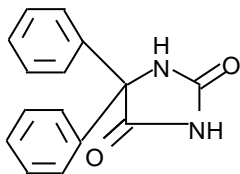


DATA SHEET

DILANTIN[®]

Phenytoin



Description

Phenytoin is chemically described as 5,5-diphenylimidazolidine-2,4-dione. It is a white, or almost white, odourless or almost odourless, crystalline powder. It is very slightly soluble in water and soluble 1 in 70 alcohol.

Phenytoin sodium is the sodium salt of phenytoin. It is a white, odourless, slightly hygroscopic crystalline powder. It is soluble in water and alcohol.

Dilantin Capsules contain phenytoin sodium 30 mg and 100 mg. The 30 mg capsules also contain sucrose, magnesium stearate, maize starch, – purified talc, titanium dioxide, carbon black and gelatin. The 100 mg capsules also contain sucrose, lactose, maize starch, – purified talc, magnesium stearate, titanium dioxide, sunset yellow FCF, erythrosine, carbon black and gelatin.

Dilantin Infatabs contain phenytoin 50 mg with sucrose, sunset yellow FCF, maize starch, quinoline yellow, saccharin sodium, magnesium stearate, purified talc and spearmint flavour.

Dilantin Paediatric Suspension contains phenytoin 30 mg/5 mL. Dilantin Paediatric Suspension also contains sodium benzoate, sucrose, glycerol, aluminium magnesium silicate, carmellose sodium, polysorbate 40, vanillin, orange oil terpeneless, ethanol, carmosine, sunset yellow FCF, citric acid monohydrate, hydrochloric acid, banana flavour and purified water.

Pharmacology

Pharmacological Action

Dilantin is an anticonvulsant drug which can be useful in the treatment of epilepsy. The primary site of action appears to be the motor cortex, where the spreading of seizure activity is inhibited. It is likely that, by promoting sodium efflux from neurones, Dilantin tends to stabilise the threshold against hyperexcitability caused by excessive stimulation or those environmental changes capable of reducing the gradient of sodium ions through membranes. This also applies to the reduction of post-tetanic potentiation at synapse level. Losing post-

tetanic potential prevents the cortical seizure foci from deteriorating neighbouring cortical areas. In this sense, Dilantin reduces the maximal activity of brain stem centres associated with the tonic phase of grand mal seizures.

Pharmacokinetics

In general the reported plasma half-life of phenytoin averages 22 hours, with a range of 7 to 42 hours. Steady state therapeutic levels are achieved at least 7 to 10 days (5 to 7 half-lives) after initiation of therapy with recommended doses of 300 mg/day.

Conventionally, with drugs following linear kinetics the half-life is used to determine the dose rate, drug accumulation and the time to reach steady state. Phenytoin however, demonstrates non-linear kinetics and therefore the half-life is affected by the degree of absorption, saturation of metabolic pathways, dose and the degree of metabolic enzyme induction. This results in considerable inter- and intra- patient variability in phenytoin pharmacokinetics. As a consequence the clinical relevance of reported phenytoin half-life values are limited and cannot be used in the conventional manner to estimate the dosage regimen. When administering phenytoin to a patient it is necessary to measure serum levels as this provides the most accurate means of deriving a suitable dosage regimen.

Serum level determinations should originally be obtained at least 7 to 10 days after treatment initiation, dosage change, or addition or subtraction of another drug to the regimen so that equilibrium or steady state will have been achieved. Further serum level determinations may be required to further refine the dosage regimen. Trough levels provide information about clinically effective serum level range and confirm patient compliance and are obtained just prior to the patient's next scheduled dose. Peak drug levels indicate an individual's threshold for emergence of dose-related side effects and are obtained at the time of expected peak concentration.

Optimum control without clinical signs of toxicity occurs more often with serum levels between 10 and 20 µg/mL.

In most patients maintained at steady dosage, stable phenytoin serum levels are achieved. There may be wide interpatient variability in phenytoin serum levels with equivalent dosages. Patients with unusually low levels may be noncompliant or hypermetabolisers of phenytoin.

