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Drug Profile of Emtricitabine and Tenofovir AF

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ABSTRACT

Emtricitabine and Tenofovir alafenamide (tenofovir AF) is a novel oral prodrug of the nucleos(t)ide reverse transcriptase inhibitor (NRTI) tenofovir that has several pharmacological advantages over tenofovir disoproxil fumarate (tenofovir DF), including increased plasma stability and reduced tenofovir systemic exposure. Tenofovir AF has been coformulated with emtricitabine for the treatment of adults and adolescents with HIV-1 infection.

Keywords: Emtricitabine, Tenofovir alafenamide, NRTI.

I. INTRODUCTION

Drug Profile of Emtricitabine

Molecular structure

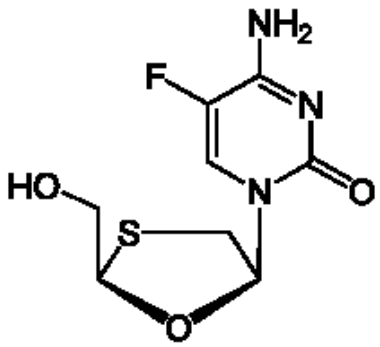

Figure 1. Structure of Emtricitabine

IUPAC Name	4-amino-5-fluoro-1-[(2R,5S)-2-(hydroxymethyl)-1,3-oxathiolan-5-yl]-1,2-dihydropyrimidin-2-one.
CAS Number	143491-57-0
Drug Bank	**DB00879** (APRD00226)
Molecular formula	$C_8H_{10}FN_3O_3S$
Molecular weight	247.248 gm/mol
Category	Antiretroviral
Description	Emtricitabine is a nucleoside reverse transcriptase inhibitor for the treatment of HIV infection in adults.

Solubility Soluble in water

pK_a value 2.65

Mechanism of action

Emtricitabine works by inhibiting reverse transcriptase, the enzyme that copies HIV RNA into new viral DNA. Emtricitabine is a synthetic nucleoside analogue of cytidine. It is phosphorylated by cellular enzymes to form Emtricitabine 5'-triphosphate, which is responsible for the inhibition of HIV-1 reverse transcriptase.

Pharmacokinetic data

Absorption

Rapidly absorbed mean absolute bioavailability of 93% for capsules and 75% for solution. Food does not effect absorption.

Protein Binding

Very low (less than 4%)

Metabolism

Minimally transformed (13%), most appears unchanged in urine (86%). The biotransformation of Emtricitabine includes oxidation of the thiol moiety to form the 3'-sulfoxide diastereomers and conjugation with glucuronic acid to form 2'-O-glucuronide.

Route of elimination

The renal clearance of Emtricitabine is greater than the estimated creatinine clearance, suggesting elimination by both glomerular filtration and active tubular secretion.

Half life

$t_{1/2}$ = Approximately 10 hours

Adverse effects

- ✓ Chest pain or tightness
- ✓ Cough or Hoarseness
- ✓ Fever Or Chills
- ✓ Lower Back Or Side Pain
- ✓ Painful Or Difficult Urination

Uses

- ✓ Emtricitabine is indicated in combination with other antiretroviral agents for the treatment of HIV infection in adults.
- ✓ Emtricitabine exhibits clinical activity against the hepatitis B virus (HBV)
- ✓ Emtricitabine treatment results in significant histologic, virologic and biochemical improvement.
- ✓ Drugs used to treat HBV infection may have to be used in combination to prevent the evolution of drug resistant strains

Storage

Should be kept in a tightly closed container and protect from moisture. Keep out of reach of children.

Dosage

It consists of 200mg/1 tab.

