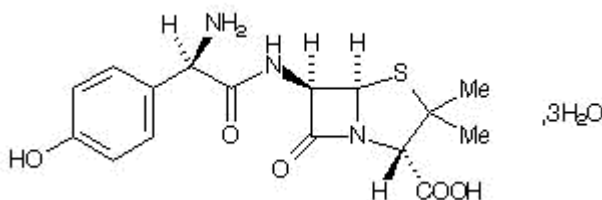


## DESCRIPTION

Amoxycillin trihydrate is a semisynthetic antibiotic and is a member of the penicillinase-stable group of penicillins derived from the penicillin nucleus, 6-aminopenicillanic acid, isolated at Beecham Research Laboratories. It is identified chemically as (2S,5R,6R)-6-[(R)-2-amino-2-(4-hydroxyphenyl)acetamido]-3,3-dimethyl-7-oxo-4-thia-1-azabicyclo[3.2.0]heptane-2-carboxylic acid. The molecular weight of amoxycillin trihydrate is 419.4. Amoxycillin trihydrate may be represented structurally as:



CAS – 61336-70-7.

Amoxycillin trihydrate is a white or almost white, crystalline powder, slightly soluble in water and in alcohol.

## MICROBIOLOGY

Amoxycillin is similar to ampicillin in its bactericidal action against Gram-positive and Gram-negative susceptible organisms during the stage of active multiplication. It acts through the inhibition of biosynthesis of the cell wall mucopeptide.

It is active *in vitro* against most strains of *Haemophilus influenzae*\*, *Neisseria gonorrhoeae*\*, *Neisseria meningitidis*, *Escherichia coli*\*, *Proteus mirabilis*\* and *Salmonellae*. Because amoxycillin does not resist destruction by penicillinase, it is not active against penicillinase-producing organisms, particularly penicillinase-producing staphylococci. All strains of *Pseudomonas species*, *Klebsiella species*, *Enterobacter species*, indole-positive *Proteus species*, *Serratia marcescens*, *Citrobacter species*, penicillinase-producing *N. gonorrhoeae* and penicillinase-producing *H. influenzae* are resistant. *In vitro* studies have demonstrated the susceptibility of most strains of the following gram-positive bacteria: alpha- and beta-haemolytic streptococci, *Diplococcus pneumoniae*, non-penicillinase producing staphylococci and *Streptococcus faecalis*. These organisms are susceptible to amoxycillin at serum concentrations, which may be expected following the recommended doses. However, some of the organisms were susceptible to amoxycillin only at concentrations achieved in the urine. (see Indications)

\*Activity refers only to betalactamase negative strains.

*Escherichia coli* isolates are becoming increasingly resistant to amoxycillin *in vitro* due to the presence of penicillinase-producing strains.

Strains of gonococci which are relatively resistant to benzylpenicillin may be sensitive to amoxycillin.

The following *in vitro* data are available, but their clinical significance is unknown.

*In vitro* data for amoxycillin vs. clinical pathogens

Organism (n)	MIC90 (mcg/mL)
<i>S. pneumoniae</i> (3493) <sup>1</sup>	2
<i>H. influenzae</i> (3366) <sup>1</sup>	32
<i>S. pyogenes</i> (683) <sup>1</sup>	0.03
<i>H. influenzae</i> b-lac + (725) <sup>1</sup>	32
<i>H. influenzae</i> b-lac – (2587) <sup>1</sup>	1
<i>Klebsiella pneumonia</i> (1161) <sup>1</sup>	32
<i>M. catarrhalis</i> (864) <sup>1</sup>	16
MSSA (1232) <sup>1</sup>	32
<i>Bacteroides fragilis</i> group (80) <sup>2</sup>	64
<i>Fusobacterium</i> sp (23) <sup>2</sup>	8
<i>Clostridium difficile</i> (21) <sup>2</sup>	2
<i>N. gonorrhoeae</i> (34) <sup>3</sup>	128

<sup>1</sup> Data from the Augmentin Global Surveillance Study: June 1999- December 2000 from USA, Canada, Brazil, Mexico, Hong Kong, Australia, France, Belgium, Italy, Netherlands, Spain, Sweden and the UK.

