

Zovirax™
Oral Formulations
Aciclovir

QUALITATIVE AND QUANTITATIVE COMPOSITION

Tablets:

Zovirax Tablets 200mg are white, round, biconvex tablets impressed “GXCL3” on one side and plain on the other, each tablet containing 200mg aciclovir.

Zovirax Tablets 400mg are pink, shield-shaped tablets impressed ‘Zovirax 400’ on one face and a triangle on the reverse, each tablet containing 400mg aciclovir.

Zovirax Dispersible Tablets 800mg are white, film-coated oval biconvex tablets, branded “GXCG1” on one face and plain on the other and contain 800mg aciclovir in each tablet.

Oral Suspension:

Zovirax Suspension 200mg/5mL is a white, banana-flavoured, oral suspension containing 200mg acyclovir in each 5mL.

PHARMACEUTICAL FORM

Tablets.

Dispersible tablets

Oral suspension.

CLINICAL PARTICULARS

Indications

Zovirax Oral Formulations are indicated for the treatment of Herpes simplex virus infections of the skin and mucous membranes, including initial and recurrent genital herpes.

Zovirax Oral Formulations are indicated for the suppression (prevention of recurrence) of recurrent Herpes simplex infections in immune-competent patients.

Zovirax Oral Formulations are indicated for the prophylaxis of Herpes simplex infections in immune-compromised patients.

Zovirax Oral Formulations are indicated for treatment of Varicella (Chickenpox) and Herpes zoster (Shingles) infections. Studies have shown that early treatment of shingles with Zovirax has a beneficial effect on pain and can reduce the incidence of post-herpetic neuralgia (zoster-associated pain).

Dosage and Administration

Dosage for treatment of Herpes simplex in adults

For the treatment of Herpes simplex infections, 200mg Zovirax should be taken five times daily at approximately four-hourly intervals omitting the night time dose. Treatment should continue for five days but in severe initial infections may have to be extended.

In severely immune-compromised patients (e.g., after marrow transplant) or in patients with impaired absorption from the gut the dose can be doubled to 400mg or, alternatively, intravenous dosing could be considered.

Dosing should begin as early as possible after the start of an infection; for recurrent episodes this should preferably be during the prodromal period or when lesions first appear.

Dosage for suppression of Herpes simplex in adults

For suppression of Herpes simplex infections in immune-competent patients, 200mg Zovirax should be taken four times daily at approximately six-hourly intervals.

Many patients may be conveniently managed on a regimen of 400mg Zovirax taken twice daily at approximately twelve-hourly intervals.

Dosage titration down to 200mg Zovirax taken three times daily at approximately eight-hourly intervals or even twice daily at approximately twelve-hourly intervals, may prove effective.

Some patients may experience breakthrough infections on total daily doses of 800mg Zovirax.

Therapy should be interrupted periodically at intervals of six to twelve months in order to observe possible changes in the natural history of the disease.

Dosage for prophylaxis of Herpes simplex in adults

For prophylaxis of Herpes simplex infections in immunocompromised patients, 200mg Zovirax should be taken four times daily at approximately six-hourly intervals.

In severely immunocompromised patients (e.g. after marrow transplant) or in patients with impaired absorption from the gut the dose can be doubled to 400mg Zovirax four times daily at approximately six hourly intervals or, alternatively, intravenous dosing could be considered. The duration of prophylactic administration is determined by the duration of the period at risk.

Dosage for treatment of Varicella and Herpes zoster in adults

For treatment of Varicella and Herpes zoster infections, 800mg Zovirax should be taken five times daily at approximately four-hourly intervals, omitting the night time dose. Treatment should continue for seven days.

In severely immune-compromised patients (e.g. marrow transplant) or in patients with impaired absorption from the gut, consideration should be given to intravenous dosing (See Administration).

Dosing should begin as early as possible after the start of an infection; treatment yields better result if initiated as soon as possible after onset of the rash.

Dosage in infants and children For the treatment of Herpes simplex infections and for prophylaxis of Herpes simplex infections in the immune-compromised, children aged two years and older should be given adult dosage and infants and children below the age of two years should be given half the adult dose.

For treatment of Varicella infections in children:

6 years and over:	800 mg ZOVIRAX four times daily
2 - < 6 years:	400 mg ZOVIRAX four times daily
Under 2 years:	200 mg ZOVIRAX four times daily

Dosing may be more accurately calculated as 20mg Zovirax/kg bodyweight (not to exceed 800mg) four times daily.

Treatment should continue for five days (*see Administration*).

No specific data are available on the suppression of Herpes simplex infections or the treatment of Herpes zoster infections in immune-competent children.

Dosage in elderly

In the elderly, total aciclovir body clearance declines in parallel with creatinine clearance. Adequate hydration of elderly patients taking high oral doses of Zovirax should be maintained. Special attention should be given to dosage reduction in elderly patients with impaired renal function (*see Renal impairment*).