Unusually high levels of phenytoin result from liver disease, congenital enzyme deficiency or drug interactions which result in metabolic interference. The patient with large variations in phenytoin plasma levels, despite standard doses, present a difficult clinical problem. Serum level determinations in such patients may be particularly helpful. As phenytoin is highly protein bound, free phenytoin levels may be altered in patients whose protein binding characteristics differ from normal. Protein binding may be lower in neonates and hyperbilirubinaemic infants; also altered in patients with hypoalbuminaemia, uraemia or acute trauma and in pregnancy.

Most of the drug is excreted in the bile as inactive metabolites which are then reabsorbed from the intestinal tract and excreted in the urine. Urinary excretion of phenytoin and its metabolites occurs partly with glomerular filtration but more importantly by tubular secretion. Because phenytoin is hydroxylated in the liver by an enzyme system which is saturable at high plasma levels, small incremental doses may increase the half-life and produce very

substantial increases in serum levels, when these levels are at or above the upper therapeutic range.

The steady-state level may be disproportionately increased, with resultant intoxication, from an increase in dosage of 10% or more.

Pharmacokinetic Interactions

Co-administration of nelfinavir tablets (1,250 mg twice a day) with phenytoin capsules (300 mg once a day) did not change the plasma concentration of nelfinavir. However, co-administration of nelfinavir reduced the AUC values of phenytoin (total) and free phenytoin by 29% and 28% respectively.

Indications

Dilantin is indicated for the control of grand mal and psychomotor seizures. Dilantin will prevent or effectively decrease the incidence and severity of convulsive seizures in a high percentage of cases, with patients exhibiting little tendency to become resistant to its action. Besides its effectiveness in controlling seizures, Dilantin frequently improves the mental condition and outlook of epileptic patients and there is also increasing evidence that Dilantin is valuable in the prevention of seizures occurring during or after neurosurgery and in the treatment of certain cardiac arrhythmias. Phenytoin serum level determinations may be necessary for optimal dosage adjustments (see **Dosage and Administration**).

Contraindications

Patients with a history of hypersensitivity to phenytoin or other hydantoin products.

Precautions

General

Abrupt withdrawal of phenytoin in epileptic patients may precipitate status epilepticus, hence any need for dosage reduction, discontinuation, or substitution of alternative antiepileptic medication should be implemented gradually. However, in the event of an allergic or hypersensitivity reaction, rapid substitution of an alternative therapy may be necessary. In this case, alternative therapy should be an antiepileptic drug not belonging to the hydantoin chemical class.

Suicidal Behaviour and Ideation

Antiepileptic drugs (AEDs), including phenytoin, increase the risk of suicidal thoughts or behaviour in patients taking these drugs for any indication. Patients treated with any AED for any indication should be monitored for the emergence or worsening of depression, suicidal thoughts or behaviour, and/or any unusual changes in mood or behaviour.

Pooled analyses of 199 placebo-controlled clinical trials (mono- and adjunctive therapy) of 11 different AEDs showed that patients randomized to one of the AEDs had approximately twice the risk (adjusted Relative Risk 1.8, 95% CI:1.2, 2.7) of suicidal thinking or behaviour compared to patients randomized to placebo. In these trials, which had a median treatment duration of 12 weeks, the estimated incidence rate of suicidal behaviour or ideation among 27,863 AED-treated patients was 0.43%, compared to 0.24% among 16,029 placebo-treated patients, representing an increase of approximately one case of suicidal thinking or behaviour for every 530 patients treated. There were four suicides in drug-treated patients in the trials and none in placebo-treated patients, but the number is too small to allow any conclusion about drug effect on suicide.

The increased risk of suicidal thoughts or behaviour with AEDs was observed as early as one week after starting drug treatment with AEDs and persisted for the duration of treatment assessed. Because most trials included in the analysis did not extend beyond 24 weeks, the risk of suicidal thoughts or behaviour beyond 24 weeks could not be assessed.

The risk of suicidal thoughts or behaviour was generally consistent among drugs in the data analysed. The finding of increased risk with AEDs of varying mechanisms of action and across a range of indications suggests that the risk applies to all AEDs used for any indication. The risk did not vary substantially by age (5-100 years) in the clinical trials analysed. Table 1 shows absolute and relative risk by indication for all evaluated AEDs.