<sup>2</sup> Data from 1994-1995, France (Dubreuil L et al, 1996. *In vitro* evaluation of nitazoxanide and tizoxanide against anaerobes and aerobic organisms. *Antimicrob Agents Chemother.* 40(10), 2266-2270.)

<sup>3</sup> Data from 1994-1995, UK (Wise R et al, 1996. *In vitro* activity of the tricyclic  $\beta$ -lactam GV104326. *Antimicrob Agents Chemother.* 40(5), 1248-1253.)

A positive  $\beta$ -lactamase test predicts resistance to penicillin, ampicillin and amoxycillin.

### Rates of resistance to amoxicillin for Common Pathogens in Australia

Organism	Average % resistance
<i>B. fragilis</i>	100
Enterobacter spp.	96
Klebsiella spp.	98
<i>M. catarrhalis</i>	94
<i>P. aeruginosa</i>	100
<i>S. aureus</i> (methicillin-susceptible)	85
<i>Enterococcus faecalis</i>	0.2
<i>Enterococcus faecium</i>	80
<i>E. coli</i>	45.4
<i>H. influenzae</i>	20.3
<i>P. mirabilis</i>	14
<i>S. pneumoniae</i>	0.6 (fully resistant) 3.2 (intermediate resistance)

### Breakpoints

*Streptococcus pneumoniae*: S  $\leq$  2 mcg/ml; I = 4 mcg/ml; R  $\geq$  8 mcg/ml

Note: Because amoxycillin has greater *in vitro* activity against *S. pneumoniae* than does ampicillin, the majority of *S. pneumoniae* strains with intermediate susceptibility to ampicillin are fully susceptible to amoxycillin.

### Susceptibility Tests

Dilution or diffusion techniques – either quantitative (MIC) or breakpoint, should be used following a regularly updated, recognised and standardised method (eg. NCCLS). Standardised susceptibility test procedures require the use of laboratory control microorganisms to control the technical aspects of the laboratory procedures.

A report of “Susceptible” indicates that the pathogen is likely to be inhibited if the antimicrobial compound in the blood reaches the concentrations usually achievable. A report of “Intermediate” indicates that the result should be considered equivocal, and if the microorganism is not fully susceptible to alternative, clinically feasible drugs, the test should be repeated. This category implies possible clinical applicability in body sites where the drug is physiologically concentrated or in situations where high dosage of drug can be used. This category also provides a buffer zone, which prevents small uncontrolled technical factors from causing major discrepancies in

interpretation. A report of “Resistant” indicates that the pathogen is not likely to be inhibited if the antimicrobial compound in the blood reaches the concentrations usually achievable; other therapy should be selected.

Note: The prevalence of resistance may vary geographically for selected species and local information on resistance is desirable, particularly when treating severe infections. This information gives only an approximate guidance on probabilities whether organisms will be susceptible to amoxicillin.

Cross-resistance: Other  $\beta$ -lactams,  $\beta$ -lactam/ $\beta$ -lactamase inhibitor combinations and cephalosporins

Resistance mechanisms: Production of penicillinase, altered penicillin binding proteins.

## **PHARMACOKINETICS**

Amoxicillin is stable in the presence of gastric acid and is rapidly and well absorbed after oral administration, even in the presence of food. Amoxicillin diffuses rapidly into most body tissues and fluids, with the exception of brain and spinal fluid except when meninges are inflamed.

Amoxicillin has been shown to diffuse into sputum and saliva and is excreted mainly via the urine where it exists in a high concentration.

The amount to be found in the bile is variable depending on normal biliary secretory function.

The half-life of amoxicillin is 61.3 minutes with normal renal function and in the absence of renal function 16-20 hours.

Amoxicillin is excreted in the urine both unchanged and as penicilloic acid. About 75% of a 1g dose is excreted in the urine in 6 hours in the presence of normal renal function (60% is biologically active and 15% is penicilloic acid). However about 32% of a 3g dose is excreted via the urine as the biologically active component in 8 hours (by which time most of the urinary excretion is complete). This proportional difference in the amount excreted from the different doses reflects a lack of linearity between doses and extent of absorption with a levelling off at higher doses of oral amoxicillin.