Dosage in renal impairment

Caution is advised when administering Zovirax oral formulations to patients with impaired renal function. Adequate hydration should be maintained.

In the management of Herpes simplex infections in patients with impaired renal function, the recommended oral doses will not lead to accumulation of aciclovir above levels that have been established safe by intravenous infusion. However for patients with severe renal impairment (creatinine clearance less than 10mL/minute) an adjustment of dosage to 200mg twice daily at approximately twelve-hourly intervals is recommended.

In the treatment of Varicella and Herpes zoster infections, it is recommended to adjust the dosage to 800mg twice daily at approximately twelve-hourly intervals, for patients with severe renal impairment (creatinine clearance less than 10mL/minute), and to 800mg three times daily, at intervals of approximately eight hours, for patients with moderate renal impairment (creatinine clearance in the range 10 to 25mL/minute) (*see Administration*).

Administration

Zovirax Dispersible Tablets 800mg may be dispersed in a minimum of 50ml of water or swallowed whole with a little water.

Contraindications

Zovirax Tablets and Zovirax Suspensions are contraindicated in patients known to be hypersensitive to aciclovir or valaciclovir.

Warnings and Precautions

Use in patients with renal impairment and in elderly patients:

Aciclovir is eliminated by renal clearance, therefore the dose must be reduced in patients with renal impairment (*see Dosage and Administration*). Elderly patients are likely to have reduced renal function and therefore the need for dose reduction must be considered in this group of patients. Both elderly patients and patients with renal impairment are at increased risk of developing neurological side effects and should be closely monitored for evidence of these effects. In the reported cases, these reactions were generally reversible on discontinuation of treatment (*see Adverse Reactions*).

Prolonged or repeated courses of aciclovir in severely immune-compromised individuals may result in the selection of virus strains with reduced sensitivity, which may not respond to continued aciclovir treatment (see *Pharmacological Properties*).

Hydration status: Care should be taken to maintain adequate hydration in patients receiving high oral doses of aciclovir.

The data currently available from clinical studies is not sufficient to conclude that treatment with aciclovir reduces the incidence of chickenpox-associated complications in immunocompetent patients.

Interactions

No clinically significant interactions have been identified.

Aciclovir is eliminated primarily unchanged in the urine via active renal tubular secretion. Any drugs administered concurrently that compete with this mechanism may increase aciclovir plasma concentrations. Probenecid and cimetidine increase the AUC of aciclovir by this mechanism, and reduce aciclovir renal clearance. Similarly increases in plasma AUCs of aciclovir and of the inactive metabolite of mycophenolate mofetil, an immunosuppressant agent used in transplant patients have been shown when the drugs are coadministered. However no dosage adjustment is necessary because of the wide therapeutic index of aciclovir.

Pregnancy and Lactation

Pregnancy

A post-marketing aciclovir pregnancy registry has documented pregnancy outcomes in women exposed to any formulation of Zovirax. The birth defects described amongst Zovirax exposed subjects have not shown any uniqueness or consistent pattern to suggest a common cause.

The use of aciclovir should be considered only when the potential benefits outweigh the possibility of unknown risks.

Lactation

Following oral administration of 200 mg aciclovir five times a day, aciclovir has been detected in breast milk at concentrations ranging from 0.6 to 4.1 times the corresponding plasma levels. These levels would potentially expose nursing infants to aciclovir dosages of up to 0.3 mg/kg/day. Caution is therefore advised if Zovirax is to be administered to a nursing woman.

Effects on Ability to Drive and Use Machines

The clinical status of the patient and the adverse event profile of Zovirax should be borne in mind when considering the patient's ability to drive or operate machinery. There have been no studies to investigate the effect of aciclovir on driving performance or the ability to operate machinery. Further, a detrimental effect on such activities cannot be predicted from the pharmacology of the active substance.

Adverse Reactions

The frequency categories associated with the adverse events below are estimates. For most events, suitable data for estimating incidence were not available. In addition, adverse events may vary in their incidence depending on the indication.

The following convention has been used for the classification of undesirable effects in terms of frequency:- Very common $\geq 1/10$, common $\geq 1/100$ and $< 1/10$, uncommon $\geq 1/1000$ and $< 1/100$, rare $\geq 1/10,000$ and $< 1/1000$, very rare $< 1/10,000$.

Blood and lymphatic system disorders

Very rare: Anaemia, leukopenia, thrombocytopenia.

Immune system disorders

Rare: Anaphylaxis.

Psychiatric and nervous system disorders

Common: Headache, dizziness.

Very rare: Agitation, confusion, tremor, ataxia, dysarthria, hallucinations, psychotic symptoms, convulsions, somnolence, encephalopathy, coma.

