

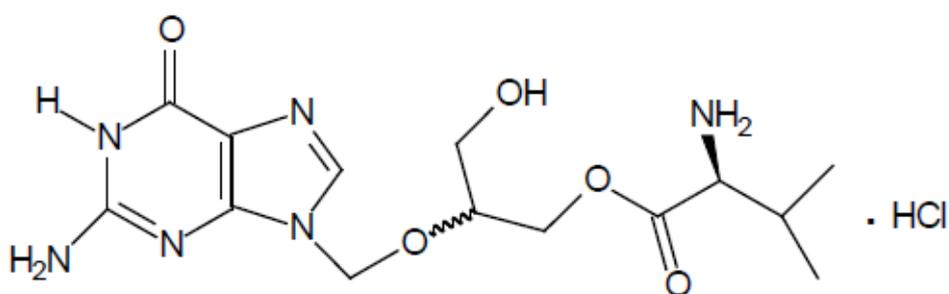
Product Information Valganciclovir Sandoz

NAME OF THE MEDICINE

Valganciclovir hydrochloride

The chemical name for valganciclovir hydrochloride is L-valine, 2-[(2-amino-1,6 dihydro-6-oxo-9H-purin-9-yl)methoxy]-3-hydroxypropyl ester, monohydrochloride.

The molecular formula is $C_{14}H_{22}N_6O_5 \cdot HCl$



CAS: 175865-59-5

MW: 390.83

DESCRIPTION

Valganciclovir hydrochloride (valganciclovir HCl) is the hydrochloride salt of the L-valyl ester of ganciclovir. Ganciclovir is a synthetic nucleoside analogue of guanine.

Valganciclovir HCl is a white to off white crystalline powder.

Valganciclovir HCl is a polar hydrophilic compound with a solubility of 70 mg/mL in water at 25°C at a pH of 7.0 and an n-octanol/water partition coefficient of 0.0095 at pH 7.0. The pKa for valganciclovir is 7.6.

Each tablet contains valganciclovir 450mg (as valganciclovir hydrochloride 496mg). The excipients are microcrystalline cellulose, crospovidone, stearic acid and povidone. The film coat applied to the tablets contains Opadry Pink 15B24005 which consists of hypromellose, titanium dioxide, macrogol 400, iron oxide red and polysorbate 80.

PHARMACOLOGY

Pharmacodynamics

Valganciclovir is an L-valyl ester salt (prodrug) of ganciclovir which, after oral administration, is rapidly converted to ganciclovir by intestinal and hepatic esterases. Ganciclovir is a synthetic analogue of 2'-deoxyguanosine, which inhibits replication of herpes viruses *in vitro* and *in vivo*. Sensitive human viruses include human cytomegalovirus (HCMV), herpes-simplex virus-1 and -2 (HSV-1 and HSV-2), human herpes virus type 6, 7 and 8 (HHV-6, HHV-7, HHV-8), Epstein-Barr virus (EBV), varicella-zoster virus (VZV) and hepatitis B virus.

In cytomegalovirus (CMV)-infected cells, ganciclovir is initially phosphorylated to ganciclovir monophosphate by the viral protein kinase, UL97. Further phosphorylation occurs by cellular kinases to produce ganciclovir triphosphate, which is then slowly metabolised intracellularly. This has been shown to occur in CMV-infected cells (half-life 18 hours) and HSV-infected cells (half-life between 6 and 24 hours) after removal of extracellular ganciclovir. As the phosphorylation is largely dependent on the viral kinase, phosphorylation of ganciclovir occurs preferentially in virus-infected cells.

The virustatic activity of ganciclovir is due to inhibition of viral DNA synthesis by: (a) competitive inhibition of incorporation of deoxyguanosine-triphosphate into DNA by viral DNA polymerase, and (b) incorporation of ganciclovir triphosphate into viral DNA causing termination of, or very limited, further viral DNA elongation. Typical anti-viral IC₅₀ against CMV *in vitro* is in the range 0.08 µM (0.02 µg/mL) to 14.32 µM (3.58 µg/mL).

Valganciclovir allows systemic exposure of ganciclovir comparable to that achieved with recommended doses of intravenous (IV) ganciclovir, which has been shown to be efficacious in the treatment of CMV.

The clinical antiviral effect of valganciclovir has been demonstrated in the treatment of AIDS patients with newly diagnosed CMV retinitis (Study WV15376). CMV shedding was decreased in urine from 46% (32/69) of patients at study entry to 7% (4/55) of patients following four weeks of valganciclovir treatment.

Viral Resistance

Viral resistance to ganciclovir can arise after chronic dosing with valganciclovir by selection of mutations in either the viral kinase gene (UL97) responsible for ganciclovir monophosphorylation or the viral polymerase gene (UL54). Virus containing mutations in the UL97 gene is resistant to ganciclovir alone, whereas virus with mutations in the UL54 gene may show cross-resistance to other antivirals targeting the viral polymerase and vice versa.

Treatment of CMV Retinitis in AIDS:

A genotypic analysis of CMV in polymorphonuclear leucocytes (PMNL) isolates from 148 patients enrolled in one clinical study has shown that 2.2% (3/137), 6.5% (8/123), 12.8% (13/101) and 15.3% (13/85) contain UL97 mutations after 3, 6, 12 and 18 months, respectively, of valganciclovir treatment (using the number of patients still on treatment at the assessment time as the denominator). Phenotypic resistance was not identified, but very few CMV culture isolates were available for analysis.

Prevention of CMV Disease in Transplantation:

Resistance was studied by genotypic analysis of CMV in PMNL samples collected i) on Day 100 (end of study drug prophylaxis) and ii) in cases of suspected CMV disease up to 6 months after transplantation. From the 245 patients randomised to receive valganciclovir, 198 Day 100 samples were available for testing and no ganciclovir resistance mutations were observed. This compares with 2 ganciclovir resistance mutations detected in the 103 samples tested (1.9%) for patients in the oral ganciclovir comparator arm.

Of the 245 patients randomised to receive valganciclovir, samples from 50 patients with suspected CMV disease were tested and no resistance mutations were observed. Of the 127 patients randomised on the ganciclovir comparator arm, samples from the 29 patients with suspected CMV disease were tested, from which two resistance mutations were observed, giving an incidence of resistance of 6.9%.

Pharmacokinetics

The pharmacokinetic properties of valganciclovir have been evaluated in HIV- and CMV-seropositive patients, patients with AIDS and CMV retinitis and in solid organ transplant patients.

The parameters which control the exposure of ganciclovir from valganciclovir are the oral absorption of valganciclovir and the renal excretion of ganciclovir.

Absorption

Valganciclovir is a prodrug of ganciclovir, which is well absorbed from the gastrointestinal tract and rapidly metabolised in the intestinal wall and liver to ganciclovir. The absolute bioavailability of ganciclovir from valganciclovir is approximately 60%. Systemic exposure to valganciclovir is transient and low. AUC_{0-24h} and C_{max} values are approximately 1% and 3% of those of ganciclovir, respectively.

Dose proportionality with respect to ganciclovir AUC following administration of valganciclovir in the dose range 450 to 2625 mg was demonstrated only under fed conditions. When valganciclovir is given with food mean ganciclovir AUC_{0-24h} increased by 24% to 56% depending on the dose. When valganciclovir was given with food at a dose of 875 mg, increases were seen in both mean ganciclovir AUC_{0-24h} (approximately 30%) and mean ganciclovir C_{max} values (approximately 14%). Therefore, it is recommended that valganciclovir be administered with food (see **DOSAGE AND ADMINISTRATION**).

For ganciclovir, average AUC_{0-24h} has been shown to correlate with time to progression of CMV retinitis.

The bioavailability of ganciclovir from valganciclovir is comparable across all the patient populations studied. The systemic exposure of ganciclovir to heart, kidney and liver transplant recipients was similar after oral administration of valganciclovir according to the renal function dosing algorithm.

