

Ningbo Voice Biochemic Co., Ltd.

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This information is intended for use by health professionals

1. Name of the medicinal product

Doxycycline 100mg Capsules

2. Qualitative and quantitative composition

Each capsule contains 100mg doxycycline base as doxycycline hyclate.

Excipient with known effect: Each capsule contains sucrose. For the full list of excipients, see section 6.1.

3. Pharmaceutical form

Hard gelatin capsule

Hard gelatin capsule with opaque green cap and opaque green body with "DOXY 100mg" printed in white ink.

4. Clinical particulars

4.1 Therapeutic indications

Doxycycline has been found clinically effective in the treatment of a variety of infections caused by susceptible strains of Gram-positive and Gram-negative bacteria and certain other micro-organisms.

Respiratory tract infections

Pneumonia and other lower respiratory tract infections due to susceptible strains of *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Klebsiella pneumoniae* and other organisms. *Mycoplasma pneumoniae* pneumonia. Treatment of chronic bronchitis, sinusitis.

Urinary tract infections

Infections caused by susceptible strains of *Klebsiella* species, *Enterobacter* species.

Escherichia coli, *Streptococcus faecalis* and other organisms.

Sexually transmitted diseases

Infections due to *Chlamydia trachomatis* including uncomplicated urethral, endocervical or rectal infections. Non-gonococcal urethritis caused by *Ureaplasma urealyticum* (T- mycoplasma).

Doxycycline is also indicated in chancroid, granuloma inguinale and lymphogranuloma venereum. Doxycycline is an alternative drug in the treatment of gonorrhoea and syphilis.

Dermatological infections

Acne vulgaris when antibiotic therapy is considered necessary.

Since Doxycycline is a member of the tetracycline group of antibiotics, it may be expected to be useful in the treatment of infections, which respond to other tetracyclines, such as:

Ophthalmic infections

Due to susceptible strains of gonococci, staphylococci and *Haemophilus influenzae*. Doxycycline Capsules are indicated in the treatment of trachoma, although the infectious agent is not always eliminated, as judged by immunofluorescence.

Rickettsial infections

Rocky Mountain spotted fever, typhus group, Q fever, *Coxiella endocarditis* and tick fevers.

Other infections

Psittacosis, cholera, melioidosis, leptospirosis, other infections due to susceptible strains of *Yersinia* species, *Brucella* species (in combination with Streptomycin), *Clostridium* species, *Francisella tularensis* and chloroquine-resistant falciparum malaria.

Doxycycline Capsules are indicated for prophylaxis in the following conditions: Scrub typhus, travellers' diarrhoea (enterotoxigenic *Escherichia coli*), leptospirosis.

Consideration should be given to official guidance on the appropriate use of antibacterial agents.

4.2 Posology and method of administration

The capsules should be swallowed with plenty of fluid in either the resting or standing position and well before going to bed for the night to reduce the likelihood of oesophageal irritation and ulceration.

If gastric irritation occurs, it is recommended that Doxycycline Capsules be given with food or milk. Studies indicate that the absorption of doxycycline is not notably influenced by simultaneous ingestion of food or milk.

Posology

Adults and children aged 12 years to less than 18 years

The usual dosage of Doxycycline for the treatment of acute infections in adults *and children aged 12 years to less than 18 years* is 200mg on the first day (as a single dose or in divided doses with a twelve hour interval) followed by a maintenance dose of 100mg/day. In the management of more severe infections (particularly chronic infections of the urinary tract), 200mg daily should be given throughout the treatment period.

Exceeding the recommended dosage may result in an increased incidence of side effects. Therapy should be continued for at least 24 to 48 hours after the symptoms and fever have subsided.

When used in streptococcal infections, therapy should be continued for 10 days to prevent the development of rheumatic fever or glomerulonephritis.

Dosage recommendations in specific infections:

Acne vulgaris

50mg daily with food or fluid for 6 to 12 weeks.

Sexually transmitted diseases

100mg twice daily for 7 days is recommended in the following infections: uncomplicated gonococcal infections (except anorectal infections in men); uncomplicated urethral, endocervical or rectal infection caused by *Chlamydia trachomatis*; non-gonococcal urethritis caused by *Ureaplasma urealyticum*.

Acute epididymo-orchitis caused by *Chlamydia trachomatis* or *Neisseria gonorrhoea* 100mg twice daily for 10 days.