The above events are generally reversible and usually reported in patients with renal impairment, or with other predisposing factors (*see Warnings and Precautions*).

Respiratory, thoracic and mediastinal disorders

Rare: Dyspnoea.

Gastrointestinal disorders

Common: Nausea, vomiting, diarrhoea, abdominal pains.

Hepato-biliary disorders

Rare: Reversible rises in bilirubin and liver related enzymes.

Very rare: Hepatitis, jaundice.

Skin and subcutaneous tissue disorders

Common: Pruritus, rashes (including photosensitivity)

Uncommon: Urticaria. Accelerated diffuse hair loss.

Accelerated diffuse hair loss has been associated with a wide variety of disease processes and medicines, the relationship of the event to aciclovir therapy is uncertain.

Rare: Angioedema.

Renal and urinary disorders

Rare: Increases in blood urea and creatinine.

Very rare: Acute renal failure, renal pain.

Renal pain may be associated with renal failure.

General disorders and administration site conditions

Common: Fatigue, fever.

Overdose

Symptoms & signs

Aciclovir is only partly absorbed in the gastrointestinal tract. Patients have ingested overdoses of up to 20g aciclovir on a single occasion, usually without toxic effects. Accidental, repeated overdoses of oral aciclovir over several days have been associated with gastrointestinal effects (such as nausea and vomiting) and neurological effects (headache and confusion).

Overdosage of intravenous aciclovir has resulted in elevations of serum creatinine, blood urea nitrogen and subsequent renal failure. Neurological effects including confusion, hallucinations, agitation, seizures and coma have been described in association with intravenous overdosage.

Management

Patients should be observed closely for signs of toxicity. Haemodialysis significantly enhances the removal of aciclovir from the blood and may therefore, be considered a management option in the event of symptomatic overdose.

PHARMACOLOGICAL PROPERTIES

Pharmacodynamic Properties

Mechanism of Action

Aciclovir is a synthetic purine nucleoside analogue with *in vitro* and *in vivo* inhibitory activity against human herpes viruses, including Herpes simplex virus (HSV) types 1 and 2, Varicella zoster virus (VZV), Epstein Barr virus (EBV) and Cytomegalovirus (CMV). In cell culture, aciclovir has the greatest antiviral activity against HSV-1, followed (in decreasing order of potency) by HSV-2, VZV, EBV and CMV.

The inhibitory activity of aciclovir for HSV-1, HSV-2, VZV, EBV and CMV is highly selective. The enzyme thymidine kinase (TK) of normal, non-infected cells does not use aciclovir

effectively as a substrate, hence toxicity to mammalian host cells is low; however, TK encoded by HSV, VZV and EBV converts aciclovir to aciclovir monophosphate, a nucleoside analogue, which is further converted to the diphosphate and finally to the triphosphate by cellular enzymes. Aciclovir triphosphate interferes with the viral DNA polymerase and inhibits viral DNA replication with the resultant chain termination following its incorporation into the viral DNA.

Pharmacodynamic Effects

Prolonged or repeated course of aciclovir in severely immunocompromised individuals may result in the selection of virus strains with reduced sensitivity, which may not respond to continued aciclovir treatment. Most of the clinical isolates with reduced sensitivity have been relatively deficient in viral TK, however, strains with altered viral TK or DNA polymerase have also been reported. *In vitro* exposure of HSV isolates to aciclovir can also lead to emergence of less sensitive strains. The relationship between the *in vitro* determined sensitivity of HSV isolates and clinical response to aciclovir therapy is not clear.

All patients should be cautioned to ensure they avoid the potential of virus transmission, particularly when active lesions are present.

Pharmacokinetic Properties

Aciclovir is only partially absorbed from the gut. Mean steady state peak plasma concentrations (C_{ssmax}) following doses of 200mg administered four-hourly were 3.1 μ Mol (0.7 μ g/mL) and equivalent trough plasma levels (C_{ssmin}) were 1.8 μ Mol (0.4 μ g/mL).

Corresponding C_{ssmax} levels following doses of 400mg and 800mg administered four-hourly were 5.3 μ Mol (1.2 μ g/mL) and 8 μ Mol (1.8 μ g/mL) respectively, and equivalent C_{ssmin} levels were 2.7 μ Mol (0.6 μ g/mL) and 4 μ Mol (0.9 μ g/mL).

In adults the terminal plasma half life of aciclovir after administration of intravenous aciclovir is about 2.9 hours. Most of the drug is excreted unchanged by the kidney. Renal clearance of aciclovir is substantially greater than creatinine clearance, indicating that tubular secretion in addition to glomerular filtration contributes to the renal elimination of the drug. 9-carboxymethoxy-methyguanine is the only significant metabolite of aciclovir and accounts for approximately 10-15% of the administered dose recovered from the urine.