Distribution

Due to the rapid conversion of valganciclovir to ganciclovir, protein binding of valganciclovir was not determined. Plasma protein binding of ganciclovir was 1% to 2%. The steady state volume of distribution of ganciclovir after IV administration was 0.680 ± 0.161 L/kg.

Metabolism

Valganciclovir is rapidly hydrolysed to ganciclovir; no other metabolites have been detected. No metabolite of orally-administered radiolabelled ganciclovir (1000 mg single dose) accounted for more than 1% to 2% of the radioactivity recovered in the faeces or urine.

Elimination

Following dosing with valganciclovir, renal excretion as ganciclovir by glomerular filtration and active tubular secretion is the major route of elimination of valganciclovir. Renal clearance accounts for $81.5\% \pm 22\%$ of the systemic clearance of ganciclovir.

The terminal half-life ($t_{1/2}$) of ganciclovir following oral administration of valganciclovir to either healthy or HIV- and CMV-positive subjects was 4.18 ± 0.80 hours ($n = 244$), and that following administration of IV ganciclovir was 3.85 ± 0.74 hours ($n = 87$).

In patients undergoing haemodialysis, approximately half of the ganciclovir present at the start of a dialysis session is removed during dialysis. The mean intra-dialysis half-life and the mean inter-dialysis half-life was estimated to be 3.47 hours and 51.0 hours, respectively.

Pharmacokinetics in Special Populations

Patients with renal impairment

Decreased renal function resulted in decreased clearance of ganciclovir from valganciclovir, and a corresponding increase in terminal half-life. Therefore, dosage adjustment is required for renally impaired patients (see **PRECAUTIONS** and **DOSAGE AND ADMINISTRATION**).

Patients with hepatic impairment

The pharmacokinetics of valganciclovir in stable liver transplant recipients were investigated in one open label 4-part cross-over study ($n = 28$). The absolute bioavailability of ganciclovir from valganciclovir following a single dose of 900 mg valganciclovir under fed conditions was approximately 60%, in agreement with the estimates obtained in other patient populations. Ganciclovir AUC_{0-24h} was comparable to that achieved by 5 mg/kg IV ganciclovir in liver transplant recipients.

Paediatric patients

The pharmacokinetics of ganciclovir were evaluated following the administration of valganciclovir in three studies which enrolled a total of 109 paediatric solid organ transplant patients aged 4 months to 16 years (106 of the 109 were evaluable for pharmacokinetics). In these studies, patients received daily intravenous doses of ganciclovir to produce exposure equivalent to an adult 5 mg/kg intravenous dose (70 kg reference body weight) and/or received oral doses of valganciclovir to produce exposure equivalent to an adult 900 mg dose.

The pharmacokinetics was similar across organ type and age range. Population pharmacokinetic modelling suggested that bioavailability was approximately 60%. Clearance was positively influenced by both body surface area and renal function. The mean total clearance was 5.3 L/h (88.3 mL/min) for a patient with creatinine clearance of 70.4 mL/min. The mean C_{max} and AUC by age and organ type are listed in Table 1.

Table 1 Mean (\pm SD) pharmacokinetics of ganciclovir in paediatric patients by age (Study WV16726)

	PK Parameter	Age Group (Years)		
		≤ 2 ($n = 2$)	$> 2 - < 12$ ($n = 12$) [*]	≥ 12 ($n = 19$)
Kidney ($n = 33$)	AUC _{0-24h} ($\mu\text{g}\cdot\text{h}/\text{mL}$)	65.2 (16.6)	55.0 (11.9)	50.0 (11.6)
	C _{max} ($\mu\text{g}/\text{mL}$)	10.0 (0.04)	8.74 (2.49)	7.85 (2.10)
	t _{1/2} (h)	3.10 (0.59)	4.40 (1.41)	5.67 (1.06)
		≤ 2 ($n = 9$)	$> 2 - < 12$ ($n = 6$)	≥ 12 ($n = 2$)
Liver ($n = 17$)	AUC _{0-24h} ($\mu\text{g}\cdot\text{h}/\text{mL}$)	69.4 (35.4)	58.4 (6.18)	35.6 (2.76)
	C _{max} ($\mu\text{g}/\text{mL}$)	11.7 (3.59)	9.35 (2.33)	5.55 (1.34)
	t _{1/2} (h)	2.72 (1.32)	3.61 (0.80)	4.50 (0.25)
		≤ 2 ($n = 6$)	$> 2 - < 12$ ($n = 2$)	≥ 12 ($n = 4$)
Heart ($n = 12$)	AUC _{0-24h} ($\mu\text{g}\cdot\text{h}/\text{mL}$)	56.3 (23.2)	60.0 (19.3)	61.2 (26.0)
	C _{max} ($\mu\text{g}/\text{mL}$)	8.22 (2.44)	12.5 (1.02)	9.50 (3.34)
	t _{1/2} (h)	3.60 (1.73)	2.62 (0.65)	5.05 (0.70)

* There was one subject who received both a kidney and liver transplant. The PK profile for this subject has not been included in this table as it is not possible to determine whether the effects observed are from the kidney/liver transplant or neither.

Ganciclovir pharmacokinetics were also evaluated in 24 neonates aged 8 to 34 days with symptomatic congenital CMV disease. All patients received 6 mg/kg intravenous ganciclovir twice daily. Patients were then treated with oral valganciclovir, where the dose of valganciclovir powder for oral solution ranged from 14 mg/kg to 20 mg/kg twice daily. A dose of 16 mg/kg twice daily of valganciclovir powder for oral solution provided comparable ganciclovir exposure as 6 mg/kg intravenous ganciclovir twice daily in neonates, and also achieved ganciclovir exposure similar to the effective adult 5 mg/kg intravenous dose.

The pharmacokinetic modelling suggested that the typical value of clearance (L/h), volume of distribution (L), and bioavailability of ganciclovir in neonates were $0.146 \times \text{Weight}^{1.68}$, $1.15 \times \text{Weight}$, and 54%, respectively.

CLINICAL TRIALS

Study WV15376: Treatment of CMV Retinitis in AIDS

In a randomised, controlled study, 160 patients with AIDS and newly diagnosed CMV retinitis were randomised to receive treatment with either valganciclovir tablets (900 mg twice daily for 21 days, then 900 mg daily for 7 days) or with IV ganciclovir solution (5 mg/kg twice daily for 21 days, then 5 mg/kg daily for 7 days). Participants in the two treatment arms were comparable with respect to age, sex, weight, height and race. The mean age in the valganciclovir treatment arm was 39.6 years compared with 37.7 years in the ganciclovir arm. There was a higher proportion of males in each treatment group; 90% in the valganciclovir arm and 91% in the ganciclovir arm. The median CD4+ T-cell count at screening was 20.0 cells/ μL for patients on the valganciclovir arm, and 26.0 cells/ μL for patients on the ganciclovir arm; and the median HIV viral load was 4.8 log₁₀ copies/mL in the valganciclovir arm and 4.9 log₁₀ copies/mL in the ganciclovir arm.

In the final analysis of CMV retinitis progression by week 4 based on masked assessment of fundus photographs, 146 of 160 patients were included (73 in the valganciclovir tablets group and 73 in the IV ganciclovir group). The proportion of patients with retinitis progression at week 4 was the same in both treatment groups: 0.099 for the valganciclovir treatment group and 0.1 for the ganciclovir treatment group. The difference in progression proportions (IV ganciclovir minus valganciclovir tablets) was 0.001, with a 95% confidence interval of -0.097 to 0.100.

After week 4, all patients in this study were allowed to continue to receive treatment with valganciclovir tablets given at the dosage of 900 mg once daily. The mean (median) time from randomisation to progression of CMV retinitis in the group receiving induction and maintenance treatment with valganciclovir tablets ($n = 80$) was 226 (160) days and in the group receiving induction treatment with IV ganciclovir and maintenance treatment with valganciclovir tablets ($n = 80$) was 219 (125) days.