Excretion of amoxicillin can be delayed by concurrent administration of probenecid thus prolonging its therapeutic effect.

Amoxicillin is not highly protein-bound, being only 17% protein-bound in serum as measured by ultrafiltration or equilibrium dialysis.

Orally administered doses of 250mg and 500mg amoxycillin result in average peak serum levels one to two hours after administration of 5.0mcg/mL and 6.6 - 10.8mcg/mL respectively. Detectable serum levels of amoxycillin are present 8 hours after ingestion of a single dose.

## INDICATIONS

It is indicated for the treatment of the following infections due to susceptible strains of sensitive organisms:

Note Therapy should be guided by bacteriological studies, including sensitivity tests, and by clinical response. However, in emergency cases where the causative organism has not been identified, therapy with amoxycillin may be useful. Clinical judgement will decide whether combination with another antibiotic would provide a sufficiently broad spectrum of activity pending sensitivity test results.

**Skin and Skin Structure:** Staphylococcus, non-penicillinase producing; Streptococcus; *E.coli* (see Microbiology).

**Respiratory (Acute and Chronic):** *H.influenzae*, Streptococcus; *S.pneumoniae*; staphylococcus, non-penicillinase-producing; *E.coli* (see Microbiology).

**Genitourinary Tract (complicated and uncomplicated, Acute and Chronic):** *E.coli* (see Microbiology), *P.mirabilis* and *S.faecalis*.

**Gonorrhoea:** *N.gonorrhoeae* (non-penicillinase producing).

**Prophylaxis of endocarditis:** AMOXIL may be used for the prophylaxis of bacterial endocarditis in individuals at particular risk, such as those with a prosthetic heart valve or those who have previously had endocarditis.

## CONTRAINDICATIONS

Amoxycillin is a penicillin and should not be given to patients with a history of hypersensitivity to beta-lactam antibiotics (eg. penicillins, cephalosporins).

## PRECAUTIONS

Serious, and occasionally fatal, hypersensitivity reactions (anaphylaxis) have been reported in patients receiving beta-lactam antibiotics. Although anaphylaxis is more frequent following parenteral therapy, it has occurred in patients on oral therapy. Before commencing therapy with

any penicillin careful enquiry should be made concerning previous hypersensitivity reactions to penicillins, cephalosporins or other allergens. If an allergic reaction occurs, appropriate therapy should be instituted and amoxycillin therapy discontinued.

Serious anaphylactic reactions require immediate emergency treatment with adrenaline. Oxygen, intravenous steroids and airway management, including intubation, should also be administered as indicated.

Antibiotic associated pseudomembranous colitis has been reported with many antibiotics including amoxycillin. A toxin produced with *Clostridium difficile* appears to be the primary cause. The severity of the colitis may range from mild to life threatening. It is important to consider this diagnosis in patients who develop diarrhoea or colitis in association with antibiotic use (this may occur up to several weeks after cessation of antibiotic therapy). Mild cases usually respond to drug discontinuation alone. However in moderate to severe cases appropriate therapy with a suitable oral antibiotic agent effective against *Clostridium difficile* should be considered. Fluids, electrolytes and protein replacement should be provided when indicated. Drugs which delay peristalsis, eg. opiates and diphenoxylate with atropine (Lomotil) may prolong and/or worsen the condition and should not be used.

Use in Pregnancy (Category A): Animal studies with amoxycillin have shown no teratogenic effects. The product has been in extensive clinical use since 1972 and its suitability in human pregnancy has been well documented in clinical studies.

Amoxycillin may be used in pregnancy when the potential benefits outweigh the potential risks associated with treatment.

Use in Labour and Delivery: Oral ampicillin class antibiotics are generally poorly absorbed during labour. Studies in guinea pigs have shown that intravenous administration of ampicillin decreased the uterine tone, frequency of contractions, height of contractions and duration of contractions. However, it is not known whether the use of amoxycillin in humans during labour or delivery has immediate or delayed adverse effects on the foetus, prolongs the duration of labour or increases the likelihood that forceps delivery or other obstetrical intervention or resuscitation of the newborn will be necessary.