Primary and secondary syphilis: 300mg a day in divided doses for at least 10 days.

Louse and tick-borne relapsing fevers

A single dose of 100mg or 200mg according to severity.

Treatment of chloroquine-resistant falciparum malaria

200mg daily for at least 7 days. Due to the potential severity of the infection, a rapid-acting schizonticide such as quinine should always be given in conjunction with Doxycycline; quinine dosage recommendations vary in different areas.

Prophylaxis of malaria

100mg daily in adults and children over the age of 12 years. Prophylaxis can begin 1-2 days before travel to malarial areas. It should be continued daily during travel in the malarial areas and for 4 weeks after the traveller leaves the malarial area. For current advice on geographical resistance patterns and appropriate chemoprophylaxis, current guidelines or the Malaria Reference Laboratory should be consulted, details of which can be found in the British National Formulary (BNF).

For the prevention of scrub typhus

200mg as a single dose.

For the prevention of travellers' diarrhoea in adults

200mg on the first day of travel (administered as a single dose or as 100mg every 12 hours) followed by 100mg daily throughout the stay in the area. Data on the use of the drug prophylactically are not available beyond 21 days.

For the prevention of leptospirosis

200mg once each week throughout the stay in the area and 200mg at the completion of the trip. Data on the use of the drug prophylactically are not available beyond 21 days.

Children aged 8 years to less than 12 years. (Section 4.4)

The use of doxycycline for the treatment of acute infections in children aged 8 years to less than 12 years should be carefully justified in situations where other drugs are not available, are not likely to be effective or are contraindicated.

In such circumstance, the doses for the treatment of acute infections are:

For children 45 kg or less- Initial dose: 4.4 mg/kg (in single or 2 divided doses) with maintenance dose: 2.2 mg/kg (in single or 2 divided doses). In the management of more severe infections, up to 4.4 mg/kg should be given throughout treatment.

For children, over 45 kg - Dose administered for adults should be used.

Children aged from birth to less than 8 years.

Doxycycline should not be used in children aged younger than 8 years due to the risk of teeth discolouration. (Section 4.4 and 4.8)

Paediatric population: Not recommended.

Elderly patients

Doxycycline may be prescribed in the usual dose with no special precautions. No dosage adjustment is necessary in the presence of renal impairment.

Renal impairment: Studies to date have indicated that administration of doxycycline at the usual recommended doses does not lead to excessive accumulation of the antibiotic in patients with renal impairment.

The anti-anabolic action of the tetracyclines may cause an increase in blood urea. Studies to date indicate that this does not occur with the use of doxycycline in patients with impaired renal function.

Haemodialysis does not alter the serum half-life of doxycycline.

4.3 Contraindications

- Hypersensitivity to the active substance, any of the tetracyclines or to any of the excipients listed in section 6.1
- *Pregnancy*: Doxycycline is contraindicated in pregnancy (see section 4.6). It appears that the risks associated with the use of tetracyclines during pregnancy are predominantly due to effects on teeth and skeletal development (see Section 4.4 regarding use during tooth development).
- *Nursing mothers*: Tetracyclines are excreted into milk and are therefore contraindicated in nursing mothers (see Section 4.4 regarding use during tooth development).
- *Sucrose intolerance*: Patients with rare hereditary problems of fructose intolerance, glucose galactose malabsorption or sucrose-isomaltase insufficiency should not take doxycycline.

4.4 Special warnings and precautions for use

Paediatric population

The use of drugs of the tetracycline class during tooth development (last half of pregnancy; infancy and childhood to the age of 8 years) may cause permanent discolouration of the teeth (yellow-grey-brown). This adverse reaction is more common during long-term use of the drugs but has been observed following repeated short-term courses. Enamel hypoplasia has also been reported. Use doxycycline in paediatric patients aged younger than 8 years only when the potential benefits are expected to outweigh the risks in severe or life-threatening conditions (e.g. Rocky Mountain spotted fever), particularly only when there are no adequate alternative therapies.

Although the risk of permanent teeth staining is rare in children aged 8 years to less than 12 years, the use of doxycycline should be carefully justified in situations where other drugs are not available, are not likely to be effective or are contraindicated.