Satisfactory induction was achieved at week 4 in 47/61 (77%) patients given ganciclovir and 46/64 (72%) patients given valganciclovir. Satisfactory induction was defined as no progression, no increase in lesion activity and a reduction in retinitis border activity. Response was reassessed at 6 weeks when 39/62 (63%) patients given ganciclovir and 39/56 (70%) patients given valganciclovir maintained a satisfactory response to induction therapy. Three (8%) patients in each group had active retinitis at the week 6 assessment.

Study PV16000: Prevention of CMV Disease in Solid Organ Transplantation

A double-blind, double-dummy clinical active comparator study has been conducted in 372 heart, liver and kidney transplant patients at high-risk for CMV disease (Donor seropositive/Recipient seronegative [(D+/R-)]). The study was designed to test for non-inferiority between the 2 treatment arms. Patients were randomised (2 valganciclovir: 1 oral ganciclovir) to receive either valganciclovir (900 mg once daily) or oral ganciclovir (1000 mg three times daily) starting within 10 days of transplantation until Day 100 post-transplant.

The primary analysis of the primary endpoint, the proportion of patients who developed CMV disease, including CMV syndrome and/or tissue invasive disease during the first 6 months post-transplant was 12.1% in the valganciclovir arm ($n = 239$) compared with 15.2% in the oral ganciclovir arm ($n = 125$) as assessed by a blinded Endpoint Committee. The study achieved its objective and it was concluded that valganciclovir was non-inferior to oral ganciclovir for the prevention of CMV disease in solid organ transplant patients.

The majority of cases of CMV disease occurred following cessation of prophylaxis (post-Day 100) with cases in the valganciclovir arm occurring on average later than those in the oral ganciclovir arm. The incidence of acute rejection in the first 6 months was 29.7% in patients randomised to valganciclovir compared with 36.0% in the oral ganciclovir arm. For a summary of PV16000 see Table 2 below.

Table 2 Summary of CMV disease (as assessed by the Endpoint Committee) and acute graft rejection up to 6 months post-transplant (ITT population)

No. of Patients (PV16000)	Ganciclovir ($n = 125$)		Valganciclovir ($n = 239$)		Total ($n = 364$)		Weighted Difference in Proportions (95% CI)	
		(%)		(%)		(%)		
Patients with CMV disease	19	15.2	29	12.1	48	13.2	3.4%	-4.2%, 11.0%*
CMV syndrome	13	10.4	12	5.0	25	6.9		
Tissue-invasive CMV	6	4.8	17	7.1	23	6.3		
Acute Graft Rejection	45	36.0	71	29.7	116	31.9		

*If the lower limit of the 95% CI is ≥ -0.05 , then valganciclovir is non-inferior to ganciclovir. As the lower limit of the 95% confidence interval (-0.042) was above the pre-specified non-inferiority value of -0.05, non-inferiority was achieved.

For study PV16000 a population pharmacokinetics analysis was conducted using plasma samples taken from 160/245 patients in the valganciclovir arm and 82/127 patients in the oral ganciclovir arm, and from this analysis it was estimated that the median exposure to ganciclovir from valganciclovir was 1.74 times higher than seen with oral ganciclovir (AUC_{0-24h} 44.3 vs. 25.4 µg.h/mL).

IMPACT Study (Study NT18435): Prevention of CMV Disease in Kidney Transplant Patients

A double-blind, placebo controlled study has been conducted in 326 kidney transplant patients at high risk of CMV disease (D+/R-) to assess the efficacy and safety of extending valganciclovir CMV prophylaxis from 100 to 200 days post-transplant.

The inclusion criteria in this study required the patients to have adequate haematological (absolute neutrophil count > 1000 cells/µL, platelets > 25,000/µL, haemoglobin > 8 g/dL) and renal function (creatinine clearance > 15 mL/min and improving) in the immediate post-transplant period. The mean age of the patients who participated in this trial was about 48 years.

Patients were randomised (1:1) to receive valganciclovir tablets (900 mg once daily) within 10 days of transplantation until Day 200 post-transplant or until Day 100 post-transplant followed by 100 days placebo.

The proportion of patients who developed CMV disease during the first 12 months post-transplant is shown in Table 3.

Table 3 Percentage of Kidney Transplant Patients with CMV Disease¹, 12 Month ITT Population

	100-day group	200-day group	Treatment difference (95% CI)
Patients with confirmed or assumed CMV disease ²	71/163 (43.6%)	36/155 (23.2%)	-20.3% (-30.8%, -9.9%)
Patients with confirmed CMV disease	60/163 (36.8%)	25/155 (16.1%)	-20.7% (-30.4%, -10.9%)

¹ CMV Disease is defined as either CMV syndrome or tissue invasive CMV. ² Confirmed CMV is a clinically confirmed case of CMV disease. Patients were assumed to have CMV disease if there was either no week 52 assessment or no confirmation of CMV disease before this time point.

The graft survival rate at 12 months post-transplant was 98.1% (160/163) for the 100-day dosing regimen and 98.2% (152/155) for the 200-day dosing regimen. The incidence of biopsy proven acute rejection at 12 months post-transplant was 17.2% (28/163) for the 100-day dosing regimen and 11.0% (17/155) for the 200-day dosing regimen.

No clinical trials have been conducted in patients following haematological or lung transplants.

Paediatric Studies

The safety and efficacy of valganciclovir in paediatric patients have not been established in adequate and well-controlled clinical studies.

The pharmacokinetics and safety of valganciclovir powder for oral solution in paediatric patients were studied in four Phase I/II open-label, multi-centre clinical trials. Three studies enrolled 109 paediatric solid organ transplant recipients (heart: 12; kidney: 59; kidney + liver: 1; liver: 37) requiring anti-CMV prophylaxis, and the fourth study enrolled 24 neonates with symptomatic congenital CMV disease. Patients ranging in age from 8 days to 16 years received single or multiple doses of valganciclovir. Patients enrolled in the multiple dose studies could have received up to 100 days of therapy.

One study enrolled 20 liver transplant patients with a median age of 2 years (6 months to 16 years) who received a single daily dose of valganciclovir on 2 consecutive days. A second study enrolled 26 kidney patients with a median age of 12 years (1 to 16 years) who received multiple doses of valganciclovir on 2 consecutive days. For these two studies, the most commonly reported adverse events were related to the gastrointestinal system, particularly vomiting (liver and kidney patients), diarrhoea (kidney patients) and nausea (kidney patients).

The third solid organ transplant study enrolled 63 kidney, liver or heart patients with a median age of 9 years (4 months to 16 years) who received multiple doses of valganciclovir for up to 100 days. Common adverse events in this study were diarrhoea, pyrexia, hypertension, upper respiratory tract infection, vomiting, anaemia, neutropenia, constipation, nausea, and transplant rejection. There was no CMV disease reported during the study. However, CMV events were reported in 7 patients during the study, but none of these events fulfilled the definition of CMV disease.

In the neonate study, 24 neonates with a median age of 16.5 days (8 to 34 days) received 6 weeks of antiviral therapy. Common adverse events in this study were neutropenia and anaemia.

INDICATIONS

Valganciclovir is indicated for the treatment of cytomegalovirus (CMV) retinitis in patients with acquired immunodeficiency syndrome (AIDS).

Valganciclovir is indicated for the prophylaxis of CMV infection and disease following solid organ transplantation in patients at risk of CMV disease.

CONTRAINDICATIONS

Valganciclovir is contraindicated in patients with known hypersensitivity to valganciclovir, ganciclovir or to any component of the product.

Due to the similarity of the chemical structure of valganciclovir and that of aciclovir and valaciclovir, a cross-hypersensitivity reaction between these medicines is possible.

Valganciclovir should not be administered if the absolute neutrophil count is less than 500 cells/ μ L, the platelet count is less than 25 000/ μ L, or the haemoglobin is less than 8 g/dL.

