

**Zovirax**  
Oral Formulations  
**Aciclovir**

**QUALITATIVE AND QUANTITATIVE COMPOSITION**

Tablets

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

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

Oral Suspension

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

**CLINICAL INFORMATION**

**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**

### *Pharmaceutical Form*

Tablets.  
Dispersible tablets.  
Oral suspension.

### *Dosage for treatment of herpes simplex in adults*

For the treatment of herpes simplex infections, 200 mg 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 400 mg 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, 200 mg Zovirax should be taken four times daily at approximately six-hourly intervals.

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

Dosage titration down to 200 mg 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 800 mg 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, 200 mg 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 400 mg 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, 800 mg 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. after marrow transplant) or in patients with impaired absorption from the gut, consideration should be given to intravenous dosing.

Dosing should begin as early as possible after the start of an infection. Treatment yields better results 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. Do not dilute the oral suspension formulation.

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 20 mg Zovirax/kg body weight (not to exceed 800 mg) four times daily.

Treatment should continue for five days.

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 10 ml/minute) an adjustment of dosage to 200 mg 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 800 mg twice daily at approximately twelve-hourly intervals, for patients with severe renal impairment (creatinine clearance less than 10 ml/minute), and to 800 mg three times daily, at intervals of approximately 8 hours, for patients with moderate renal impairment (creatinine clearance in the range 10 to 25 ml/minute).

### **Administration**

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

### **Contraindications**

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

### **Warnings and Precautions**

***Severe cutaneous adverse reactions:*** Cases of severe cutaneous adverse reactions (SCARs), including toxic epidermal necrolysis (TEN), Stevens-Johnson syndrome (SJS), acute generalized exanthematous pustulosis (AGEP), drug reaction with eosinophilia and systemic symptoms (DRESS) and erythema multiforme (EM) have been reported in patients treated with aciclovir.

As SCARs can be life-threatening or fatal, if signs and symptoms suggestive of SCARs appear, treatment with Zovirax must be discontinued immediately, and alternative treatment should be given. Patients who have developed SCARs with the use of aciclovir or valaciclovir must not receive Zovirax (see *Contraindications and Adverse Reactions*).

***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 co-administered. However, no dosage adjustment is necessary because of the wide therapeutic index of aciclovir.

## **Pregnancy and Lactation**

### **Fertility**

See *Clinical Studies*.

### **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  $\geq 1/1,000$  and  $< 1/100$ , rare  $\geq 1/10,000$  and  $< 1/1,000$ , 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.

Very rare: Toxic epidermal necrolysis (TEN), Stevens-Johnson syndrome (SJS), acute generalized exanthematous pustulosis (AGEP), drug reaction with eosinophilia and systemic symptoms (DRESS), erythema multiforme (EM) (see *Warnings and Precautions*).

### **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 20 g 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 overdose.

### *Treatment*

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**

#### **ATC Code**

Pharmacotherapeutic group: Direct acting antivirals, Nucleosides and nucleotides excl. reverse transcriptase inhibitors.

ATC code: J05AB01

#### **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 courses 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

### Absorption

Aciclovir is only partially absorbed from the gut. The average oral bioavailability varies between 10 and 20%. Under fasting conditions, mean peak concentrations ( $C_{max}$ ) of 0.4 microgram/ml are achieved at approximately 1.6 hours after a 200 mg dose administered as oral suspension or capsule. Mean peak plasma concentrations ( $C_{ssmax}$ ) increase to 0.7 microgram/ml (3.1 micromoles) at steady state following doses of 200 mg administered every four hours. A less than proportional increase is observed for  $C_{ssmax}$  levels following doses of 400 mg and 800 mg administered four-hourly, with values reaching 1.2 and 1.8 microgram/ml (5.3 and 8 micromoles), respectively.

### Distribution

The mean volume of distribution of 26 L indicates that aciclovir is distributed within total body water. Apparent values after oral administration ( $Vd/F$ ) ranged from 2.3 to 17.8 L/kg. As plasma protein binding is relatively low (9 to 33%), drug interactions involving binding site displacement are not anticipated. Cerebrospinal fluid levels are approximately 50% of corresponding plasma levels at steady-state.

### Metabolism

Aciclovir is predominantly excreted unchanged by the kidney. The only known urinary metabolite is 9-[(carboxymethoxy)methyl]guanine, and accounts for 10-15% of the dose excreted in the urine.

### Elimination

Mean systemic exposure ( $AUC_{0-\infty}$ ) to aciclovir ranges between 1.9 and 2.2 microgram\*h/ml after a 200 mg dose. In adults, the terminal plasma half-life after oral administration has been shown to vary between 2.8 and 4.1 hours. Renal clearance of aciclovir ( $CLr = 14.3$  L/h) is substantially greater than creatinine clearance, indicating that tubular secretion, in addition to glomerular filtration, contributes to the renal elimination of the drug. The half-life and total clearance of aciclovir are

dependent on renal function. Therefore, dosage adjustment is recommended for renally impaired patients.

In neonates (0 to 3 months of age) treated with doses of 10 mg/kg administered by infusion over a one-hour period every 8 hours, the terminal plasma half-life was 3.8 hours.

### **Special Patient Populations**

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.

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.

### **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 1 g per day for up to six months has been shown to have no clinically significant effect on sperm count, motility or morphology.

### **Non-Clinical Information**

#### **Mutagenicity**

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.

#### **Carcinogenicity**

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

#### **Fertility**

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.

#### **Teratogenicity**

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 INFORMATION**

### **List of Excipients**

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

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

200 mg/5 ml Oral Suspension: sorbitol solution, glycerol, dispersible cellulose, methyl hydroxybenzoate, propyl hydroxybenzoate, banana flavor, vanillin, purified water.

### **Shelf Life**

The expiry date is indicated on the packaging.

### **Storage**

The storage conditions are detailed on the packaging.

200 mg Tablets, 800 mg Dispersible Tablets: Keep dry. Protect from light.

### **Nature and Contents of Container**

#### **200 mg Tablets**

PVC/PVDC/aluminium foil blister or Child resistant PVC/PVDC/aluminium foil/paper blister.

#### **Dispersible Tablets 800 mg**

PVC/aluminium foil blister or Child resistant PVC/aluminium foil/paper blister.

#### **200 mg/5 ml Oral Suspension**

Amber glass bottles with plastic child resistant closure.

Bottles may be supplied with a measuring cup or double-ended spoon.

### **Incompatibilities**

There are no special requirements for use on handling of this product.

## **Use and Handling**

For administration of 100 mg dose, the measuring device provided may be used, or alternatively a graduated syringe.

## **Pack Sizes**

200 mg Tablets: 25 tablets per pack.

Dispersible Tablets 800 mg: 35 tablets per pack.

200 mg/5 ml Oral Suspension: 125 ml per pack.

Not all presentations are available in every country.

## **Product Registrant (Singapore)**

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