Use in Lactation: Ampicillin class antibiotics are excreted in the milk; therefore, caution should be exercised when amoxycillin is administered to a nursing woman.

As with any potent drug, periodic assessment of renal, hepatic and haematopoietic function should be made during prolonged therapy. The possibility of superinfections with mycotic or bacterial pathogens should be kept in mind during therapy. If superinfections occur (usually involving

Aerobacter, Pseudomonas or Candida), the drug should be discontinued and/or appropriate therapy instituted.

Amoxycillin, an aminopenicillin, is not the treatment of choice in patients presenting with sore throat or pharyngitis because of the possibility that the underlying cause is infectious mononucleosis, in the presence of which there is a high incidence of rash if amoxycillin is used.

Amoxycillin should be given with caution to patients with lymphatic leukaemia since they are especially susceptible to ampicillin-induced skin rashes.

Following single dose therapy of acute lower urinary tract infections, the urine should be cultured. A positive culture may be evidence of a complicated or upper urinary tract infection and call for longer or larger course of therapy.

Adequate fluid intake and urinary output must be maintained in patients receiving high doses of amoxycillin.

Dosage should be adjusted in patients with renal impairment (see Dosage and Administration).

Amoxycillin paediatric drops and sugar free syrups contain sodium benzoate.

**Drug/Laboratory Test Interactions** Oral administration of amoxycillin will result in high urine concentrations of amoxycillin. Since high urine concentrations of amoxycillin may result in false positive reactions when testing for the presence of glucose in urine using Clinitest, Benedict's Solution or Fehling's Solution, it is recommended that glucose tests based on enzymatic glucose oxidase reactions (such as Clinistix, or Testape) be used.

Following administration of ampicillin to pregnant women, a transient decrease in plasma concentration of total conjugated oestriol, oestriol-glucuronide, conjugated oestrone and oestradiol has been noted. This effect may also occur with amoxycillin.

**Drug Interactions** Probenecid decreases the renal tubular secretion of amoxycillin. Concurrent use with amoxycillin may result in increased and prolonged blood levels of amoxycillin.

The concurrent administration of allopurinol and ampicillin increases substantially the incidence of rashes in patients receiving both drugs as compared to patients receiving ampicillin alone. It is not known whether this potentiation of ampicillin rashes is due to allopurinol or the hyperuricemia present in these patients. Similar reactions can be expected with amoxycillin.

In common with other broad spectrum antibiotics, amoxycillin may reduce the efficacy of oral contraceptives and patients should be warned accordingly.

Tetracyclines and other bacteriostatic drugs may interfere with the bactericidal effects of amoxycillin.

## ADVERSE REACTIONS

As with other penicillins, it may be expected that untoward reactions will be essentially limited to sensitivity phenomena. They are more likely to occur in individuals who have previously demonstrated hypersensitivity to penicillins.

The following adverse reactions have been reported as associated with the use of amoxycillin:

**Gastro-intestinal** Nausea, vomiting, diarrhoea, Intestinal candidiasis and antibiotic associated colitis (including pseudomembranous colitis and haemorrhagic colitis) have been reported rarely. (see Warnings).

**Hypersensitivity reactions** Erythematous maculopapular rash, pruritus and urticaria have been reported occasionally. Rarely, skin reactions such as erythema multiforme and Stevens-Johnson syndrome, toxic epidermal necrolysis and bullous, exfoliative dermatitis and acute generalised exanthematous pustulosis (AGEP) have been reported. As with other antibiotics, severe allergic reactions including angioneurotic oedema, anaphylaxis, serum sickness, hypersensitivity vasculitis and interstitial nephritis have been reported rarely.

Whenever such reactions occur, amoxycillin should be discontinued. (Note: Urticaria, other skin rashes and serum sickness-like reactions may be controlled with antihistamines and, if necessary, systemic corticosteroids.) Anaphylaxis is the most serious reaction experienced (see Warnings).

**Liver** A moderate rise in AST and/or ALT has occasionally been noted, but the significance of this finding is unknown. As with other beta-lactam antibiotics, hepatitis and cholestatic jaundice have been reported rarely.