PRECAUTIONS

Clinical toxicities of valganciclovir, which is metabolised to ganciclovir, include leucopenia and thrombocytopenia. Concomitant administration of valganciclovir and other medicines that are known to be myelosuppressive or associated with renal impairment may result in added toxicity (see INTERACTIONS WITH OTHER MEDICINES).

In animal studies ganciclovir was found to be mutagenic, clastogenic, aspermatogenic, teratogenic and carcinogenic; therefore it should be considered a potential teratogen and carcinogen in humans with potential to cause birth defects and cancers. It is also considered likely that valganciclovir causes temporary or permanent inhibition of spermatogenesis (see PRECAUTIONS, Carcinogenicity, Genotoxicity). Valganciclovir is indicated in those patients as outlined under the INDICATIONS section where the potential benefits to the patient outweighs the risks stated herein.

The diagnosis of CMV retinitis should be made by indirect ophthalmoscopy. Other conditions in the differential diagnosis of CMV retinitis include candidiasis, toxoplasmosis, histoplasmosis, retinal scars and cotton wool spots, any of which may produce a retinal appearance similar to CMV. For this reason it is essential that the diagnosis of CMV be established by an ophthalmologist familiar with the presentation of these conditions. The diagnosis of CMV retinitis may be supported by culture of CMV in the urine, blood, throat, or other sites, but a negative culture does not rule out CMV retinitis.

Haematologic

Severe leucopenia, neutropenia, anaemia, thrombocytopenia, pancytopenia, bone marrow depression and aplastic anaemia have been observed in patients treated with valganciclovir (and ganciclovir) (see **ADVERSE EFFECTS** and **DOSAGE AND ADMINISTRATION**).

Therapy should not be initiated if the absolute neutrophil count is less than 500 cells/ μ L; or platelet count is less than 25 000/ μ L; or the haemoglobin is less than 8 g/dL. It is recommended that complete blood counts and platelet counts be monitored frequently during therapy; especially in patients in whom ganciclovir or other nucleoside analogues have previously resulted in leucopenia, or in whom neutrophil counts are less than 1000 cells/ μ L at the beginning of treatment.

Valganciclovir should, therefore, be used with caution in patients with pre-existing cytopenias, or who have received or are receiving myelosuppressive medicines or irradiation. Cytopenia may occur at any time during treatment and may increase with continued dosing. In patients with severe leucopenia, neutropenia, anaemia and/or thrombocytopenia, it is recommended that treatment with haematopoietic growth factors and/or dose interruption be considered. Cell counts usually begin to recover within 3 to 7 days of discontinuing medication. Colony-stimulating factors have been shown to increase neutrophil counts in patients receiving ganciclovir for treatment of CMV retinitis.

Renal Impairment

In patients with impaired renal function, dosage adjustments based on creatinine clearance are required.

Increased serum creatinine levels have been observed in trials evaluating valganciclovir tablets. Patients should have serum creatinine or creatinine clearance values monitored carefully to allow for dosage adjustments in renally impaired patients (see **DOSAGE AND ADMINISTRATION**, Special Patient Groups).

Effects on Fertility

In animal studies ganciclovir was found to be aspermatogenic. It is therefore considered likely that valganciclovir causes temporary or permanent inhibition of spermatogenesis.

Reproductive toxicity studies have not been conducted with valganciclovir. Valganciclovir is rapidly and extensively converted to ganciclovir and therefore is expected to have similar reproductive toxicity effects as ganciclovir. Animal data indicate that the administration of ganciclovir causes inhibition of spermatogenesis and subsequent infertility. These effects were reversible at lower doses and irreversible at higher doses. It is considered probable that in humans, valganciclovir at the recommended doses may cause temporary or permanent inhibition of spermatogenesis. Ganciclovir caused decreased mating behaviour, decreased fertility, and an increased incidence of embryoletality in female mice following IV doses of 90 mg/kg/day (approximately 2.1 times the mean drug exposure to ganciclovir in humans following the maximum recommended dose of valganciclovir, 900 mg twice daily, based on AUC comparisons).

Ganciclovir caused decreased fertility in male mice and hypospermatogenesis in mice and dogs following daily oral or IV administration of doses ranging from 0.2 to 10 mg/kg/day. Systemic drug exposure (AUC) at the lowest dose showing toxicity in each species ranged from 0.02 to 0.1 times the AUC of ganciclovir in humans following the maximum recommended dose of valganciclovir. Valganciclovir caused similar effects on spermatogenesis in mice, rats and dogs. It is considered likely that valganciclovir could cause inhibition of human spermatogenesis.

Use in Pregnancy - Category D

Women of childbearing potential should be advised to use effective contraception during treatment with valganciclovir because of the mutagenic and teratogenic potential of ganciclovir. Men should be advised to practise barrier contraception during, and for at least 90 days following, treatment with valganciclovir.

Valganciclovir is expected to have reproductive toxicity effects similar to ganciclovir. Ganciclovir has been shown to be embryotoxic in rabbits and mice following IV administration, and teratogenic in rabbits. Foetal resorptions were present in at least 85% of rabbits at 60 mg/kg/day IV and mice at 108 mg/kg/day (2.7 times the mean drug exposure to ganciclovir in humans following the maximum recommended dose of valganciclovir, 900 mg twice daily, based on AUC comparisons). Effects observed in rabbits included: foetal growth retardation, embryoletality, teratogenicity and/or maternal toxicity. Teratogenic changes included cleft palate, anophthalmia/microphthalmia, aplastic organs (kidney and pancreas),

hydrocephaly and brachygnathia. In mice, effects observed were foetal toxicity and embryoletality.

Daily intravenous doses of 90 mg/kg administered to female mice prior to mating, during gestation, and during lactation caused hypoplasia of the testes and seminal vesicles in the month-old male offspring, as well as pathologic changes in the nonglandular region of the stomach. The drug exposure in mice as estimated by the AUC was approximately 2.1 times the human AUC.

Valganciclovir may be teratogenic or embryotoxic at dose levels recommended for human use. In addition, the effect on the future fertility of boys is unknown. There are no adequate and well-controlled studies in pregnant women. The safety of valganciclovir for use in human pregnancy has not been established. Valganciclovir should be used during pregnancy only if the potential benefit justifies the potential risk to the foetus.

Use in Lactation

It is not known whether ganciclovir is excreted in human or animal milk. However, many medicines are excreted in human milk and, because carcinogenic and teratogenic effects occurred in animals treated with ganciclovir, the possibility of serious adverse reactions from ganciclovir in breastfed infants is considered likely. Therefore valganciclovir should not be given to breastfeeding mothers or breastfeeding should be discontinued. The minimum time interval before breastfeeding can safely be resumed after the last dose of valganciclovir is unknown

Paediatric use

The safety and efficacy of valganciclovir in paediatric patients have not been established in adequate and well controlled clinical studies.

The use of valganciclovir in children warrants extreme caution. Valganciclovir should be considered a potential carcinogen in humans. This potential to cause cancers is greater in infants and children than in adults. Valganciclovir is likely to cause temporary or permanent inhibition of spermatogenesis. This could result in permanent male infertility. Administration to children should be undertaken only after careful evaluation and only if, in the opinion of the physician, the potential benefits of treatment outweigh these considerable risks.

Use in the elderly

The pharmacokinetic profiles of valganciclovir in elderly patients have not been established. Since elderly individuals frequently have a reduced glomerular filtration rate, particular attention should be paid to assessing renal function before and during administration of valganciclovir.

Clinical studies of valganciclovir did not include sufficient numbers of subjects aged 65 and over to determine whether they respond differently from younger subjects. In general, dose selection for an elderly patient should be cautious, reflecting the greater frequency of decreased hepatic, renal, or cardiac function, and of concomitant disease or other therapy. Valganciclovir is known to be substantially excreted by the kidney, and the risk of toxic reactions to this medicine may be greater in patients with impaired renal function. Since elderly patients are more likely to have decreased renal function, care should be taken in dose selection. In addition, renal function should be monitored and dosage adjustments should be made accordingly (see **PRECAUTIONS**, Renal Impairment; and **DOSAGE AND ADMINISTRATION**, Patients with Renal Impairment)

Genotoxicity

Valganciclovir increased mutations in mouse lymphoma cells and was clastogenic in the mouse micronucleus assay. Valganciclovir was not mutagenic in the Ames Salmonella assay.