Photosensitivity

Photosensitivity manifested by an exaggerated sunburn reaction has been observed in some individuals taking tetracyclines, including doxycycline. Patients likely to be exposed to direct sunlight or ultraviolet light should be advised that this reaction can occur with tetracycline drugs and treatment should be discontinued at the first evidence of skin erythema.

Use in patients with impaired hepatic function

Doxycycline should be administered with caution to patients with hepatic impairment or those receiving potentially hepatotoxic drugs. Abnormal hepatic function has been reported rarely and has been caused by both the oral and parenteral administration of tetracyclines, including doxycycline.

Use in patients with renal impairment

Excretion of doxycycline by the kidney is about 40%/72 hours in individuals with normal renal function. This percentage excretion may fall to a range as low as 1-5%/72 hours in individuals with severe renal insufficiency (creatinine clearance below 10ml/min). Studies have shown no significant difference in the serum half-life of doxycycline in individuals with normal and severely impaired renal function.

Haemodialysis does not alter the serum half-life of doxycycline. The anti-anabolic action of the tetracyclines may cause an increase in blood urea. Studies to date indicate that this anti-anabolic effect does not occur with the use of Doxycycline in patients with impaired renal function.

Microbiological overgrowth

The use of antibiotics may occasionally result in overgrowth of non-susceptible organisms including *Candida*. If a resistant organism appears, the antibiotic should be discontinued and appropriate therapy instituted.

Pseudomembranous colitis has been reported with nearly all antibacterial agents, including doxycycline, and has ranged in severity from mild to life-threatening. It is important to consider this diagnosis in patients who present with diarrhoea subsequent to the administration of antibacterial agents.

Clostridium difficile associated diarrhoea (CDAD) has been reported with use of nearly all antibiotics, including doxycycline, and has ranged in severity from mild diarrhoea to fatal colitis. Treatment with antibacterial agents alters the normal flora of the colon leading to overgrowth of *C. difficile*. *C. difficile* produces toxins A and B, which contribute to development of CDAD. Hypertoxin producing strains of *C. difficile* cause increased morbidity and mortality, as these infections can be refractory to antimicrobial therapy and may require colectomy. CDAD should be considered in all patients who present with diarrhoea after antibiotic treatment. Careful medical history is necessary since CDAD has been reported to occur over two months after the administration of antibacterial agents.

Oesophagitis

Instances of oesophagitis and oesophageal ulcerations have been reported in patients receiving capsule and tablet forms of drugs in the tetracycline class, including doxycycline. Most of these patients took medications immediately before going to bed or with inadequate amounts of fluid.

Bulging fontanelles

Bulging fontanelles in infants and benign intracranial hypertension in juveniles and adults have been reported in individuals receiving full therapeutic dosages. These conditions disappeared rapidly when the drug was discontinued.

Porphyria

There have been rare reports of porphyria in patients receiving tetracyclines.

Venereal disease

When treating venereal disease, where co-existent syphilis is suspected, proper diagnostic procedures, including dark-field examinations, should be utilised. In such cases monthly serological tests should be performed for at least four months.

Beta-haemolytic streptococci infections

Infections due to Group A beta-haemolytic streptococci should be treated for at least 10 days.

Myasthenia gravis

Due to a potential for weak neuromuscular blockade, care should be taken in administering tetracyclines to patients with myasthenia gravis.

Systemic lupus erythematosus

Tetracyclines can cause exacerbation of systemic lupus erythematosus (SLE).

Jarisch-Herxheimer reaction

Some patients with spirochete infections may experience a Jarisch-Herxheimer reaction shortly after doxycycline treatment is started. Patients should be reassured that this is a usually self-limiting consequence of antibiotic treatment of spirochete infections.

Methoxyflurane

Caution is advised in administering tetracyclines with methoxyflurane (see section 4.5).

4.5 Interaction with other medicinal products and other forms of interaction

There have been reports of prolonged prothrombin time in patients taking warfarin and doxycycline.

Tetracyclines depress plasma prothrombin activity and reduced dosage of concomitant anti-coagulants may be necessary

Since bacteriostatic drugs may interfere with the bactericidal action of penicillin, it is advisable to avoid giving doxycycline in conjunction with penicillin.

The absorption of doxycycline may be impaired by concurrently administered antacids containing aluminium, calcium, magnesium or other drugs containing these cations; oral zinc, iron salts or bismuth preparations. Dosages should be maximally separated.

