

# AUSTRALIAN PRODUCT INFORMATION – DBL™ GENTAMICIN INJECTION BP (Gentamicin)

## 1. NAME OF THE MEDICINE

Gentamicin

## 2. QUALITATIVE AND QUANTITATIVE COMPOSITION

DBL Gentamicin Injection BP is a sterile solution containing in each mL: Gentamicin Sulphate BP equivalent to gentamicin base 10 mg or 40 mg and Disodium Edetate BP 0.1 mg. Ampoules of DBL Gentamicin Injection BP do not contain any antimicrobial preservative or antioxidant.

For the full list of excipients, see Section 6.1 List of excipients.

## 3. PHARMACEUTICAL FORM

DBL Gentamicin Injection BP is a sterile solution for injection.

## 4. CLINICAL PARTICULARS

### 4.1 Therapeutic indications

DBL Gentamicin Injection BP is indicated in the treatment of serious infections caused by susceptible strains of the following microorganisms:

*Pseudomonas aeruginosa*

*Proteus* species (indole positive and indole negative)

*Escherichia coli*

*Klebsiella - Enterobacter - Serratia* species

*Staphylococcus* species (coagulase positive and coagulase negative)

DBL Gentamicin Injection BP should be considered for the treatment of the following conditions when caused by susceptible organisms:

Septicaemia

Respiratory tract infections

Infected wounds, bone and soft tissue infections including peritonitis, septic abortion and burns complicated by sepsis

Urinary tract infections (recurrent, complicated)

DBL Gentamicin Injection BP is not routinely indicated in the initial treatment of uncomplicated urinary tract infections unless the organism is resistant to other less toxic antibacterials.

DBL Gentamicin Injection BP may be considered as initial therapy in suspected or confirmed gram negative infections and therapy may be instituted before obtained results of susceptibility testing. If anaerobic organisms are suspected, additional antimicrobial therapy should be added to the gentamicin regime.

The decision to continue therapy with gentamicin should be based on the results of susceptibility tests, the severity of the infection, and the important additional considerations outlined in Section 4.4 Special warnings and precautions for use. If the causative organisms are resistant to gentamicin and the patient is not responding favourably, other appropriate therapy should be instituted.

## 4.2 Dose and method of administration

### Dosage

Dosage in patients with normal renal function

**Table 1. Adults**

Type of Infection	Dosage	Dosage Interval	Duration of Therapy
Systemic & severe urinary tract infections* such as pyelonephritis	3 mg/kg/day (bodyweight > 60 kg: usual individual dose 80 mg bodyweight < 60 kg: usual individual dose 60 mg)	8 hours	7 - 10 days
Life threatening infections	5 mg/kg/day initially then 3 mg/kg/day as soon as clinically indicated.	6 - 8 hours	7 - 10 days Longer therapy may be required. If so, auditory renal and vestibular functions should be monitored.

\*Note: Gentamicin activity is increased at pH 7.5. It may therefore be advantageous to alkalinise the patient's urine before therapy

**Table 2. Paediatric**

Type of Infection	Age	Dosage #	Dosage Interval
Systemic	0 - 7 days	5 mg/kg/day initially	12 hours
	1 week - 1 year	6 mg/kg/day initially	12 hours
	1 year - 12 years	4.5 mg/kg/day initially	8 hours
Uncomplicated urinary tract infections	-	3 mg/kg/day	8 - 12 hours
Life threatening infections	0 - 7 days	5 mg/kg/day initially	12 hours
	1 week - 1 year	7.5 mg/kg/day initially	8 hours
	1 year - 12 years	6 mg/kg/day initially	8 hours

#Note: In neonates, infants and children, where possible, serum levels should be determined and the dose adjusted to provide the desired serum level.

### **Method of administration**

DBL Gentamicin Injection BP is given by the intramuscular route or intravenously when intramuscular administration is not feasible, eg in shocked or severely burned patients. The dosage is the same for either route of administration.