Table 1 Risk by indication for antiepileptic drugs in the pooled analysis

| Indication | Placebo Patients with Events Per 1000 Patients | Drug Patients with Events Per 1000 Patients | Relative Risk: Incidence of Events in Drug Patients/Incidence in Placebo Patients | Risk Difference: Additional Drug Patients with Events Per 1000 Patients |
|-------------|--|---|---|---|
| Epilepsy | 1.0 | 3.4 | 3.5 | 2.4 |
| Psychiatric | 5.7 | 8.5 | 1.5 | 2.9 |
| Other | 1.0 | 1.8 | 1.9 | 0.9 |
| Total | 2.4 | 4.3 | 1.8 | 1.9 |

The relative risk for suicidal thoughts or behaviour was higher in clinical trials for epilepsy than in clinical trials for psychiatric or other conditions, but the absolute risk differences were similar for the epilepsy and psychiatric indications.

Anyone considering prescribing phenytoin or any other AED must balance this risk with the risk of untreated illness. Epilepsy and many other illnesses for which AEDs are prescribed are themselves associated with morbidity and mortality and an increased risk of suicidal thoughts and behaviour. Should suicidal thoughts and behaviour emerge during treatment, the prescriber needs to consider whether the emergence of these symptoms in any given patient may be related to the illness being treated.

Patients, their caregivers, and families should be informed that AEDs increase the risk of suicidal thoughts and behaviour and should be advised of the need to be alert for the emergence or worsening of the signs and symptoms of depression, any unusual changes in mood or behaviour, or the emergence of suicidal thoughts, behaviour, or thoughts about self-harm. Behaviours of concern should be reported immediately to the treating doctor.

Cases of acute hepatotoxicity, including infrequent cases of acute hepatic failure, have been reported with phenytoin. These incidents have been associated with a hypersensitivity syndrome characterised by fever, skin eruptions and lymphadenopathy, and usually occur within the first 2 months of treatment. Other common manifestations include jaundice, hepatomegaly, elevated serum transaminase levels, leukocytosis and eosinophilia. The clinical course of acute phenytoin hepatotoxicity ranges from prompt recovery to fatal outcomes. In these patients with acute hepatotoxicity, phenytoin should be immediately discontinued and not re-administered.

There have been a number of reports suggesting a relationship between phenytoin and the development of lymphadenopathy (local or generalised) including benign lymph node hyperplasia, pseudolymphoma, lymphoma, and Hodgkin's Disease. Although a cause and effect relationship has not been established, the occurrence of lymphadenopathy indicates the need to differentiate such a condition from other types of lymph node pathology. Lymph node involvement may occur with or without symptoms and signs resembling serum sickness *e.g.* fever, rash and liver involvement.

In all cases of lymphadenopathy, follow-up observation for an extended period is indicated and every effort should be made to achieve seizure control using alternative antiepileptic drugs.

Acute alcoholic intake may increase phenytoin serum levels while chronic alcoholic use may decrease serum levels.

Anticonvulsant Hypersensitivity Syndrome (AHS) is a rare drug induced, multiorgan syndrome which is potentially fatal and occurs in some patients taking anticonvulsant medication. It is characterized by fever, rash, lymphadenopathy, and other multiorgan pathologies, often hepatic. The mechanism is unknown. The interval between first drug exposure and symptoms is usually 2-4 weeks but has been reported in individuals receiving anticonvulsants for 3 or more months.

Patients at higher risk for developing AHS include black patients, patients who have a family history of or who have experienced this syndrome in the past, and immuno-suppressed patients. The syndrome is more severe in previously sensitized individuals. If a patient is diagnosed with AHS, discontinue the phenytoin and provide appropriate supportive measures.

In view of isolated reports associating phenytoin with exacerbation of porphyria, caution should be exercised in using this medication in patients suffering from this disease.

The main site of biotransformation of phenytoin is the liver, so patients with impaired liver function, elderly patients or those gravely ill, may show early signs of toxicity on standard dosage. Care should be exercised with dose adjustment in these patients.