Phenobarbital, carbamazepine, primidone and phenytoin may increase the metabolism of doxycycline (reduced half-life). An increase in the daily dosage of doxycycline should be considered.

Alcohol may decrease the half-life of doxycycline.

The concurrent use of tetracyclines and methoxyflurane has been reported to result in fatal renal toxicity (see section 4.4).

Doxycycline may increase the plasma concentration of ciclosporin. Co-administration should only be undertaken with appropriate monitoring.

Drugs that induce hepatic enzymes such as rifampicin may accelerate the decomposition of doxycycline, thereby decreasing its half-life. Sub-therapeutic doxycycline concentrations may result. Monitoring concurrent use is advised and an increase in doxycycline dose may be required.

There is a possible increased risk of benign intra-cranial hypertension when doxycycline given with retinoids. Concomitant use should be avoided.

Antibacterials inactivate oral typhoid vaccines. Avoid administration of vaccine during treatment with doxycycline.

Ergotamine and methysergide; There is an increased risk of ergotism when doxycycline is co-administered with ergotamine and methysergide.

Methotrexate; Doxycycline increases the risk of methotrexate toxicity; prescribe with caution to patients on methotrexate.

Kaolin and sucralfate may reduce the absorption of doxycycline.

Quinapril contains magnesium carbonate and may interfere with the absorption of doxycycline

A few cases of pregnancy or breakthrough bleeding have been attributed to the concurrent use of tetracycline antibiotics with oral contraceptives.

Laboratory test interactions

False elevations of urinary catecholamine levels may occur due to interference with the fluorescence test.

4.6 Fertility, pregnancy and lactation

See “Contra-indications”, section 4.3.

4.7 Effects on ability to drive and use machines

Visual disturbances such as blurring of vision may occur during treatment with doxycycline and in such cases; patients must refrain from driving or operating machinery.

4.8 Undesirable effects

The following adverse reactions have been observed in patients receiving tetracyclines, including doxycycline.

Hypersensitivity reactions, including anaphylactic shock, anaphylaxis, anaphylactoid reaction, anaphylactoid purpura, hypotension, pericarditis, angioneurotic oedema, exacerbation of systemic lupus erythematosus, dyspnoea, serum sickness, peripheral oedema, tachycardia and urticaria.

Infections and infestations

As with all antibiotics, overgrowth of non-susceptible organisms may cause candidiasis, glossitis, staphylococcal enterocolitis, pseudomembranous colitis (with *Clostridium difficile* overgrowth) and inflammatory lesions (with candidal overgrowth) in the anogenital region.

Blood and lymphatic system disorders

Haemolytic anaemia, thrombocytopenia, neutropenia, porphyria, and eosinophilia have been reported with tetracyclines.

Immune system disorders

Jarisch-Herxheimer reaction (Frequency Not known) (see Section 4.4)

Endocrine disorders

When given over prolonged periods, tetracyclines have been reported to produce brown-black microscopic discolouration of thyroid tissue. No abnormalities of thyroid function are known to occur.

Nervous system disorders

Headache. Bulging fontanelles in infants and benign intracranial hypertension in juveniles and adults have been reported in individuals receiving full therapeutic dosages of tetracyclines. These are reversible on stopping the drug. Symptoms included blurring of vision, scotomata, diplopia and permanent visual loss has been reported.

Ear and labyrinth disorders

Tinnitus

Gastrointestinal disorders

Gastrointestinal symptoms are usually mild and seldom necessitate discontinuation of treatment. They include abdominal pain, stomatitis, anorexia, nausea, vomiting, diarrhoea, dyspepsia and rarely dysphagia. Oesophagitis and oesophageal ulceration have been reported in patients receiving doxycycline. A significant proportion of these cases occurred with the hydrochloride salt in the capsule form (see section 4.4). Tooth discolouration (*Reversible and superficial discolouration of permanent teeth has been reported with the use of doxycycline but frequency cannot be estimated from available data*) Black hairy tongue (frequency not known).

Hepatobiliary disorders

There have been rare reports of hepatotoxicity with transient increases in liver function tests, hepatitis, jaundice, hepatic failure and pancreatitis.

Skin and subcutaneous tissue disorders

Rashes including maculopapular and erythematous rashes, exfoliative dermatitis, erythema multiforme, Stevens-Johnson syndrome and toxic epidermal necrolysis have been reported. Photosensitivity (see section 4.4) and photo-onycholysis. Drug Rash with Eosinophilia and Systemic Symptoms (DRESS) (frequency not known).