Whenever possible, and especially in patients with impaired renal function, peak and trough gentamicin serum concentrations should be determined and dosage adjusted where necessary, to maintain desired serum concentrations. In general, desired peak concentrations are between 4 and 10 micrograms/mL, and trough concentrations are below 2 micrograms/mL. Prolonged concentrations greater than these values may be associated with an increased risk of toxicity.

Blood specimens for the determination of peak gentamicin concentrations should be obtained approximately one hour following IM administration and 30 minutes after completion of a 30 minute infusion. Blood specimens for the trough gentamicin concentration should be obtained immediately prior to the next IM or IV dose.

### ***Intravenous administration***

For IV administration, the prescribed dose of gentamicin may be diluted in 100 to 200 mL of sterile normal saline or 5% glucose in water. The concentration of gentamicin in the solution should not exceed 1 mg/mL. Infusion periods of 30 minutes to 2 hours have been advocated.

Administration of the dose by bolus injection produces serum levels which are initially in excess of what is regarded as being safe from toxic side effects. The high serum level does however rapidly fall and the potential danger or safety of this method of administration is yet to be established.

DBL Gentamicin Injection BP must not be physically mixed with other drugs, but should be administered by separate infusion (see Section 4.5 Interactions with other medicines and other forms of interactions).

DBL Gentamicin Injection BP is available in ampoules. Ampoules of the injection do not contain any bacteriostat and should be discarded following a single use.

### **Dosage adjustments**

#### ***Renal impairment***

In the presence of renal failure it is particularly important to monitor renal, auditory and vestibular functions during gentamicin therapy. Dosage should be adjusted for patients with renal impairment to minimise the risk of toxicity. The first dose should be as normal; subsequent doses should be given less frequently, depending on the degree of renal impairment. Table 3 below provides guidelines for adjustment of the dosage interval based on renal function tests.

Table 3.

Creatinine clearance (mL/minute)	Serum creatinine (mmol/litre)	BUN (mmol/litre)	Dosage Interval
over 70	less than 0.12	less than 6.5	8 hours
35 – 70	0.12 - 0.17	6.5 - 10	12 hours
24 – 34	0.18 - 0.25	11 - 14	18 hours
16 – 23	0.26 - 0.33	15 - 18	24 hours
10 – 15	0.34 - 0.47	19 - 26	36 hours
5 – 9	0.48 - 0.64	27 - 36	48 hours

In adults with renal failure undergoing haemodialysis, the amount of gentamicin removed from the blood may vary depending upon several factors including the dialysis method used. An eight-hour haemodialysis may reduce serum concentrations of gentamicin by approximately 50%. The recommended dosage at the end of each dialysis period is 1 to 1.7 mg/kg depending upon the severity of infection.

The above dosage schedules are provided as guidelines only, and are not intended as a rigid dosage recommendations. The measurement of gentamicin serum levels is highly desirable in patients with renal impairment to ensure optimal serum gentamicin concentrations.

### ***Bodyweight***

Prior to administration, the patient's bodyweight should be measured for the correct calculation of dosage. In obese patients, the appropriate dose can be calculated by assuming the bodyweight is the patient's estimated lean bodyweight plus 40% of the excess.

## **4.3 Contraindications**

Gentamicin is contraindicated in patients with a history of hypersensitivity to gentamicin, other aminoglycoside or any constituents of the injection (see Section 2 Qualitative and quantitative composition), as well as in patients who have experienced serious toxic reactions (ototoxicity or nephrotoxicity) to gentamicin or to other aminoglycoside therapy.

## **4.4 Special warnings and precautions for use**

### **Nephrotoxicity and ototoxicity**

Neurotoxicity, manifested by both vestibular and auditory ototoxicity can occur. The auditory changes are generally irreversible, usually bilateral and may be partial or total. Other manifestations of neurotoxicity may include numbness, skin tingling, muscle twitching and convulsions.