In some individuals, the rate of phenytoin metabolism has been shown to be slower than normal. This slow rate of degradation may be due to enzymatic unavailability or to defective induction mechanisms, effects that appear to be genetically determined.

Toxic hepatitis, liver damage and hypersensitivity syndrome have been reported and may, in rare cases, be fatal.

Phenytoin can cause rare, serious skin adverse events such as exfoliative dermatitis, Stevens-Johnson Syndrome (SJS), and toxic epidermal necrolysis (TEN), which can be fatal. Although serious skin reactions may occur without warning, patients should be alert for the signs and symptoms of skin rash and blisters, fever, or other signs hypersensitivity such as itching, and should seek medical advice from their physician immediately when observing any indicative signs or symptoms. The physician should advise the patient to discontinue treatment if the rash appears. If the rash is of a milder type (measles-like or scarlatiniform), therapy may be resumed after the rash has completely disappeared. If the rash recurs upon reinstatement of therapy, further phenytoin medication is contraindicated. Published literature has suggested that there may be an increased, although still rare, risk of hypersensitivity reactions, including skin rash, SJS, TEN, hepatotoxicity, and Anticonvulsant Hypersensitivity Syndrome in black patients.

Studies in patients of Chinese ancestry have found a strong association between the risk of developing SJS/TEN and the presence of HLA-B*1502, an inherited allelic variant of the HLA B gene, in patients using carbamazepine. Limited evidence suggests that HLA-B*1502 may be a risk factor for the development of SJS/TEN in patients of Asian ancestry taking drugs associated with SJS/TEN, including phenytoin. Consideration should be given to avoiding use of drugs associated with SJS/TEN, including phenytoin, in HLA-B*1502 positive patients when alternative therapies are otherwise equally available.

Literature reports suggest that the combination of phenytoin, cranial irradiation and the gradual reduction of corticosteroids may be associated with the development of erythema multiforme, and / or Stevens-Johnson syndrome, and / or toxic epidermal necrolysis.

Phenytoin and other hydantoin are contraindicated in patients who have experienced phenytoin hypersensitivity. Additionally caution should be exercised if using structurally similar compounds (*e.g.* barbiturates, succinimides, oxazolinediones and other related compounds) in these same patients.

While *macrocytosis* and megaloblastic anaemia have occurred, these conditions usually respond to folic acid therapy. If folic acid is added to phenytoin therapy, a decrease in seizure control may occur.

Hyperglycaemia, resulting from the drug's inhibitory effects on insulin release, has been reported. Phenytoin may also raise the serum glucose level in diabetic patients.

Phenytoin and other anticonvulsants that have been shown to induce the CYP450 enzyme are thought to affect bone mineral metabolism indirectly by increasing the metabolism of Vitamin D3. This may lead to Vitamin D deficiency and heightened risk of osteomalacia, bone fractures, osteoporosis, hypocalcaemia and hypophosphatemia in chronically treated epileptic patients.

Phenytoin is not indicated for seizures due to hypoglycaemic or other metabolic causes. Appropriate diagnostic procedures should be performed as indicated.

Phenytoin is not effective for absence (petit-mal) seizures. If tonic-clonic (grand-mal) and absence (petit-mal) seizures are present, combined drug therapy is needed.

Serum levels of phenytoin sustained above the optimal range may produce confusional states referred to as delirium, psychosis or encephalopathy, or rarely irreversible cerebellar dysfunction. Accordingly, at the first sign of acute toxicity, determination of plasma drug levels is recommended. Dose reduction of phenytoin therapy is indicated if plasma drug levels are excessive; if symptoms persist, termination of phenytoin therapy is recommended.

It is recommended that patients receiving long-term Dilantin therapy should undergo regular blood counts as serious haematological abnormalities have been reported (see Adverse Reactions).

Hypoalbuminaemia, from any cause, may be potentially toxic through its effect on increasing unbound phenytoin levels.

Use in Pregnancy: Category D

The risk of a mother with epilepsy giving birth to a baby with an abnormality is about three times that of the normal population. Some of this risk is due to the anticonvulsant drugs taken.

