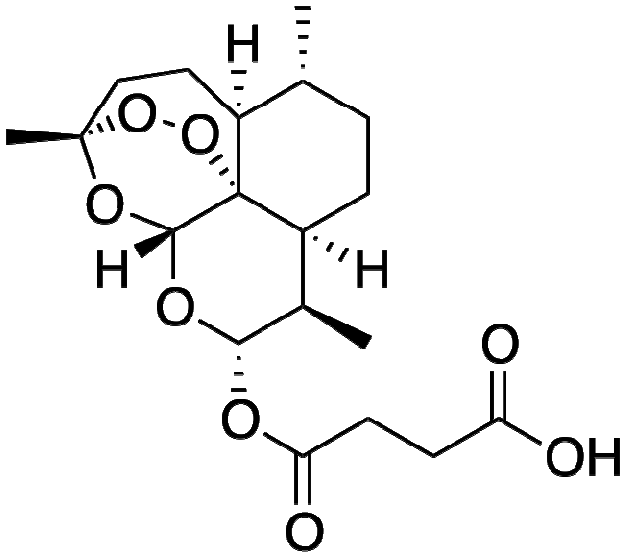
It is safefull drug for Diabetic, Hypertension and Pregnant patients.

3) Artesunate Drugs-

Molecular formula- C19H28O8

Molar Mass - 382.21 gm/mole.

Structure of Artesunate-



It is an antimalerial drug has antiproliferative capacities. Artesunate is semisynthetic derivative of Artemisinin (a sesquiterpene lactone from Artemisia annua L.) However it has been used as antimalerial drug so far [5,6]. It has cytotoxic action against cellwall of COVID-19 viruse. It is included in WHO's medicine list.

Mode of Action-

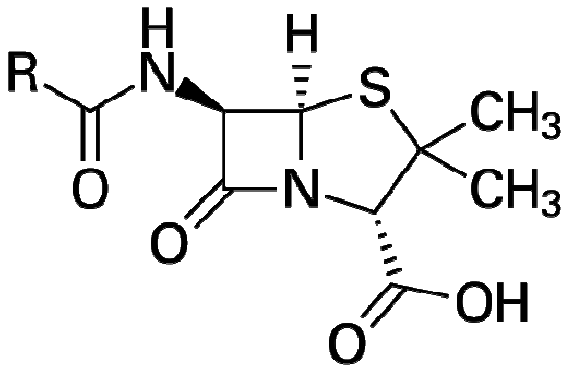
It is antiviral and antiparacitical drug. The mechanism of artisunate involves cleavages of endo peroxide bond through reaction with haeme. This produces free radicals which alkylateproteins of COVID-19 virus. It is prodrug rapidly converted to its active form dihydroartemisinin which inhibits the calcium dependant ATP ase on endoplasmic membrane which disruptes protein folding of COVID-19 virus or parasite. This drug is helpful in multiparacitical infection cases. Artesuinate supressed the genome replicates.

4) Penicillin-

Molecular Formula - R-C9H11N2O4S

Molar mass - 436 to 450 gm/mole

Core structure of penicillin-



In penicillin G, R= C6H5CH2-

In Penicillin V, R= C6H5 O CH2

It is discovered by Alexander Flaming, penicillin works by interfering with bacterial cell wall. Peoples less than one percent are dangerously allergic to penicillin. Penicillin derives originally from common moulds (fungi) known as penicillin moulds. Different types of Penicillin includes Penicillin G (intravein use), Peincillin V (use by mouth), procain Penicillin and benzathine penicillin (intra muscular use). Penicillin is four membered Beta lactum ring which has antibacterial activity [7].

Mode of Action-

Penicillin gets absorb in distal half of ileum and metabolised in liver and excreted through kidney. Penicillin also hydrolyses and reptured the lipid covering of COVID-19 virus. It plays fundamental role in lipolytic action. Various antiviral drugs are available to inhibit the protein synthesis of COVID-19 virus. Thus Penicillin reduces the viruse.

Penicillin kills suseptible bacteria by inhibiting transpeptase that catalyses final step in cellwall biosynthesis cros linking of peptidoglycan. Penicillin is highly reactive Beta Lactum structure irreversibly acylate active site cellwall transpeptase. Cellwall transpeptase closely related penicillin sensitive cellwall enzyme. It also acts as antibiotic introduction of penicillin inside chain of peptide linkage in increases acid stability and oral absorbtion. Substitution of alpha proton by ionic or polar group of peptide linkage increases activity against pathogens.