Ganciclovir increased mutations in mouse lymphoma cells and DNA damage in human lymphocytes *in vitro*. Ganciclovir was clastogenic in the mouse micronucleus assay. Ganciclovir was not mutagenic in the Ames Salmonella assay.

Carcinogenicity

Ganciclovir was genotoxic and carcinogenic in animal studies. Valganciclovir should be considered a potential carcinogen in humans with the potential to cause cancers. No long-term carcinogenicity studies have been conducted with valganciclovir. However, upon oral administration, valganciclovir is rapidly and extensively converted to ganciclovir.

Toxicity in mice, dogs and rats was primarily characterised by testicular atrophy. Male infertility occurred at doses of 2 mg/kg/day and above which was consistent with the infertility and testicular atrophy seen in toxicity studies with doses between 2 and 10 mg/kg/day. In females, a more complex range of effects were induced which were characterised by embryo-foetal abnormalities and embryo-foetal losses in mice and rabbits and in multi-dose studies, by toxic and eventually carcinogenic changes to the reproductive system in mice.

Ganciclovir was carcinogenic in the mouse after oral doses of 20 mg/kg/day for 18 months and 1000 mg/kg/day for 15 months. All ganciclovir-induced tumours were of haematopoietic epithelial or vascular origin. Epithelial tumours involved a wide variety of tissues, including the female reproductive organs, pancreas, gastrointestinal tract and skin, as well as rodent specific glands (peritumoural, clitoral and Harderian). Vascular tumours were observed in females, mainly in the reproductive organs, but also in the mesenteric lymph nodes and liver. No carcinogenic effects occurred at 1 mg/kg/day. Based on data on plasma drug concentrations, exposure of humans to ganciclovir would be similar to or greater than the exposure of mice in the above study at 1000 mg/kg/day. This potential is likely to be markedly greater in children, as cell division occurs more rapidly in children.

Effects on the Ability to Drive and Use Machines

Convulsions, sedation, dizziness, ataxia and/or confusion have been reported with the use of valganciclovir and/or ganciclovir. If they occur, such effects may affect tasks requiring alertness including the patient's ability to drive and operate machinery.

INTERACTIONS WITH OTHER MEDICINES

In a rat *in situ* model of intestinal permeability, there was no interaction of valganciclovir, didanosine, nelfinavir, cyclosporin, omeprazole and mycophenolate mofetil with valganciclovir.

Valganciclovir is rapidly and extensively converted to ganciclovir; therefore interactions associated with ganciclovir will be expected for valganciclovir.

Binding of ganciclovir to plasma proteins is only about 1% to 2%, and medicine interactions involving binding site displacement are not anticipated.

Imipenem-cilastatin

Convulsions have been reported in patients taking ganciclovir and imipenem-cilastatin concomitantly. Valganciclovir should not be administered concomitantly with imipenem-cilastatin unless the potential benefits outweigh the potential risks (see **PRECAUTIONS**).

Probenecid

Probenecid given with oral ganciclovir resulted in statistically significantly decreased renal clearance of ganciclovir (20%) leading to statistically significantly increased exposure (40%). These changes were consistent with a mechanism of interaction involving competition for renal tubular excretion. Therefore patients taking probenecid and valganciclovir concomitantly should be closely monitored for ganciclovir toxicity.

Zidovudine

When zidovudine was given in the presence of oral ganciclovir there was a small (17%), but statistically significant, increase in the AUC of zidovudine. There was also a trend towards lower ganciclovir concentrations when administered with zidovudine although this was not statistically significant. However, since both zidovudine and valganciclovir have the potential to cause neutropenia and anaemia, some patients may not tolerate concomitant therapy at full dosage.

Didanosine

Didanosine plasma concentrations were found to be consistently raised when given with ganciclovir (both IV and oral). At ganciclovir oral doses of 3 g/day and 6 g/day, an increase in the AUC of didanosine ranging from 84% to 124% has been observed, and likewise at IV doses of 5 mg/kg/day and 10 mg/kg/day, and increase in the AUC of didanosine ranging from 38% to 67% has been observed. This increase cannot be explained by competition for renal tubular secretion, as there was an increase in the percentage of didanosine dose excreted. This increase could arise from either increased bioavailability or decreased metabolism. There was no clinically significant effect on ganciclovir concentrations. However, given the increase in didanosine plasma concentrations in the presence of ganciclovir, patients should be closely monitored for didanosine toxicity.

Mycophenolate mofetil

Based on the results of a single dose administration study of recommended doses of oral mycophenolate mofetil (MMF) and IV ganciclovir and the known effects of renal impairment on the pharmacokinetics of MMF and ganciclovir, it is anticipated that co-administration of these medicines (which have the potential to compete for renal tubular secretion) will result in increases in phenolic glucuronide of mycophenolic acid (MPAG) and ganciclovir concentration. No substantial alteration of mycophenolic acid (MPA) pharmacokinetics is anticipated and MMF dose adjustment is not required. In patients with renal impairment in which MMF and ganciclovir are co-administered, the dose recommendation of ganciclovir should be observed and patients monitored carefully.

Zalcitabine

Zalcitabine increased the AUC_{0-8h} of oral ganciclovir by 13%. There were no statistically significant changes in any of the other pharmacokinetic parameters assessed. Additionally, there were no clinically relevant changes in zalcitabine pharmacokinetics in the presence of oral ganciclovir although a small increase in the elimination rate constant was observed.

Stavudine

No statistically significant pharmacokinetic interaction was observed when stavudine and oral ganciclovir were given in combination.

Trimethoprim

Trimethoprim statistically significantly decreased the renal clearance of oral ganciclovir by 16.3% and this was associated with a statistically significant decrease in the terminal elimination rate and corresponding increase in half-life by 15%. However, these changes are unlikely to be clinically significant, as AUC_{0-8h} and C_{max} were unaffected. The only statistically significant change in trimethoprim pharmacokinetic parameters when co-administered with ganciclovir was an increase in C_{min} by 12%. However, this is unlikely to be of clinical significance and no dose adjustment is recommended.

Cyclosporin

There was no evidence that introduction of ganciclovir affects the pharmacokinetics of cyclosporin based on the comparison of cyclosporin trough concentrations. However, there was some evidence of increases in the maximum serum creatinine value observed following initiation of ganciclovir therapy.

Other Potential Medicine Interactions

Toxicity may be enhanced when ganciclovir is co-administered with other medicines known to be myelosuppressive or associated with renal impairment (such as dapsons, pentamidine, flucytosine, vincristine, vinblastine, adriamycin, amphotericin B, nucleoside analogues and hydroxyurea). Therefore, these medicines should be considered for concomitant use with ganciclovir only if the potential benefits outweigh the potential risks.

ADVERSE EFFECTS

Clinical Trials

Experience with Valganciclovir

Valganciclovir, a prodrug of ganciclovir, is rapidly converted to ganciclovir after oral administration. The undesirable effects known to be associated with ganciclovir usage can therefore be expected to occur with valganciclovir. All of the adverse events observed in clinical studies with valganciclovir have been previously observed with ganciclovir.

Treatment of CMV Retinitis in AIDS

The safety profiles of valganciclovir and IV ganciclovir during 28 days of randomised study phase (21 days induction dose and 7 days maintenance dose) in 158 patients were comparable. The most frequently reported events were diarrhoea, neutropenia and pyrexia. More patients reported diarrhoea, oral candidiasis, headache and fatigue in the oral valganciclovir arm, and nausea and injection site-related events in the IV ganciclovir arm (see Table 4).