Mothers taking more than one anticonvulsant drug might have a higher risk of having a baby with a malformation than mothers taking one drug.

A number of reports suggest an association between the use of anticonvulsant drugs by women with epilepsy and a higher incidence of birth defects in children born to these women. Data are more extensive with respect to phenytoin and phenobarbital, but these are also the most commonly prescribed anticonvulsant drugs. Less systematic or anecdotal reports suggest a possible similar association with the use of all known anticonvulsant drugs.

The reports suggesting a higher incidence of birth defects in children of drug-treated epileptic women cannot be regarded as adequate to prove a definite cause and effect relationship. There are intrinsic methodologic problems in obtaining adequate data on drug teratogenicity in humans. Genetic factors or the epileptic condition itself may be more important than drug therapy in leading to birth defects. The great majority of mothers on anticonvulsant medication deliver normal infants.

It is important to note that antiepileptic drugs should not be discontinued in patients in whom the drug is administered to prevent major seizures, because of the strong possibility of precipitating status epilepticus with attendant hypoxia and threat to life. In individual cases where the severity and frequency of the seizure disorder are such that the removal of medication does not pose a serious threat to the patient, discontinuation of the drug may be considered prior to and during pregnancy, although it cannot be said with any confidence that even minor seizures do not pose some hazard to the developing embryo and foetus. The prescribing physician will wish to weigh these considerations in treating and counselling epileptic women of childbearing potential.

In addition to the reports of increased incidence of congenital malformations such as cleft lip/palate and heart malformations in children of women receiving phenytoin and other anticonvulsant drugs, there have been reports of a “foetal hydantoin syndrome”. This consists of prenatal growth deficiency, microcephaly and mental deficiency in children born to mothers who have received phenytoin, barbiturates, alcohol or trimethadione. However, these features are all interrelated and are frequently associated with intrauterine growth retardation from other causes.

There have been isolated reports of malignancies including neuroblastoma, in children whose mothers received phenytoin during pregnancy.

An increase in seizure frequency during pregnancy occurs in a high proportion of patients, because of altered phenytoin absorption or metabolism. Periodic measurement of serum phenytoin levels is particularly valuable in the management of a pregnant epileptic patient as a guide to an appropriate adjustment of dosage. However, postpartum restoration of the original dosage will probably be indicated. Neonatal coagulation defects have been reported within the first 24 hours in babies born to epileptic mothers receiving phenobarbital and / or phenytoin. Vitamin K₁ has been shown to prevent or correct this defect and has been recommended to be given to the mother before delivery and the neonate after birth.

Use during Lactation

Infant breast-feeding is not recommended for women taking this drug because phenytoin appears to be secreted in low concentration in human milk. Phenytoin concentrations in breast milk is approximately one-third of the corresponding maternal plasma concentration.

Drug Interactions

There are many drugs which may increase or decrease phenytoin levels or which phenytoin may affect. These may result through an affect on metabolic degradation of phenytoin, interference with protein binding, alteration of absorption or by other mechanisms. Serum level determinations for phenytoin are especially helpful when possible drug interactions are suspected. The most commonly occurring drug interactions are listed below:

1. Drugs which may increase phenytoin serum levels include: acute alcohol intake, amiodarone, amphotericin B, azapropazone, chloramphenicol, chlordiazepoxide, cimetidine, clopidrogel, diazepam, dicumarol diltiazem, disulfiram, erythromycin, felbamate, fluconazole, fluoxetine, fluvoxamine, H₂-antagonists, halothane, isoniazid,

itraconazole, ketoconazole, methylphenidate, miconazole, nifedipine, oestrogens, omeprazole, phenothiazines, phenylbutazone, salicylates, sertraline, succinimides (ethosuximide, methsuximide, phensuximide), sulfonamides, ticlopidine, tolbutamide, trazodone, viloxazine.