When aciclovir is given one hour after 1 gram of probenecid the terminal half life and the area under the plasma concentration-time curve is extended by 18% or 40% respectively. In adults, mean C_{ssmax} levels following a one-hour infusion of 2.5mg/kg, 5mg/kg and 10mg/kg were 22.7 μ Mol (5.1 μ g/mL), 43.6 μ Mol (9.8 μ g/mL), 92 μ Mol (20.7 μ g/mL), respectively. The corresponding C_{ssmin} levels 7 hours later were 2.2 μ Mol (0.5 μ g/mL), 3.1 μ Mol (0.7 μ g/mL) and 10.2 μ Mol (2.3 μ g/mL), respectively. In children over 1 year of age similar mean C_{ssmax} and C_{ssmin} levels were observed when a dose of 250mg/m² was substituted for 5mg/kg and a dose of

500mg/m² was substituted for 10mg/kg. In neonates and young infants (0-3 months of age) treated with doses of 10mg/kg administered by infusion over a one-hour period every 8 hours the C_{ss}max was found to be 61.2µMol (13.8µg/mL) and the C_{ss}min to be 10.1µMol (2.3µg/mL). The terminal plasma half-life in these patients was 3.8 hours. A separate group of neonates treated with 15 mg/kg every 8 hours showed approximate dose proportional increases, with a C_{max} of 83.5µMol (18.8µg/mL) and C_{min} of 14.1µMol (3.2µg/mL). In the elderly total body clearance falls with increasing age associated with decreases in creatinine clearance although there is little change in the terminal plasma half life.

In patients with chronic renal failure the mean terminal half life was found to be 19.5 hours. The mean aciclovir half life during haemodialysis was 5.7 hours. Plasma aciclovir levels dropped approximately 60% during dialysis.

Cerebrospinal fluid levels are approximately 50% of corresponding plasma levels. Plasma protein binding is relatively low (9 to 33%) and drug interactions involving binding site displacement are not anticipated.

Clinical Studies

There is no information on the effect of ZOVIRAX oral formulations on human female fertility. In a study of 20 male patients with normal sperm count, oral aciclovir administered at doses of up to 1g per day for up to six months has been shown to have no clinically significant effect on sperm count, motility or morphology.

Preclinical Safety Data

The results of a wide range of mutagenicity tests in vitro and in vivo indicate that aciclovir is unlikely to pose a genetic risk to man.

Aciclovir was not carcinogenic in long-term studies in the rat and the mouse.

Largely reversible adverse effects on spermatogenesis in association with overall toxicity in rats and dogs have been reported only at doses of aciclovir greatly in excess of those employed therapeutically. Two-generation studies in mice did not reveal any effect of orally administered aciclovir on fertility.

Systemic administration of aciclovir in internationally accepted standard tests did not produce embryotoxic or teratogenic effects in rabbits, rats or mice. In a non-standard test in rats, foetal abnormalities were observed but only following such high subcutaneous doses that maternal toxicity was produced. The clinical relevance of these findings is uncertain.

PHARMACEUTICAL PARTICULARS

List of Excipients

200mg Tablets: lactose monohydrate, microcrystalline cellulose, sodium starch glycolate, povidone K30, magnesium stearate

400mg Tablets: microcrystalline cellulose, sodium starch glycolate, povidone K30, magnesium stearate, iron oxide red

Dispersible Tablets 800mg: microcrystalline cellulose, aluminium magnesium silicate, sodium starch glycolate, povidone K30, magnesium stearate, hypromellose, polyethylene glycol 400, titanium dioxide, polyethylene glycol 8000

200mg/5mL Oral Suspension: sorbitol solution, glycerol, dispersible cellulose, methylparaben, propylparaben, banana flavor, vanillin, purified water

Shelf Life

The expiry date is indicated on the packaging.

Special Precautions for Storage

200mg and 400mg Tablets:

Store below 25°C. Keep dry. Protect from light.

Dispersible Tablets 800mg:

Store below 30°C. Keep dry. Protect from light.

200mg/5mL Oral Suspension:

Store below 25°C.

Instructions for Use/Handling

Dilution

Zovirax Oral Suspension 200mg/5mL may be diluted with an equal volume of either Syrup BP or Sorbitol Solution 70 per cent (Non-crystallising), BP.

The diluted product is stable for 4 weeks at 25°C but it is recommended that all dilutions are freshly prepared.

Where a dilution of Zovirax Oral Suspension, 400mg/5mL is prescribed, it is recommended that the 200mg/5mL suspension is dispensed.

Pack Sizes

200mg Tablets: 25 tablets per pack

400mg Tablets: 70 tablets per pack

Dispersible Tablets 800mg: 35 tablets per pack

200mg/5ml Oral suspension: 125ml per pack

Not all strengths and presentations may be available locally.

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