Table 4 Percentage of patients with selected adverse events occurring during the randomised study phase

Adverse event	Valganciclovir arm (n = 79)	IV ganciclovir arm (n = 79)
Diarrhoea	16%	10%
Oral candidiasis	11%	6%
Headache	9%	5%
Fatigue	8%	4%
Nausea	8%	14%
Venous phlebitis and thrombophlebitis	-	6%

Based on two clinical trials ($n = 370$) where patients with CMV retinitis received valganciclovir at a dosage of 900 mg twice daily or once daily, corresponding to the induction or maintenance regimen, respectively, the adverse events with an incidence of $\geq 5\%$, regardless of seriousness and drug relationship is shown in Table 5. Approximately 65% of these patients received valganciclovir for more than nine months (maximum duration was 30 months).

The most frequently reported adverse events (% of patients), regardless of seriousness and drug relationship reported from these two clinical trials ($n = 370$) in patients taking valganciclovir were diarrhoea (38%), pyrexia (26%), nausea (25%), neutropenia (24%) and anaemia (22%). The majority of the adverse events were of mild or moderate intensity. The most frequently reported adverse event (% of patients), regardless of seriousness, that were considered related (remotely, possibly or probably) to valganciclovir by the investigator were neutropenia (21%), anaemia (14%), diarrhoea (13%) and nausea (9%).

Prevention of CMV Disease in Transplantation

Table 5 shows the adverse events regardless of seriousness and drug relationship with an incidence of $\geq 5\%$ from a clinical trial, PV16000 (up to 28 days after study treatment) where solid organ transplant patients received valganciclovir ($n = 244$) or oral ganciclovir ($n = 126$) starting within 10 days of transplantation until Day 100 post-transplant. The most frequently reported adverse events (% of patients), regardless of seriousness and drug relationship in patients taking valganciclovir reported in this clinical trial ($n = 244$) were diarrhoea (30%), tremors (28%), graft rejection (24%), nausea (23%), headache (22%), lower limb oedema (21%), constipation (20%), back pain (20%), insomnia (20%), hypertension (18%), and vomiting (16%). These events were also seen with oral ganciclovir at a comparable incidence. The majority of the adverse events were of mild or moderate intensity.

Events seen in the solid organ transplant clinical trial (100 day dosing regime) not seen in CMV retinitis clinical trials at a frequency $\geq 2\%$ included hypertension (18%), raised blood creatinine (10%), metabolism disorders e.g. hyperkalaemia (14%) and abnormal hepatic function (9%). These events occurred at a similar rate with oral ganciclovir and could be considered a reflection of the underlying disease process.

The most frequently reported adverse reactions (% of patients), regardless of seriousness, that were considered related (remotely, possibly or probably) to valganciclovir by the investigator in solid organ transplant patients treated until Day 100 post-transplant were leucopenia (9%), diarrhoea (7%), nausea (6%), neutropenia (5%) and vomiting (5%). The most frequently reported adverse reactions (% of patients), regardless of seriousness, that were considered related (remotely, possibly or probably) to ganciclovir by the investigator in solid organ transplant patients were leucopenia (4%), diarrhoea (6%), nausea (3%), vomiting (3%), thrombocytopenia (3%) and renal impairment (3%).

Table 5 Percentage of Patients with Adverse Events occurring in $\geq 5\%$ of Patients in either CMV Retinitis or Solid Organ Transplantation clinical trials treated with valganciclovir or ganciclovir

System organ class	Patients with CMV retinitis	Solid Organ Transplant Patients Dosing until Day 100 Post-Transplant	
	Valganciclovir (n = 370) %	Valganciclovir (n = 244) %	Oral ganciclovir (n = 126) %
Gastrointestinal disorders			
Diarrhoea	38	30	29
Nausea	25	23	23
Vomiting	20	16	14
Abdominal pain	13	14	14
Constipation	6	20	20
Abdominal pain upper	6	9	6
Dyspepsia	4	12	10
Abdominal distention	2	6	6
Ascites	-	9	6
General disorders and administration site conditions			
Pyrexia	26	13	14
Fatigue	20	13	15
Oedema lower limb	5	21	16
Pain	3	5	7
Oedema	1	11	9
Oedema peripheral	1	6	7
Weakness	4	6	6
Blood and lymphatic system disorders			
Neutropenia	24	8	3
Anaemia	22	12	15
Thrombocytopenia	5	5	5
Leucopenia	4	14	7
Infections and infestations			
Oral candidiasis	20	3	3
Pharyngitis/nasopharyngitis	12	4	8
Sinusitis	10	3	-
Upper respiratory tract infection	9	7	7
Influenza	9		
Pneumonia	7	4	2
Bronchitis	6	-	1
Pneumocystis carinii pneumonia	6	-	-
Urinary tract infection	5	11	9
Nervous system disorders			
Headache	18	22	27
Insomnia	14	20	16
Peripheral neuropathy	7	1	1
Paresthesia	6	5	5
Tremors	2	28	25
Dizziness (excl. vertigo)	9	10	6
Skin and subcutaneous tissue disorders			
Dermatitis	18	4	5
Night sweats	7	3	4

	Patients with CMV retinitis	Solid Organ Transplant Patients Dosing until Day 100 Post-Transplant	
	Valganciclovir (n = 370) %	Valganciclovir (n = 244) %	Oral ganciclovir (n = 126) %
System organ class			
Pruritus	6	7	4
Acne	< 1	4	6
Respiratory, thoracic and mediastinal disorders			
Cough	16	6	8
Dyspnoea	9	11	10
Productive cough	5	2	2
Rhinorrhoea	2	4	6
Pleural effusion	< 1	7	8
Eye Disorders			
Retinal detachment	13	-	-
Vision blurred	6	1	4
Psychiatric disorders			
Depression	9	7	6
Investigations			
Weight decrease	9	3	3
Blood creatinine increased	1	10	14
Musculoskeletal and connective tissue disorders			
Back pain	8	20	15
Arthralgia	6	7	7
Muscle cramps	2	6	11
Pain in limb	3	5	7
Renal and urinary disorders			
Renal impairment	1	7	12
Dysuria	2	7	6
Immune system disorders			
Graft rejection	-	24	30
Metabolism and nutrition disorders			
Anorexia	5	3	-
Cachexia	5	-	-
Hyperkalaemia	< 1	14	14
Hypokalaemia	2	8	8
Hypomagnesaemia	< 1	8	8
Hyperglycaemia	1	6	7
Appetite decreased	8	4	5
Dehydration	6	5	6
Hypophosphataemia	< 1	9	6
Hypocalcaemia	< 1	4	6
Hepatobiliary disorders			
Hepatic function abnormal	3	9	11
Surgical and medical Procedures			
Post-operative complications	1	12	8
Post-operative pain	2	13	7
Post-operative wound infection	1	11	6
Injury, poisoning and procedural complication			
Wound drainage increased	-	5	9
Wound dehiscence	< 1	5	6

	Patients with CMV retinitis	Solid Organ Transplant Patients Dosing until Day 100 Post-Transplant	
	Valganciclovir	Valganciclovir	Oral ganciclovir
System organ class	(n = 370) %	(n = 244) %	(n = 126) %
Vascular disorders			
Hypotension	1	3	8
Hypertension	3	18	15

Serious adverse events for valganciclovir from these three clinical trials ($n = 614$) with a frequency of less than 5% and which are not mentioned in the two tables above, are listed below:

Blood and lymphatic system disorders: pancytopenia, bone marrow depression, aplastic anaemia

Renal and urinary disorders: decreased renal creatinine clearance

Infections and infestations: local and systemic infections and sepsis

Bleeding complications: potentially life-threatening bleeding associated with thrombocytopenia

Nervous system disorders: convulsion, psychotic disorder, hallucinations, confusion, agitation

General disorder and administration site conditions: valganciclovir hypersensitivity

Severe neutropenia ($ANC < 500/\mu L$) is seen more frequently in CMV retinitis patients (16%) undergoing treatment with valganciclovir than in solid organ transplant patients receiving valganciclovir (5%) or oral ganciclovir (3%) until Day 100 post-transplant. There was a greater increase in serum creatinine seen in solid organ transplant patients treated until Day 100 post-transplant with both valganciclovir and oral ganciclovir when compared to CMV retinitis patients. Impaired renal function is a feature common to solid organ transplantation patients.