Increased phenytoin plasma concentrations have been reported during concomitant use of phenytoin with capecitabine or its metabolite fluorouracil (5FU). Formal interaction studies between phenytoin and capecitabine have not been conducted, but the mechanism of interaction is presumed to be inhibition of the CYP2C9 isoenzyme system by capecitabine. Patients taking phenytoin concomitantly with capecitabine or fluorouracil should be regularly monitored for increased phenytoin plasma levels.

2. Drugs which may decrease phenytoin levels include: antibacterial agents/ fluoroquinolones (such as ciprofloxacin and rifampicin), chronic alcohol abuse, diazoxide, folic acid, reserpine, sucralfate, theophylline and vigabatrin and *Hypericum perforatum* (St John's wort). Calcium ions may interfere with the absorption of phenytoin. Ingestion times of phenytoin and antacid preparations containing calcium should be staggered in patients with low serum phenytoin levels to prevent absorption problems.

A pharmacokinetic interaction study between nelfinavir and phenytoin both administered orally showed that nelfinavir reduced AUC values of phenytoin (total) and free phenytoin by 29% and 28% respectively. Therefore, phenytoin concentration should be monitored during co-administration with nelfinavir, as nelfinavir may reduce phenytoin plasma concentration.

3. Drugs which may either increase or decrease phenytoin serum levels include: antineoplastic agents, carbamazepine, chlordiazepoxide, ciprofloxacin, diazepam, phenobarbital, sodium valproate and valproic acid. Similarly, the effect of phenytoin on carbamazepine, phenobarbital, valproic acid and sodium valproate serum levels is unpredictable.
4. Although not a true drug interaction, tricyclic antidepressants may precipitate seizures in susceptible patients and phenytoin dosage may need to be adjusted.
5. Drugs whose efficacy is impaired by phenytoin include: alcuronium, chlorpropamide, clozapine, corticosteroids, coumarin anticoagulants, cyclosporin, doxycycline, frusemide, glibenclamide, lamotrigine, methadone, nifedipine, nimodipine, oestrogens, oral contraceptives, pancuronium, paroxetine, praziquantel, quinidine, rifampicin, tetracycline, theophylline, tolbutamide, verapamil, vecuronium, vitamin D.

Drug-Enteral Feeding/Nutritional Preparations Interaction

Literature reports suggest that patients who have received enteral feeding preparations and/or related nutritional supplements have lower than expected phenytoin serum levels. It is therefore suggested that phenytoin not be administered concomitantly with an enteral feeding preparation.

More frequent serum phenytoin level monitoring may be necessary in these patients.

Drug/Laboratory Test Interactions

Phenytoin may cause decreased serum levels of protein bound iodine (PBI). It may also produce lower than normal values for dexamethasone or metyrapone tests. Phenytoin may cause raised serum levels of glucose, alkaline phosphatase, and gamma glutamyl transpeptidase (GGT). Raised glucose levels appear to be due to inhibition of insulin secretion.

Adverse Reactions

Body as a Whole

Anaphylactoid reaction and anaphylaxis.

Gastrointestinal System

Nausea, vomiting, constipation, toxic hepatitis and liver damage. To prevent gastric irritation due to alkalinity, Dilantin should be taken with at least half a glass of water. Gastric irritation may often be minimised by administering Dilantin during or following meals or by using Dilantin Suspension.

Haemopoietic System

Some fatal haemopoietic complications have occasionally been reported in association with the administration of phenytoin. Included in these are thrombocytopenia, leucopenia, granulocytopenia, agranulocytosis and pancytopenia with or without bone marrow suppression. While macrocytosis and megaloblastic anaemia have occurred, these conditions usually respond to folic acid therapy.

Lymphadenopathy including benign lymph node hyperplasia, pseudolymphoma, lymphoma and Hodgkin's Disease have been reported (see Precautions).

Cardiovascular

Periarteritis nodosa.

Central Nervous System

The most common manifestations encountered with phenytoin therapy are referable to this system and are usually dose-related. These include nystagmus, ataxia, slurred speech, *decreased coordination*, and mental confusion. Cases of dizziness, insomnia, transient nervousness, motor twitchings headache, paraesthesia and somnolence have also been reported.