**Haemic and Lymphatic systems** Reactions such as anaemia, thrombocytopenia, thrombocytopenic purpura, eosinophilia and leucopenia (including severe neutropenia or agranulocytosis) have been reported during therapy with other penicillins. These reactions are usually reversible on discontinuation of therapy and are believed to be hypersensitivity phenomena. Prolongation of bleeding time and prothrombin time have also been reported rarely.



**CNS effects:** CNS effects have been seen rarely. They include hyperkinesia, dizziness and convulsions. Convulsions may occur in patients with impaired renal function or in those receiving high doses.

**Miscellaneous** Superficial tooth discolouration has been reported very rarely in children. Good oral hygiene may help to prevent tooth discolouration as it can usually be removed by brushing.

## **DOSAGE AND ADMINISTRATION**

### **Normal Renal Function**

**Upper respiratory tract infections; genito-urinary tract infections; skin and soft tissue infections.**

Adults - 250mg every eight hours.

Children (under 20 kg) - 20mg/kg/day in equally divided doses every eight hours.

In severe infections or those caused by less susceptible organisms, 500 mg every eight hours for adults and 40mg/kg/day in equally divided doses every eight hours for children may be needed.

**Lower respiratory tract infections.**

Adults - 500mg every eight hours.

Children (under 20 kg) - 40mg/kg/day in equally divided doses every eight hours.

**Urethritis, gonococcal.**

Adults - 3g as single dose. Cases of gonorrhoea with a suspected lesion of syphilis should have darkfield examinations before receiving AMOXIL and monthly serological tests for a minimum of four months.

**Acute, uncomplicated lower urinary tract infections in non-pregnant adult female.**

Adults - 3g as single dose.

**Note:** Experience in neonates is too limited to make any recommendations regarding dosage or the appropriateness of the oral route.

The children's dosage is intended for individuals whose weight will not cause dosage to be calculated greater than that recommended for adults. Children weighing more than 20 kg should be dosed according to the adult recommendations.

In renal impairment the excretion of the antibiotic will be delayed, and depending on the degree of impairment, it may be necessary to reduce the total daily dosage.

In patients receiving peritoneal dialysis, the maximum recommended dose is 500mg/day. Amoxycillin may be removed from the circulation by haemodialysis.

It should be recognised that in the treatment of chronic urinary tract infections, frequent bacteriological and clinical appraisals are necessary. Smaller doses than those recommended above should not be used. In stubborn infections, therapy may be required for several weeks. It may be necessary to continue clinical and/or bacteriological follow-up for several months after cessation of therapy.

Treatment should be continued for a minimum of 48 to 72 hours beyond the time that the patient becomes asymptomatic or evidence of bacterial eradication has been obtained. It is recommended that there be at least ten days treatment for any infection caused by haemolytic streptococci to prevent the occurrence of acute rheumatic fever or glomerulonephritis.

**Prophylaxis of endocarditis** (see Table 1)

## **OVERDOSAGE**

Gastrointestinal effects such as nausea, vomiting and diarrhoea may be evident and symptoms of water/electrolyte imbalance should be treated symptomatically. During the administration of high doses of amoxycillin, adequate fluid intake and urinary output must be maintained to minimize the possibility of amoxycillin crystalluria.

Amoxycillin can be removed from the circulation by haemodialysis.

## **PRESENTATIONS**

Capsules 250mg (brown/yellow, iron oxide colouring, marked AMOXIL/250) 20.

Capsules 500mg (brown/yellow, iron oxide colouring, marked AMOXIL/500) 20.

Chewable Tablets 250mg (white, fruit flavoured, sweetened with sucrose & saccharin, marked AMOXIL/250) 20.

Syrup Sugar Free 125mg/5mL (sweetened with sorbitol & saccharin) 100mL.

Syrup Forte Sugar Free 250mg/5mL (sweetened with sorbitol & saccharin) 100mL.

Syrup Sachet 3gram (sweetened with sucrose & saccharin), 1 sachet.

Paediatric drops (sweetened with sucrose) 100mg/mL, 20mL with dropper.

AMOXIL capsules also contain the inactive ingredient magnesium stearate. The capsule shells are made of gelatin and contain the following colouring agents: iron oxide red, iron oxide yellow, titanium dioxide and Opacode White S-1-7085.