The overall safety profile of valganciclovir did not change with the extension of prophylaxis up to 200 days in high risk kidney transplant patients. The incidence of adverse events in this patient population from the IMPACT study is shown in Tables 6 and 7. Table 6 shows adverse events occurring in the first 100 days of the study when all patients were receiving valganciclovir prophylaxis. While, Table 7 shows adverse events occurring after day 100 of the study when only patients in the 200 days arm were receiving valganciclovir (patients in the 100 day arm were receiving placebo).

Table 6 Adverse Events Occurring in $\geq 5\%$ of High Risk Kidney Transplant Patients Treated with valganciclovir (IMPACT Study, Days 1 - 100)

System organ class	100-day arm (n = 164) <u>n (%)</u>	200-day arm (n = 156) <u>n (%)</u>
Gastrointestinal disorders		
Diarrhoea	29 (18)	42 (27)
Constipation	22 (13)	14 (9)
Nausea	14 (9)	13 (8)
Abdominal pain	7 (4)	10 (6)
Dyspepsia	3 (2)	10 (6)
Vomiting	5 (3)	8 (5)
Blood and lymphatic system disorders		
Leucopenia	33 (20)	31 (20)
Anaemia	21 (13)	20 (13)
Neutropenia	20 (12)	15 (10)
General disorders and administration site Conditions		
Oedema peripheral	29 (18)	26 (17)
Pyrexia	11 (7)	10 (6)
Fatigue	4 (2)	12 (8)
Infections and Infestations		
Urinary tract infection	17 (10)	30 (19)
Nasopharyngitis	14 (9)	3 (2)
Upper respiratory tract infection	10 (6)	4 (3)
Nervous System disorders		
Tremor	15 (9)	23 (15)
Headache	14 (9)	9 (6)
Insomnia	10 (6)	10 (6)
Metabolism and nutrition disorders		
Hypophosphataemia	19 (12)	18 (12)
Hyperkalaemia	18 (11)	15 (10)
Hypomagnesaemia	16 (10)	7 (4)
Hyperglycaemia	9 (5)	4 (3)
Vascular disorders		
Hypertension	19 (12)	12 (8)
Hypotension	9 (5)	2 (1)
Investigations		
Blood creatinine increased	16 (10)	11 (7)
Renal and urinary disorders		
Haematuria	7(4)	10 (6)
Immune system disorders		
Transplant rejection	9 (5)	6(4)
Respiratory, thoracic and mediastinal disorders		
Dyspnoea	8 (5)	6 (4)
Cough	8 (5)	3 (2)

Table 7 Adverse Events Occurring in $\geq 5\%$ of High Risk Kidney Transplant Patients Treated with valganciclovir (IMPACT Study, Day 101 onwards)

System Organ Class	100-day arm (n = 164) n (%)	200 day arm (n= 156) n (%)
Blood and lymphatic system disorders		
Leucopenia	7 (4)	30 (19)
Neutropenia	5 (3)	8 (5)
Gastrointestinal disorders		
Diarrhoea	18 (11)	15 (10)
Infections and infestations		
Urinary tract infection	11 (7)	11 (7)
Cytomegalovirus infection	20 (12)	1 (<1)
Nasopharyngitis	7 (4)	10 (6)
Upper respiratory tract infection	4 (2)	11 (7)
Cytomegalovirus syndrome	12 (7)	-
General disorders and administration site conditions		
Pyrexia	10 (6)	6(4)
Respiratory, thoracic and mediastinal disorders		
Cough	9 (5)	4 (3)

Experience with Ganciclovir

Valganciclovir is rapidly converted to ganciclovir. Adverse events reported with ganciclovir, and not mentioned above, are listed below.

Gastrointestinal disorders: abdominal distension, cholangitis, dyspepsia, dysphagia, eructation, oesophagitis, faecal incontinence, flatulence, gastritis, gastrointestinal disorder, gastrointestinal haemorrhage, mouth ulceration, pancreatitis, tongue disorder

General disorders and administration site conditions: ascites, asthenia, bacterial, fungal and viral infections, haemorrhage, malaise, mucous membrane disorder, pain, photosensitivity reaction, rigors, sepsis, taste disturbance, decreased libido

Hepatobiliary disorders: hepatitis, jaundice

Skin and subcutaneous tissue disorders: acne, alopecia, exfoliative dermatitis, dry skin, increased sweating, urticaria

Nervous system disorders: abnormal dreams, amnesia, anxiety, ataxia, coma, dry mouth, emotional disturbance, hyperkinetic syndrome, hypertonia, myoclonic jerks, nervousness, somnolence, tremor

Psychiatric disorder: abnormal thinking

Musculoskeletal and connective tissue disorders: musculoskeletal pain, myasthenic syndrome

Renal and urinary disorders: haematuria present, impotence, renal failure, urinary frequency

Metabolic and nutritional disorders: increased blood alkaline phosphatase, increased blood creatine phosphokinase, decreased blood glucose, increased blood lactic dehydrogenase, decreased blood magnesium, diabetes mellitus, oedema, abnormal hepatic function, hypocalcaemia, hypokalaemia, hypoproteinaemia

Eye disorders: amblyopia, blindness, eye haemorrhage, eye pain, glaucoma, abnormal vision, vitreous disorder

Ear and labyrinth disorders: earache, deafness, tinnitus

Blood and lymphatic system disorders: eosinophilia, leucocytosis, lymphadenopathy, splenomegaly

Cardiac disorders: arrhythmia (including ventricular arrhythmia), deep thrombophlebitis, hypertension, hypotension, migraine, phlebitis, tachycardia, vasodilatation

Respiratory, thoracic and mediastinal disorders: pleural effusion, sinus congestion

Laboratory Abnormalities

Laboratory abnormalities reported with valganciclovir tablets are listed in Table 8 below.

Table 8 Laboratory abnormalities

Laboratory abnormalities	CMV Retinitis Patients	Solid Organ Transplant Patients	
	Valganciclovir (n = 370) %	Valganciclovir (n = 244) %	Oral ganciclovir (n = 126) %
Neutropenia (ANC/ μ L)			
< 500	16	5	3
500 - < 750	17	3	2
750 - < 1000	17	5	2
Anaemia (haemoglobin g/dL)			
< 6.5	7	1	2
6.5 - < 8.0	10	5	7
8.0 - < 9.5	14	31	25
Thrombocytopenia(platelets/ μ L)			
< 25000	3	0	2
25000 - < 50000	5	1	3
50000 - < 100000	21	18	21
Serum creatinine (mg/dL)			
> 2.5	2	14	21
> 1.5 – 2.5	11	45	47

Post-Marketing Experience

Experience with Ganciclovir

Adverse events from post-marketing spontaneous reports with intravenous and oral ganciclovir not mentioned in any section above, and for which a causal relationship cannot be excluded are listed below. As valganciclovir is rapidly and extensively converted to ganciclovir, such adverse events might also occur with valganciclovir.

- Anaphylaxis
- Decreased fertility in males

Adverse events that have been reported during the post-marketing period are consistent with those seen in clinical trials with valganciclovir and ganciclovir.

DOSAGE AND ADMINISTRATION

Caution – Strict adherence to dosage recommendations is essential to avoid overdose.

Valganciclovir is administered orally, and should be taken with food (see **PHARMACOLOGY**, Pharmacokinetics, and Absorption).

Valganciclovir is rapidly and extensively converted to the active ingredient ganciclovir. The bioavailability of ganciclovir from valganciclovir is up to 10-fold higher than from oral ganciclovir, therefore the dosage and administration of valganciclovir tablets or powder for oral solution as described below should be closely followed (see **PRECAUTIONS** and **OVERDOSAGE**).