Patients with mitochondrial DNA mutations, particularly the nucleotide 1555 A to G substitution in the 12S rRNA gene may be at higher risk for ototoxicity, even if the patient's aminoglycoside serum levels were within the recommended range. In case of family history of aminoglycoside induced deafness or known mitochondrial DNA mutations in the 12S rRNA gene, alternative treatments other than aminoglycosides should be considered.

Renal and eighth cranial nerve function should be closely monitored, especially in patients with known or suspected reduced renal function at onset of therapy and also in those whose renal function is initially normal but who develop signs of renal dysfunction during therapy.

Urine should be examined for decreased specific gravity, increased excretion of protein, and the presence of cells or casts. Blood urea nitrogen, serum creatinine, or creatinine clearance should be determined periodically. When feasible, it is recommended that serial audiograms be obtained in patients old enough to be tested, particularly high-risk patients. Evidence of ototoxicity (dizziness, vertigo, tinnitus, roaring in the ears or hearing loss) or nephrotoxicity requires dosage adjustment or discontinuance of the drug. As with the other aminoglycosides, on rare occasions changes in renal and eighth cranial nerve function may not become manifest until soon after completion of therapy.

Serum concentrations of aminoglycosides should be monitored to assure adequate levels and to avoid potentially toxic levels. When monitoring gentamicin peak concentrations, dosage should be adjusted so that prolonged levels above 12 micrograms/mL are avoided. When monitoring gentamicin trough concentrations, dosage should be adjusted so that levels above 2 micrograms/mL are avoided. Excessive peak and/or trough serum concentrations of aminoglycosides may increase the risk of renal and eighth cranial nerve toxicity. In the event of overdose or toxic reactions, haemodialysis may aid in the removal of gentamicin from the blood, especially if renal function is or becomes compromised. The rate of removal of gentamicin is considerably less by peritoneal dialysis than by haemodialysis.

Concurrent and/or sequential systemic or topical use of other potentially neurotoxic and/or nephrotoxic drugs, (see Section 4.5 Interactions with other medicines and other forms of interactions) should be avoided. This includes concurrent use with potent diuretics, cephalosporins or other aminoglycosides. Other factors which may increase the risk of toxicity are dehydration and advancing age. Patients should be well hydrated during therapy.

Patients treated with aminoglycoside antibiotics, including gentamicin, by injection, irrigation or local application, should be under close clinical observation because these drugs have the inherent potential for causing neurotoxicity and nephrotoxicity, particularly if patients have preexisting renal damage or if the drug is administered for longer periods or at higher doses than those recommended.

### **Neuromuscular disorders**

Aminoglycosides, including gentamicin, should be used with caution in patients with muscular disorders, such as myasthenia gravis or parkinsonism, since these drugs may aggravate muscle weakness because of their potential curare-like effect on neuromuscular junction.

### **Use during anaesthesia**

Neuromuscular blockade and respiratory paralysis have been reported in cats receiving very high doses of gentamicin (40 mg/kg). The possibility that prolonged or secondary apnoea may occur should be considered if the drug is administered to anaesthetised patients who are also receiving neuromuscular blocking agents such as succinylcholine, tubocurarine or decamethonium or in patients receiving massive transfusions of citrated blood. If neuromuscular blockade occurs it may be reversed by the administration of calcium salts.

### **Superinfection**

If overgrowth of nonsusceptible organisms occurs, appropriate therapy should be initiated.

## **Allergic reactions**

Cross allergenicity among aminoglycosides has been known to occur.

## **Use in the elderly**

Because of its toxicity, gentamicin should be used with caution in elderly patients only after less toxic alternatives have been considered and/or found ineffective. Elderly patients are more likely to have an age-related decrease in renal function. This may not be evident in the results of routine screening test such as BUN or serum creatinine. A creatinine clearance determination may be more useful. Recommended doses should not be exceeded, and the patient's renal function should be carefully monitored during therapy. Geriatric patients may require smaller daily doses of gentamicin in accordance with their increased age, decreased renal function, and possibly, decreased weight. In addition, loss of hearing may result even in patients with normal renal function.