Marketed formulation

Truvada - Emtricitabine + Tenofovir AF

Drug Profile of Tenofovir AF

Molecular structure

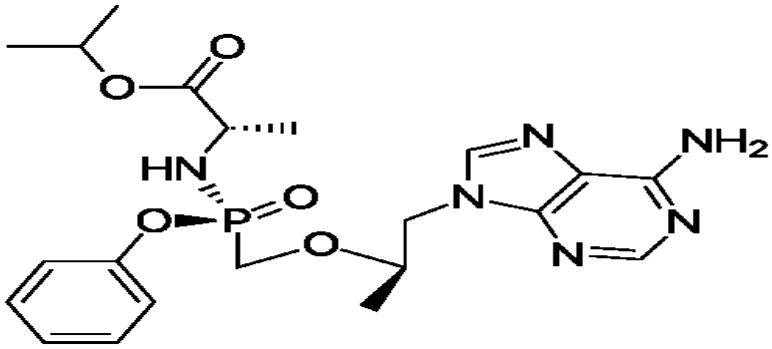

Figure 2. Structure of Tenofovir AF

IUPAC Name	propan-2-yl(2S)-2-{[(S)-({[(2R)-1-(6-amino-9H-purin- 9-yl) propan-2-yl]oxy}methyl) (phenoxy) phosphoryl] amino} propanoate
CAS Number	379270-37-8
Drug Bank	**DB09299**
Molecular formula	$C_{21}H_{29}N_6O_5P$
Molecular weight	476.474 gm/mol
Category	Anti retro viral drug

Description Tenofovir AF is a nucleotide reverse transcriptase inhibitor and a novel ester prodrug of the antiretroviral. Following oral administration, TAF is converted in vivo to Tenofovir, an acyclic nucleoside phosphonate (nucleotide) analog of adenosine 5′-monophosphate

Solubility	Very soluble in alcohol, slightly soluble in water.
pK_a value	3.8

Mechanism of action

Tenofovir AF is a nucleotide reverse transcriptase inhibitor (NRTI) and a novel ester prodrug of the antiretroviral Tenofovir AF. Following oral administration, TAF is converted in vivo to Tenofovir AF, an acyclic nucleoside phosphonate (nucleotide) analog of adenosine 5′-monophosphate. Tenofovir AF mimics normal DNA building blocks but is lacking a 3'-OH molecule required for phosphodiester bond linkage.

II. PHARMACOKINETIC DATA

Absorption

Tmax is observed at 1 hour post oral administration

Distribution

Tenofovir AF is ~80% bound to human plasma proteins..

Metabolism

In vivo, Tenofovir AF is hydrolyzed within cells to form Tenofovir (major metabolite), which is phosphorylated to the active metabolite, Tenofovir AF diphosphate. In vitro studies have shown that TAF is

metabolized to Tenofovir by cathepsin A (also known as Lysosomal Protective Protein) in peripheral blood mononuclear cells (PBMCs) and macrophages and by Carboxylesterase 1 (CES1) in hepatocytes.

Elimination Route

The renal clearance of Emtricitabine is greater than the estimated creatinine clearance, suggesting elimination by both glomerular filtration and active tubular secretion.

Half life $t_{1/2}$ = Approximately 0.5 hours

Adverse effects

- ✓ Abdominal Or Stomach Discomfort
- ✓ Decreased Appetite
- ✓ Diarrhea
- ✓ Fast, Shallow Breathing
- ✓ General Feeling Of Discomfort

Uses

- ✓ It is used for HIV-1 infection and chronic hepatitis B treatment
- ✓ For HIV-1 infection, Tenofovir AF is indicated in combination with other antiretroviral agents
- ✓ Drugs used to treat HBV infection may have to be used in combination to prevent the evolution of drug resistant strains

Storage

Should be kept in a tightly closed container and store at room temperature. Keep out of reach of children.

Dose

It consists of 25mg/1 tab

Marketed formulation

Truvada - Tenofovir AF + Emtricitabine

III. COCLUSION

Truvada is successful as part of an antiretroviral treatment. There is also convincing data that it has less undesirable effects on bone mineral density. Even though approved for use in those with predictable filtration rates as low as 30 mL/min, data is somewhat limited in this group.

IV. REFERENCES

[1]. Masho SW, Wang CL, Nixon DE: Review of tenofovir-emtricitabine. Ther Clin Risk Manag. 2007 Dec;3(6):1097-104. [PubMed:18516268]

[2]. Long MC, King JR, Acosta EP: Pharmacologic aspects of new antiretroviral drugs. Curr HIV/AIDS Rep. 2009 Feb;6(1):43-50. [PubMed:19149996]

[3]. Authors unspecified: Emtricitabine/tenofovir disoproxil fumarate. Drugs R D. 2004;5(3):160-1. [PubMed:15139777]

[4]. Goicoechea M, Best B: Efavirenz/emtricitabine/tenofovir disoproxil fumarate fixed-dose combination: first-line therapy for all? Expert Opin Pharmacother. 2007 Feb;8(3):371-82. [PubMed:17266471] .

[5]. Benhamou Y, Tubia R, Thibault V. Tenofovir disoproxil fumarate in patients with HIV and lamivudine-resistant hepatitis B virus. New Engl J Med. 2003;348:177-8. [PubMed]