Treatment of CMV Retinitis in AIDS

Induction Treatment

For patients with active CMV retinitis, the recommended dosage is 900 mg twice daily for 21 days with food. Prolonged induction treatment may increase the risk of bone marrow toxicity (see **PRECAUTIONS**, Haematologic).

Maintenance Treatment

Following induction treatment, or in patients with inactive CMV retinitis the recommended dose is 900 mg once daily with food. Patients whose retinitis worsens may repeat induction treatment (see ***Induction Treatment***).

Prevention of CMV Disease in Transplantation

Kidney Transplant

For kidney transplant patients, the recommended dose is 900 mg once daily with food, starting within 10 days of transplantation until 200 days post-transplantation [see **CLINICAL TRIALS**, IMPACT Study (Study NT18435)].

Solid Organ Transplant other than Kidney

For all other solid organ transplant patients, the recommended dose is 900 mg once daily with food, starting within 10 days of transplantation until 100 days post-transplantation (see **CLINICAL TRIALS**, Study PV16000).

Special Patient Groups

Patients with Renal Impairment

Serum creatinine or creatinine clearance levels should be monitored carefully. Dosage adjustment is required based on creatinine clearance as shown in the Table 9 below (see **PHARMACOLOGY**, Pharmacokinetics in Special Populations and **PRECAUTIONS**).

Table 9 Valganciclovir Tablets Dose for Renally Impaired Patients

CrCl (mL/min)	Induction Dose of tablets	Maintenance/ Prevention Dose of tablets
≥ 60	900 mg twice daily	900 mg once daily
40 – 59	450 mg twice daily	450 mg once daily
25 – 39	450 mg once daily	450 mg every 2 days
10 – 24	450 mg every 2 days	450 mg twice weekly
< 10	not recommended	not recommended

* Creatinine clearance can be calculated from serum creatinine by the following formula:

$$\text{For males} = \frac{(140 - \text{age}[\text{years}]) \times (\text{body weight} [\text{kg}])}{(72) \times (0.011 \times \text{serum creatinine} [\text{micromol/L}])}$$

For females = 0.85 x male value

Patients with severe leucopenia, neutropenia, anaemia, thrombocytopenia and/or pancytopenia

Severe leucopenia, neutropenia, anaemia, thrombocytopenia, pancytopenia, bone marrow depression and aplastic anaemia have been observed in patients treated with valganciclovir (and ganciclovir). Therapy should not be initiated if the absolute neutrophil count is less than 500 cells/ μL or the platelet count is less than 25,000/ μL or the haemoglobin is less than 8 g/100 mL (see **CONTRAINDICATIONS**, **PRECAUTIONS** and **ADVERSE EFFECTS**).

Paediatric Patients (Powder for oral solution can be available from other brand/s)

The safety and efficacy of valganciclovir in paediatric patients have not been established in adequate and well-controlled clinical studies.

In paediatric solid organ transplant patients, aged 4 months to 16 years, who are at risk of developing CMV disease, the recommended once daily dose of valganciclovir is based on body surface area (BSA) and creatinine clearance (CrCl) derived from Schwartz formula, and is calculated using the equation below:

Paediatric Dose (mg) = 7 x BSA x CrCl (calculated using the Schwartz formula). If the calculated Schwartz creatinine clearance exceeds 150 mL/min/1.73m², then a maximum value of 150 mL/min/1.73m² should be used in the equation.

$$\text{Mosteller BSA (m}^2\text{)} = \sqrt{\frac{\text{Height (cm)} \times \text{Weight (kg)}}{3600}}$$

$$\text{Schwartz Creatinine Clearance (ml / min / 1.73m}^2\text{)} = \frac{k \times \text{Height (cm)}}{\text{Serum Creatinine (mg / dL)}}$$

where $k = 0.45$ for patients aged < 2 years, 0.55 for boys aged 2 to < 13 years and girls aged 2 to 16 years, and 0.7 for boys aged 13 to 16 years.

All calculated doses should be rounded to the nearest 25 mg increment for the actual deliverable dose. If the calculated dose exceeds 900 mg, a maximum dose of 900 mg should be administered. The oral solution is the preferred formulation since it provides the ability to administer a dose calculated according to the formula above; however, valganciclovir tablets may be used if the calculated doses are within 10% of available tablet doses. For example, if the calculated dose is between 405 mg and 495 mg, one 450 mg tablet may be taken.

Clinical consideration should be given to close clinical and laboratory monitoring and therapeutic drug monitoring of plasma ganciclovir concentrations, in young children with high creatinine clearance values.

Handling and Disposal

Caution should be exercised in the handling of valganciclovir tablets. Valganciclovir tablets should not be broken or crushed. Since valganciclovir is considered a potential teratogen and carcinogen in humans and inhibits spermatogenesis, caution should be observed in handling valganciclovir tablets. Avoid direct contact of broken or crushed tablets with skin or mucous membranes. If such contact occurs, wash thoroughly with soap and water, and rinse eyes thoroughly with sterile water, or plain water if sterile water is unavailable.

The release of medicines into the environment should be minimised. Medicines should not be disposed of via wastewater and disposal through household waste should be avoided. Unused or expired medicine should be returned to a pharmacy for disposal.

OVERDOSAGE

Overdose Experience with Valganciclovir Tablets

One adult developed fatal bone marrow depression (medullary aplasia) after several days of dosing that was at least 10 -fold greater than recommended for the patient's estimated degree of renal impairment (decreased creatinine clearance).

It is expected that an overdose of valganciclovir could also possibly result in increased renal toxicity (see **PRECAUTIONS** and **DOSAGE AND ADMINISTRATION**, Patients with Renal Impairment).

Haemodialysis and hydration may be of benefit in reducing blood plasma levels in patients who receive an overdose of valganciclovir (see **PHARMACOLOGY**, Pharmacokinetics in Special Populations).

Overdose Experience with Intravenous Ganciclovir

Toxic manifestations seen in animals given very high single intravenous doses of ganciclovir (500 mg/kg) included emesis, hypersalivation, anorexia, bloody diarrhoea, inactivity, cytopenia, elevated liver function test results, elevated serum urea, testicular atrophy, and death.

Reports of overdoses with intravenous ganciclovir have been received from clinical trials and during post-marketing experience. In some of these cases no adverse events were reported. The majority of patients experienced one or more of the following adverse events.

- *Haematological toxicity*: pancytopenia, bone marrow depression, medullary aplasia, leucopenia, neutropenia, granulocytopenia
- *Hepatotoxicity*: hepatitis, liver function disorder

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- *Renal toxicity*: worsening of haematuria in a patient with pre-existing renal impairment, acute renal failure, and elevated creatinine.
 - *Gastrointestinal toxicity*: abdominal pain, diarrhoea, vomiting
 - *Neurotoxicity*: generalised tremor, convulsion

Treatment of overdose should consist of general supportive measures.

Contact the Poisons Information Centre on telephone 13 11 26 for advice on management of overdose.

PRESENTATION AND STORAGE CONDITIONS

Valganciclovir Tablets

Valganciclovir Sandoz (valganciclovir HCl) is available as 450 mg pink convex oval tablets with "J" on one side and "156" on the other side. Each tablet contains 450 mg valganciclovir. Valganciclovir Sandoz is supplied in blister packs (AI/AI) of 60 tablets. Valganciclovir Sandoz tablets should be stored at below 25 °C.

Protect from light.

NAME AND ADDRESS OF THE SPONSOR

Sandoz Pty Ltd
ABN 60 075 449 553
54 Waterloo Road, Macquarie Park
NSW 2113
Australia

Tel: 1800 634 500

POISON SCHEDULE OF THE MEDICINE

Schedule 4 – Prescription Only Medicine

DATE OF FIRST INCLUSION IN THE AUSTRALIAN REGISTER OF THERAPEUTIC GOODS (THE ARTG): 09/12/2016

DATE OF MOST RECENT AMENDMENT: N/A