AMOXIL chewable tablets contain the inactive ingredients mannitol, magnesium stearate, silicon dioxide, saccharin sodium, sucrose, maize starch, glycine, citric acid and cherry (57.627 AP 0551), banana (59.256 AP 0551) and peppermint (57.720 TP 0551) flavouring agents.

AMOXIL syrups contain the inactive ingredients disodium edetate, sodium benzoate, xanthan gum, saccharin sodium, sorbitol, silicon dioxide, silica-colloidal anhydrous, lemon trusil flavour (16-8162), strawberry trusil flavour (17-8729) and peach trusil flavour (17-3449).

AMOXIL syrup sachets contain the inactive ingredients disodium edetate, sodium benzoate, sodium citrate, xanthan gum, ammonium glycyrrhizinate, saccharin sodium, sucrose, lemon trusil flavour (16-8162), strawberry trusil flavour (17-8729) and peach trusil flavour (17-3449).

AMOXIL paediatric drops contain the inactive ingredients sodium benzoate, carmellose sodium, sucrose, Trusil peach flavour (17-3449), Trusil strawberry flavour (17-8729) and Trusil lemon flavour (16-8162).

## **STORAGE**

Amoxil capsules, tablets and dry powder should be stored below 25°C.

## **SPONSOR**

GlaxoSmithKline Australia Pty Ltd  
1061 Mountain Highway,  
Boronia, Victoria, 3155.  
Australia.  
Telephone: (03) 9721 6000

Date of TGA approval: 18 February 1993  
Date of last amendment: 20 June 2003

TABLE 1

Based on the recommendations of the British Society for Antimicrobial Chemotherapy

Condition		Adults' Dosage (including elderly)	Child
<p><i>Dental Procedures:</i> Prophylaxis for patients undergoing extraction, scaling or surgery involving gingival tissues, and who have not received a penicillin in the previous month. (N.B. Patients with prosthetic heart valves should be referred to hospital- see below).</p>	Patient not having general anaesthetic.	3g Amoxil orally, 1 hour before procedure. A second dose may be given 6 hours later, if considered necessary.	Under 10 years  Under 5 years
	Patient having general anaesthetic: oral antibiotics not appropriate.	1g Amoxil IM immediately before induction; with 500mg orally, 6 hours later.	Under 10 years
<p><i>Dental Procedures:</i> Patients for whom referral to hospital is recommended:</p> <p>(a) patients to be given a general anaesthetic who have been given a penicillin in the previous month. (b) patients to be given a general anaesthetic who have a prosthetic heart valve. (c) patients who have had one or more attacks of endocarditis.</p>		Initially: 1g Amoxil IM with 120mg gentamicin IM, immediately prior to anaesthesia (if given) or 15 minutes prior to dental procedure. Followed by (6 hours later): 500mg Amoxil orally.	Under 10 years Amoxil should be 2mg/kg dose; the gentamicin should be 2mg/kg
<p><i>Genito-urinary Surgery or Instrumentation:</i> Prophylaxis for patients who have no urinary tract infection and who are to have genito-urinary surgery or instrumentation under general anaesthesia.</p> <p><i>Obstetric and Gynaecological Procedures and Gastro-intestinal Procedures:</i> Routine prophylaxis is recommended only for patients with prosthetic heart valves.</p>		Initially: 1g Amoxil IM with 120mg gentamicin IM, immediately before induction. Followed by (6 hours later): 500mg Amoxil orally or IM according to clinical condition.	Under 10 years Amoxil should be 2mg/kg dose; the gentamicin should be 2mg/kg
<p><i>Surgery or Instrumentation of the Upper Respiratory Tract</i></p>	Patients other than those with prosthetic heart valves.	1g Amoxil IM immediately before induction. Followed by (6 hours later): 500mg Amoxil IM.	Under 10 years
	Patients with prosthetic heart valves.	Initially: 1g Amoxil IM with 120mg gentamicin IM, immediately before induction. Followed by (6 hours later): 500mg Amoxil IM.	Under 10 years Amoxil should be 2mg/kg dose; the gentamicin should be 2mg/kg