There have also been rare reports of phenytoin induced dyskinesias, including chorea, dystonia, tremor and asterixis, similar to those induced by phenothiazine and other

neuroleptic drugs. A predominantly sensory peripheral polyneuropathy has been observed in patients receiving long-term phenytoin therapy.

Antiepileptic drugs have been associated with an increased risk of suicidal behaviour, suicidal ideation and emergence or worsening of existing depression

Immunologic

Hypersensitivity syndrome (which may include, but is not limited to, symptoms such as arthralgias, eosinophilia, fever, liver dysfunction, lymphadenopathy or rash) systemic lupus erythematosus, periarteritis nodosa and immunoglobulin abnormalities.

Connective Tissue System

Coarsening of the facial features, enlargement of the lips, gingival hyperplasia, hypertrichosis and Peyronie's Disease.

Musculoskeletal System

Bone fractures and osteomalacia have been associated with long-term (>10 years) use of phenytoin by patients with chronic epilepsy. Osteoporosis and other disorders of bone metabolism such as hypocalcaemia, hypophosphatemia and decreased serum levels of Vitamin D metabolites have also been reported.

Integumentary System

Dermatological manifestations sometimes associated with fever have included scarlatiniform or morbilliform rashes. The latter case is the most common with other types of dermatitis being more rare. In general, rashes are more frequent in children and young adults. More serious forms which may be fatal have also been reported and they include bullous, exfoliative, or other purpuric dermatitis, lupus erythematosus, Stevens-Johnson syndrome and toxic epidermal necrolysis (see Precautions).

Hepatic System

Potentially fatal cases of toxic hepatitis and liver damage may occur. This effect may be the result of a hypersensitivity reaction.

Special Senses

Taste perversion.

Miscellaneous

Gingival hyperplasia occurs frequently and its incidence may be reduced by good oral hygiene, including gum massage, frequent brushing and appropriate dental care.

Hirsutism.

Dosage and Administration

Serum concentrations should be monitored and care should be taken when switching a patient from the sodium salt to the free acid form.

Dilantin capsules (30 mg, 100 mg) are formulated with the sodium salt of phenytoin.

The free acid form of phenytoin is used in Dilantin Infatabs (50 mg) and Dilantin Paediatric Suspension (30 mg/5 mL).

Because there is approximately an 8% increase in drug content with the free form over that of the sodium salt, dosage adjustments and serum level monitoring may be necessary when switching from a product formulated with the free acid to a product formulated with the sodium salt and vice versa.

General

Dosage should be individualised to obtain maximum benefit. In some cases, serum blood level determinations may be necessary for optimal dosage adjustments. Serum levels between 10 and 20 µg/mL are considered to be clinically effective. With the recommended dosage, a period of at least 7 to 10 days may be required to achieve therapeutic blood levels of Dilantin, unless therapy is initiated with a loading dose. After the initial dose has been prescribed, plasma levels should be determined and the dosage adjusted if necessary to obtain a level in the therapeutic range; 10 to 20 µg/mL (40 to 80 µmoles/L). Because phenytoin is hydroxylated in the liver by an enzyme system which is saturable, at high plasma levels small incremental doses may increase the half-life and produce very substantial increases in serum levels, when these are in the upper range.

Oral Administration

Although phenytoin has a relatively long plasma half-life, thrice daily dosing may reduce the incidence of gastric irritation since lower doses can be administered with thrice daily dosing as compared with twice daily dosing. Recent studies suggest that a better correlation is achieved between plasma levels and dose by expressing the latter on a body-weight basis.

Adult

Initiate therapy with 4 to 5 mg/kg/day in 2 to 3 divided doses and assess plasma levels. A further upward dosage adjustment may be required to a maximum of 600 mg/day, dosage increments should be made at about 2 week intervals. Plasma phenytoin levels should be monitored should higher doses be required.

An initial dose of 6 to 7 mg/kg/day would be more likely to ensure therapeutic levels however, there is a risk that such a dose may achieve levels exceeding 20 µg/mL and increase the risk of toxicity.

Paediatric

Initiate therapy with 5 mg/kg/day in 2 to 3 equally divided doses not to exceed 300 mg daily. A recommended daily maintenance dosage is usually 4 to 8 mg/kg. Children over 6 years may require the minimum adult dose (300 mg/day).