Musculoskeletal and connective tissue disorders

Arthralgia and myalgia

Renal and urinary system disorders

Increased blood urea (see section 4.4).

Reproductive system and breast disorders

Vaginitis

Psychiatric disorders Anxiety

Reporting of suspected adverse reactions

Reporting suspected adverse reactions after authorisation 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 via the yellow card scheme at www.mhra.gov.uk/yellowcard or search for MHRA Yellow Card in the Google Play or Apple App Store.

4.9 Overdose

Acute overdosage with antibiotics is rare. In the event of overdosage gastric lavage plus appropriate supportive treatment is indicated.

Dialysis does not alter serum half-life and thus would not be of benefit in treating cases of overdosage.

5. Pharmacological properties

5.1 Pharmacodynamic properties

Pharmacotherapeutic group: tetracyclines, ATC code: J01AA02

Doxycycline is primarily a bacteriostatic antibiotic.

Mechanism of action

The main mechanism of action of doxycycline is on protein synthesis. Doxycycline passes directly through the lipid bilayer of the bacterial cell wall and an energy dependent active transport system pumps the drug through the inner cytoplasmic membrane. Once inside the cell doxycycline inhibits protein synthesis by binding to 30S ribosomes and prevents the addition of amino acids to the growing peptide chain. Doxycycline will impair protein synthesis in mammalian cells at very high concentrations but these cells lack the active transport system found in bacteria.

Doxycycline is clinically effective in the treatment of a variety of infections caused by a wide range of gram-negative and gram-positive bacteria, as well as certain other micro-organisms.

5.2 Pharmacokinetic properties

Absorption

Doxycycline is almost completely absorbed and is not subject to presystemic metabolism, the mean bioavailability being approximately 93%.

Absorption is rapid (effective concentrations are attained as from the first hour), and the peak serum concentration occurs after 2 to 4 hours.

Almost all of the product is absorbed in the upper part of the digestive tract. Absorption is not modified by administration with meals, and milk has little effect.

Distribution

Tissue distribution is good and Doxycycline has a strong affinity for renal and lung tissue. The volume of distribution for doxycycline ranges from 0.9-1.8 l/kg-1.

In adults, an oral dose of 200 mg results in;

- A peak serum concentration of more than 3 µg/ml
- A residual concentration of more than 1 µg/ml after 24 hours
- A serum half-life of 16 to 22 hours.
- Protein binding varying between 82 and 93% (labile binding) intra- and extracellular diffusion is good.

With usual dosages, effective concentrations are found in the ovaries, uterine tubes, uterus, placenta, testicles, prostate, bladder, kidneys, lung tissue, skin, muscles, lymph glands, sinus secretions, maxillary sinus, nasal polyps, tonsils, liver, hepatic and gallbladder bile, gallbladder, stomach, appendix, intestine, omentum, saliva and gingival fluid. Doxycycline is transferred into breast milk.

Only small amounts are diffused into the cerebrospinal fluid.

Biotransformation

No significant metabolism occurs.

Elimination

Doxycycline is cleared intact by renal and biliary mechanisms

The antibiotic is concentrated in the bile. About 40% of the administered dose is eliminated in 3 days in active form in the urine and about 32% in the faeces.

Urinary concentrations are roughly 10 times higher than plasma concentrations at the same time. In the presence of impaired renal function, urinary elimination decreases, faecal elimination increases and the half-life remains unchanged. The half-life is not affected by haemodialysis.

5.3 Preclinical safety data

Not Applicable

6. Pharmaceutical particulars

6.1 List of excipients

Microcellulose ; Crospovidone ; Polymethacrylate ; Talc

Capsules shell

Indigo carmine Yellow iron oxide Black iron oxide Titanium dioxide , Gelatin

6.2 Incompatibilities

None Stated

6.3 Shelf life

5 years

6.4 Special precautions for storage

Store below 25°C.

6.5 Nature and contents of container

Doxycycline capsules are packed in blister packs made of one sheet of 200 micron rigid, opaque white polyvinyl chloride and a second sheet of 20 micron aluminium.

Pack size: 10, and 100 capsule.

6.6 Special precautions for disposal and other handling

No special requirements.

7. Marketing authorisation holder

Ningbo Voice Biochemic Co., Ltd.

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