## **Paediatric use**

Gentamicin should be used with caution in premature and neonatal infants because their renal immaturity may result in the prolongation of the serum half life of the drug and subsequent gentamicin induced toxicity.

## **Effects on laboratory tests**

Laboratory abnormalities possibly related to gentamicin include: increased levels of serum transaminase (ALT, AST) serum LDH and bilirubin; decreased serum calcium, magnesium, sodium and potassium; anemia, leukopenia, granulocytopenia, transient agranulocytosis, eosinophilia, increased and decreased reticulocyte counts, and thrombocytopenia. While clinical laboratory test abnormalities may be isolated findings, they may also be associated with clinically related signs and symptoms. For example, tetany and muscle weakness may be associated with hypomagnesemia, hypocalcemia and hypokalemia.

## **4.5 Interactions with other medicines and other forms of interactions**

### **Neuromuscular blocking agents or medications with neuromuscular blocking activity**

Concurrent use of gentamicin with agents with neuromuscular blocking activity eg succinylcholine, tubocurarine, decamethonium, halogenated hydrocarbon inhalation anaesthetics, opioid analgesics and massive transfusions with citrated anticoagulated blood, should be carefully monitored; neuromuscular blockade may be enhanced, resulting in skeletal muscle weakness and respiratory depression or paralysis (apnoea); caution is recommended when these medications and gentamicin are used concurrently during surgery or in the postoperative period, especially if there is a possibility of incomplete reversal of neuromuscular blockade postoperatively; treatment with anticholinesterase agents or calcium salts may help reverse the blockade.

### **Other neurotoxic and/or nephrotoxic agents**

If possible, avoid concurrent or sequential use of other neurotoxic and/or nephrotoxic antibiotics, including other aminoglycosides, polymyxin B, colistin, cisplatin, vancomycin, amphotericin B, clindamycin and cephalosporins.

## **Potent diuretics**

If possible, do not give gentamicin in conjunction with etacrynic acid, frusemide or other potent diuretics which may themselves cause ototoxicity or enhance aminoglycoside toxicity by altering antibiotic concentrations in serum and tissue.

## **Penicillins**

Gentamicin is inactivated by solutions containing penicillins. This inactivation is brought about by the opening of the beta-lactam ring and combination of the penicillin with an amino group of gentamicin to form a biologically inactive amide. For this reason, gentamicin and penicillins should not be combined in intravenous injections/infusions. The inactivation of gentamicin by penicillins may occur *in vivo*, especially in patients with renal failure who maintain a higher level of the penicillin for a longer period of time compared to patients with normal renal function. Therefore, when gentamicin and penicillins are used together in patients with renal failure, the time of administration of each drug should be staggered so that several hours separate each infusion.

Although the inactivation of gentamicin and penicillin proceeds on an equimolar basis, in practice the penicillin is present in such an excess that only the decline in activity of gentamicin is of concern. A combination of penicillin and gentamicin is often used in the treatment of enterococcal endocarditis.

## **4.6 Fertility, pregnancy and lactation**

### **Effects on fertility**

No data available

### **Use in pregnancy - Category D**

Gentamicin and other aminoglycosides are known to cross the placenta. There is evidence of selective uptake of gentamicin by the foetal kidney resulting in cellular damage (probably reversible) to immature nephrons. Eighth cranial nerve damage has also been reported following in-utero exposure to some of the aminoglycosides. Because of their chemical similarity, aminoglycosides must be considered potentially nephrotoxic and ototoxic to the foetus. It should also be noted that therapeutic blood levels in the mother do not equate with safety for the foetus.

### **Use in lactation**

Aminoglycosides are excreted in breast milk in small but variable amounts. Although aminoglycosides are poorly absorbed from the gastrointestinal tract and problems in nursing infants have not been documented, it is not known whether they are harmful to the newborn. Therefore gentamicin should not be administered to lactating women unless the benefit clearly justifies the potential risks, including possible ototoxic and nephrotoxic effects on the baby.

## **4.7 Effects on ability to drive and use machines**

The effects of this medicine on a person's ability to drive and use machines were not assessed as part of its registration.