Paediatric dosage forms available include Dilantin Chewable Infatabs and Dilantin Paediatric Suspension.

Overdosage

Symptoms

There are marked variations among individuals with respect to phenytoin plasma levels where toxicity may occur. Nystagmus or lateral gaze, usually appears at 20 µg/mL, ataxia at 30 µg/mL, dysarthria and lethargy appear when the plasma concentration is over 40 µg/mL, but as high a concentration as 50 µg/mL has been reported without evidence of toxicity. As much as 25 times the therapeutic dose has been taken to result in a serum concentration above 100 µg/mL with complete recovery. The lethal dose in children is not known. The lethal dose in adults is estimated to be 2 to 5g.

The cardinal initial symptoms are nystagmus, ataxia, dysarthria and CNS depression. Other signs that may be seen are tremor, hyperreflexia, somnolence, drowsiness, lethargy, hallucinations, confusion, mental status changes, slurred speech, blurred vision, nausea, vomiting, choreoathetosis, dyskinesias, hyperglycaemia and mild hypoglycaemia. Severe poisoning may result in respiratory depression. Cardiotoxicity has not been reported with oral overdoses. Cerebellar atrophy has been reported as a delayed effect following severe overdoses. The patient may become comatose and hypotensive. Death is due to respiratory and circulatory depression.

Pharmacokinetic Information

In overdose settings, saturation of the hepatic hydroxylation system occurs and zero order kinetics predominate. Elimination follows a Michaelis-Menten model with a prolonged half-life. As phenytoin is continually excreted, elimination changes from zero order to first order kinetics and drug levels decrease more.

Serial plasma phenytoin concentrations should be monitored. In acute overdose, peak levels are frequently delayed for 24 to 48 hours, and occasionally as long as 7 days.

The proportion of phenytoin in plasma not bound to protein is an important measure of potential toxicity with free phenytoin levels of <1.5 µg/mL indicating no signs of toxicity; 1.5 to 5 µg/mL seen with mild to moderate intoxication; and levels above 5 µg/mL associated with severe intoxication.

Treatment

Treatment is non-specific since there is no known antidote. Most cases of overdosage may be managed conservatively with symptomatic and supportive care. Signs and symptoms of toxicity may persist up to 7 to 10 days after ingestion.

Phenytoin is poorly absorbed in the stomach, therefore although routine use of activated charcoal is not recommended, it may be considered in the rare patient with a life threatening

ingestion. In patients who are not fully conscious or have impaired gag reflex, consideration should be given to administering activated charcoal via a nasogastric tube, once the airway is protected. Administration of a further dose of activated charcoal may be considered in patients with rising serum phenytoin levels or worsening clinical condition despite initial decontamination.

Peritoneal dialysis, diuresis, haemodialysis, plasmapheresis, haemofiltration and total exchange transfusion may be of little benefit although the latter has been used in the treatment of severe intoxication in children.

In acute overdosage the possibility of other CNS depressants, including alcohol, should be borne in mind.

Contact the National Poisons Centre for advice on the management of an overdose.

Presentation

Capsules 100 mg as the sodium (white / orange, marked Parke Davis and P-D 100): 200s.

Capsules 30 mg as the sodium (white, marked Parke Davis, P-D 30): 200s.

Infatabs 50 mg (chewable tablets, spearmint-flavoured, for children, triangular, yellow, scored, marked P-D 007): 200s.

Paediatric Suspension (reddish-pink suspension), 30 mg/5 mL: 500 mL

Pharmaceutical Precautions

Capsules – Store below 30°C.

Infatabs – Store below 30°C

Paediatric Suspension – Store below 25°C.

Medicine Classification

Prescription Medicine.

Package Quantities

Capsules: 100 mg: 200's. 30 mg : 200's.

Infatabs: 50 mg : 200's.

Paediatric Suspension: 30 mg/5 mL: 500 mL

Company Name and Address

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NEW ZEALAND

Toll Free Number: 0800 736 363

Date of Preparation

21 October 2009