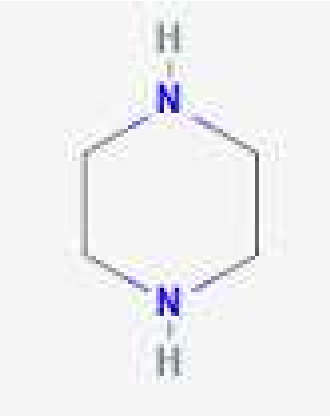
This drug is restricted for diabetic and hypertension patients.

5) Piperazine (1,4 dihydropirazine) -

Molecular Formula - C4H10N2

Molar mass -

Structure of Piperazine -



It is antiparasite drug. It is cyclic organic molecule posses two nitrogen atoms in opposite position within six membered heterocyclic ring. It gives more pronouns relief of menopausal symptoms without any notable adverse effect [8].

Mode of Action-

Piperazine acts as a gamma amino butyric acids (GABA) agonist causing chloride channel opening, nutral hyper polarisation and flaccid pyralysis of virus or paracites.

6) Zinc drug -

There are large number of zinc drugs.

The drug containing zinc metal increases immunity power and acts as antioxident, antimicrobial and antibiotic activity. It is used in anti retroviral theorapy for human immuno deficiency virus-1 (HIV-1) infection has transformed its clinical course with spectacular reduction in morbidity as mortality [9]. Zinc involves in various aspects of cellular metabolism. 10% of human proteins may bind with zinc. It plays important roles in immune function, wound healing, protein synthesis, DNA synthesis and cell division. It also shows anti oxident and anti microvial property.

Mode of Action-

Zinc promotes resistance to epithelial apaptosis through cell protection against reactive oxygen species and bacterial toxines. Zink restore mucosal barrier intergrating and entrocite brush border enzyme activity. It promotes production of antibodies and cerculating lymphocytes against pathogenes and it has direct effect on ion channel blocker of adenosine 3,5. Cyclic mono phosphate medicated clronine secreation. Zinc acts as microbial inframetory equilibrium and facilited antibiotic absorption when used in combination with other drug.

Considering the antiviral, antibacterial, antiparacitic, lypolytic, immunal and antioxidental activities of this drugs three types of combination theorapy of drugs are made in treatment of COVID-19 viruse.

Type- I : Vitamine B12 + Hydroxychloroquine + Artesunate

Type- II : Vitamine B12 + Piperazine + Hydroxychloroquine

Type- III : Vitamine B12 + Penicillin + Zinc drug

Conclusion-

Type I or Type II combination of drugs are suitable in COVID-19 virus treatment without adverse effect. Type III Combination of drug are not suitable for diabetic & hypertension pateint due side effect of penicilline.

Acknowledgement -

Thanks to Hob'ble Chief Executive Officer, Hon'ble District Health Officer, Zilla Parishad Nandurbar for valuable guidance and suggestions.

References-

1) Scott J.M., Bioavailability of Vitamin B12. Eur. J Clin Nutr. 1997 ; 51 : 549-53 [pubmed] [Google Schlolar]

2) Fiona'O' Leavy and Samir Samman ; Vitamin B12 in Health and diseases nutrients 2010, 5 Mar. 2(3):299-316

3) Katherin L. Tucker, Marian T Hanan, Ning Qiao, Paul F Jacques, Jacob Selhub, L-Adrienne cupples, D.P.Kielet al, Low plasma vitamine B12 is associated with lower BMD; The Framingham Osteoporosis study ; Journel of bone and mineral research 2009 (Vol.20) issue, 4 Dec.

4) Liu J, Cao R, Xu M. et al. , Hydroxychloroquine a less toxic derivative of chloroquine is effective in inhibiting SARS-COV-2 infection in vitro. Cell Dicov. 2020 ; 6 : 16 [PMID:32194981] doi ; 1038/S 41421-020-0156-0

5) Suhail Ahmed Kabeer Rasheed , Thomas Efferth, Irfan Ahmed Asangani, Heike , Allgayer ; international journel of Cancer 2010, 127 (6), 1475-1485

6) Prince R.N. ; Artemisinin drugs novel anti malerial agents expert opin investing drugs 2000 ; 9,1815-27

7) Demain A. L. , Biosynthesis of Beta Lactum antibiotics 1983, p189 - 228, In : antibiotic containing Beta Lactum structure A.L.Demain , N.A. Solomon (eds.) springer verlag, Berlin.

8) Mansel Alyward, F Holly , R. J. Parker ; an evaluation and clinical response to piperazine Ostrone Sulphate (Harmogen) in menopausal patients, current medical research and opinion 1974 ; 2(7); 417-423

9) Sarah C. Sassan, Anthony D Kelletier ; specific host gene modification by Zink finger nucleases ; pointing the way drug free control of HIV-I? Clinical translational immunology ; 2014 , 3(7) edition 19.