## 4.8 Adverse effects (undesirable effects)

**Nephrotoxicity** (see Section 4.4 Special warnings and precautions for use)

Adverse renal effects, as demonstrated by the presence of casts, cells or protein in the urine or by rising BUN, NPN, serum creatinine or oliguria, have been reported. They occur more frequently in patients with a history of renal impairment and in patients treated for longer periods or with larger dosage than recommended.

**Neurotoxicity** (see Section 4.4 Special warnings and precautions for use)

Serious adverse effects on both vestibular and auditory branches of the eighth cranial nerves have been reported, primarily in patients with renal impairment (especially if dialysis is required), and in patients on high doses and/or prolonged therapy. Symptoms include dizziness, vertigo, tinnitus, roaring in the ears and hearing loss, which, as with the other aminoglycosides, may be irreversible. Hearing loss is usually manifested initially by diminution of high-tone acuity. Other factors which may increase the risk of toxicity include excessive dosage, dehydration and previous exposure to other ototoxic drugs.

Peripheral neuropathy or encephalopathy, including numbness, skin tingling, muscle twitching, convulsions and a myasthenia gravis-like syndrome, have been reported.

*Note:* The risk of toxic reactions is low in patients with normal renal function who do not receive DBL Gentamicin Injection BP at higher doses or for longer periods of time than recommended.

### Other adverse reactions

Other reported adverse reactions possibly related to gentamicin include: respiratory depression, lethargy, confusion, depression, visual disturbances, decreased appetite, weight loss, and hypotension and hypertension; rash, itching, urticaria, generalized burning, laryngeal oedema, anaphylactoid reactions, fever, and headache, nausea, vomiting, increased salivation, and stomatitis; purpura, pseudotumor cerebri, acute organic brain syndrome, pulmonary fibrosis, alopecia, joint pain, transient hepatomegaly, and splenomegaly.

While local tolerance of DBL Gentamicin Injection BP is generally excellent, there has been an occasional report of pain at the injection site. Subcutaneous atrophy or fat necrosis suggesting local irritation has been reported rarely.

### Reporting suspected adverse effects

Reporting suspected adverse reactions after registration of the medicinal product is important. It allows continued monitoring of the benefit-risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions at [www.tga.gov.au/reporting-problems](http://www.tga.gov.au/reporting-problems).

## 4.9 Overdose

Peritoneal dialysis or haemodialysis will aid in the removal of gentamicin from the blood. This is particularly important in patients with renal malfunction.

For information on the management of overdose, contact the Poisons Information Centre on 13 11 26 (Australia).

## **5. PHARMACOLOGICAL PROPERTIES**

### **5.1 Pharmacodynamic properties**

#### **Mechanism of action**

Gentamicin is a bactericidal aminoglycoside antibiotic which acts by inhibiting protein synthesis of susceptible bacteria. It is effective against a wide variety of pathogenic aerobic gram negative bacilli and some gram positive organisms (see Section 4.1 Therapeutic indications). It is not active against anaerobic organisms.

#### **Clinical trials**

No data available

### **5.2 Pharmacokinetic properties**

#### **Absorption**

When gentamicin is administered intramuscularly, peak serum concentrations occur between 30 and 90 minutes after injection; effective concentrations persist for 6 to 8 hours.

Gentamicin is poorly absorbed by the oral route, and only minimal amounts have been found in the blood following oral administration.

In patients with normal renal function, peak serum concentrations of gentamicin, expressed in microgram/mL, are usually about four times the single dose expressed in mg/kg; for example, an injection of gentamicin 1 mg/kg may be expected to result in peak serum concentration of approximately 4 microgram/mL. Gentamicin administered every 8 hours does not accumulate in the serum except in patients with impaired renal function in whom the serum concentration of gentamicin is usually higher, and measurable for longer periods. When gentamicin is administered by intravenous infusion, over 1 to 2 hours, the serum concentrations are similar to those obtained with intramuscular administration. About 25 to 30% of the administered dose of gentamicin is bound by serum protein; it is released as the drug is excreted. Gentamicin is excreted principally in the urine by glomerular filtration.

#### **Distribution**

Following parenteral administration, gentamicin can be detected in tissues and body fluids. Concentrations in bile in general have been low and have suggested minimal biliary excretion. Gentamicin administered intramuscularly has been found in low concentrations in the cerebrospinal fluid. Gentamicin has also been found in the sputum, pleural fluid, and peritoneal fluid. Gentamicin crosses the peritoneal as well as the placental membranes.

#### **Excretion**

After initial administration to patients with normal renal function, 30 to 100% of the gentamicin is recoverable in the urine in 24 hours. High urine concentrations (above 100 microgram/mL) may be achieved. After several days treatment, the amount of gentamicin excreted in the urine approaches the daily dose administered. Renal clearance of gentamicin is similar to that of endogenous creatinine.

In patients with impaired renal function, the clearance of gentamicin is decreased; the more severe the impairment, the slower the clearance. Therefore, the interval between doses should be adjusted according to the degree of renal impairment. Endogenous creatinine

clearance rate and serum creatinine, which have high correlation with serum half-life of gentamicin, may be used as a guide for this purpose (see Section 4.2 Dosage and method of administration).

### **5.3 Preclinical safety data**

#### **Genotoxicity**

No data available

#### **Carcinogenicity**

No data available

## **6. PHARMACEUTICAL PARTICULARS**

### **6.1 List of excipients**

Disodium edetate  
Water for injections

### **6.2 Incompatibilities**

When gentamicin is used in combination with any other medicine, mixing the medicines before administration should be avoided at all costs.

### **6.3 Shelf life**

In Australia, information on the shelf life can be found on the public summary of the Australian Register of Therapeutic Goods (ARTG). The expiry date can be found on the packaging.

### **6.4 Special precautions for storage**

Store below 25°C.

### **6.5 Nature and contents of container**

DBL Gentamicin Injection BP is available in ampoules. Ampoules of the injection do not contain any antimicrobial preservative.

Presentation	Packs
10 mg/mL	5 x 1 mL ampoules
80 mg/2 mL	5 x 2 mL ampoules
80 mg/2 mL	50 x 2 mL ampoules (not marketed in Australia)
80 mg/2 mL	5 x 2 mL plastic ampoules (not marketed in Australia)
80 mg/2 mL	50 x 2 mL plastic ampoules (not marketed in Australia)

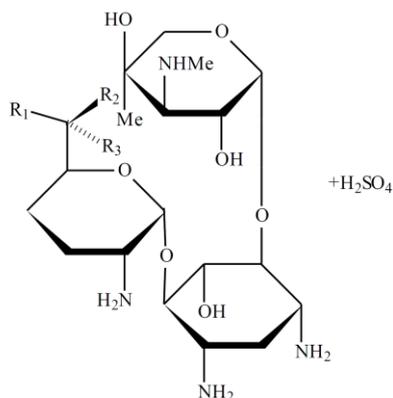
Not all pack sizes may be marketed.

## 6.6 Special precautions for disposal

In Australia, any unused medicine or waste material should be disposed of in accordance with local requirements.

## 6.7 Physicochemical properties

### Chemical structure



### CAS number

1405-41-0

## 7. MEDICINE SCHEDULE (POISONS STANDARD)

Schedule 4

## 8. SPONSOR

Pfizer Australia Pty Ltd  
Level 17, 151 Clarence Street  
Sydney NSW 2000  
Toll Free Number: 1800 675 229  
[www.pfizer.com.au](http://www.pfizer.com.au)

## 9. DATE OF FIRST APPROVAL

22 October 1992

## 10. DATE OF REVISION

26 September 2022

### Summary Table of Changes

<b>Section changed</b>	<b>Summary of new information</b>
All	Minor editorial changes throughout.
4.4	Nephrotoxicity and ototoxicity: New precaution for patients with mitochondrial DNA mutations.