

1. Name of the Medicinal Product

Isoniazid Tablets BP 100 mg

2. Qualitative and Quantitative Composition

Each tablet contains isoniazid 100 mg.

Excipients with known effect:

Each tablet contains 69mg of mannitol

For a full list of excipients see section 6.1.

3. Pharmaceutical Form

White to off-white, capsule shaped, biconvex, bevelled edge tablet debossed with **M** on one side of the tablet and **IS** on the left side of the score and **7** on the right side of the score on the other side.

The tablet can be divided into equal halves.

4. Clinical Particulars

4.1. Therapeutic indication

Isoniazid Tablets BP 100 mg is indicated for the treatment of tuberculosis caused by *Mycobacterium tuberculosis*.

The most recent official guidelines on the treatment of tuberculosis (e.g. WHO guideline: http://whqlibdoc.who.int/publications/2010/9789241547833_eng.pdf) should be taken into consideration for deciding on the appropriateness of therapy with Isoniazid Tablets BP 100 mg.

4.2. Posology and method of administration

Oral use.

Isoniazid Tablets BP 100 mg should be swallowed whole with water or another drink.

The tablets should be taken on an empty stomach (at least one hour before or two hours after a meal).

Active tuberculosis

For the treatment of active tuberculosis isoniazid must always be used in combination with other antituberculosis drugs

Adults

In adults weighing 30–45 kg the daily dose is 200 mg isoniazid, administered as a single dose.

In patients weighing > 45 kg the daily dose is 300 mg isoniazid, administered as a single dose.

Children

The dose for children is 10 mg/kg daily (range 10–15 mg/kg body-weight daily). The following table can be used:

Number of Isoniazid Tablets BP 100 mg by weight band to be taken once daily

Child's body-weight	Dose	Number of tablets
3.5–7 kg	50 mg once daily	½ tablet once daily
7–10 kg	100 mg once daily	1 tablet once daily
10–15 kg	150 mg once daily	1½ tablets once daily
15–20 kg	200 mg once daily	2 tablets once daily
20–30 kg	250 mg once daily	2½ tablets once daily

Isoniazid Tablets BP 100 mg is not indicated for daily therapy of children weighing < 3.5 kg, as appropriate dose adjustments cannot be made.

The duration of therapy is dependent on the diagnostic category, as well as the combination of drugs used together with isoniazid. Official national and/or international guidelines (e.g. WHO Guideline, available at http://whqlibdoc.who.int/publications/2010/9789241547833_eng.pdf) should be consulted.

Latent tuberculosis (monotherapy)

Adults

300 mg once daily for at least 6 months

Children

10 mg/kg body-weight daily (maximum 300 mg daily) for at least 6 months

Child's body-weight	Dose	Number of tablets
< 5 kg	50 mg once daily	½ tablet once daily
5–9.9 kg	100 mg once daily	1 tablet once daily
10–13.9 kg	150 mg once daily	1½ tablets once daily
14–19.9 kg	200 mg once daily	2 tablets once daily
20–24.9 kg	250 mg once daily	2½ tablets once daily
> 25 kg	300 mg once daily	3 tablets once daily

Isoniazid Tablets BP 100 mg is not suitable for children weighing less than 5 kg for this indication, as appropriate dose adjustments cannot be made. In these cases another formulation containing less isoniazid should be used.

In case a dose is missed, this dose should be taken as soon as possible. However, if the next regular dose is due within 6 hours, the missed dose should be skipped.

Renal impairment

No dose adjustment is generally recommended for patients with renal impairment. However, patients should be closely monitored for signs of isoniazid toxicity, especially peripheral neuropathy. A dose reduction to two-thirds of the normal daily dose may be considered in slow acetylators with severe renal impairment (creatinine clearance less than 25 ml/minute) or in those with signs of isoniazid toxicity (see section 4.4 and 5.2).

Hepatic impairment

Limited data indicate that the pharmacokinetics of isoniazid are altered in patients with hepatic impairment. Therefore, patients with hepatic impairment should be closely observed for signs of isoniazid toxicity (see also sections 4.3 and 4.4)

4.3. Contraindications

Isoniazid is contraindicated in patients with

- hypersensitivity to the active substance or to any of the excipients
- acute liver disease of any aetiology
- drug-induced hepatic disease
- previous isoniazid-associated hepatic injury or
- previous severe adverse reactions to isoniazid such as drug fever, chills or arthritis.

4.4. Special warnings and precautions for use

Severe and sometimes fatal isoniazid-associated hepatitis has been reported. The majority of cases occur within the first three months of therapy, but hepatotoxicity may also develop after a longer duration of treatment. Therefore, patients should be carefully monitored and interviewed at monthly intervals.

Patients should be instructed to immediately report signs or symptoms consistent with liver damage or other adverse effects. These include any of the following: unexplained anorexia, nausea, vomiting, dark urine, icterus, rash, persistent paraesthesia of the hands and feet, persistent fatigue, weakness of greater than 3 days duration and abdominal tenderness, especially in the right upper quadrant. If these symptoms appear or if signs suggestive of hepatic damage are detected, isoniazid should be discontinued promptly, since continued use of the drug in these cases has been reported to cause a more severe form of liver damage.

Patients especially at risk for developing hepatitis include:

- age > 35 years
- daily users of alcohol (patients should be strongly advised to restrict intake of alcoholic beverages, see section 4.5)
- patients with active chronic liver disease
- injection drug users.

In addition to monthly symptom reviews, hepatic enzymes (specifically AST and ALT) should be measured before these patients start isoniazid therapy and then periodically throughout treatment.

Furthermore, the following patients should be carefully monitored:

- patients also taking another long-term medicine (see section 4.5)
- existence of peripheral neuropathy or conditions predisposing to neuropathy
- pregnant patients and
- HIV infected patients.

The concentration of liver enzymes is commonly raised during isoniazid therapy. These effects on liver function are usually mild to moderate, and will most commonly normalise spontaneously within three months, even in the presence of continued therapy.

If the concentration of liver enzymes exceeds three to five times the upper limit of normal, discontinuation of Isoniazid Tablets BP 100 mg should be strongly considered.

Peripheral neuropathy

Peripheral neuropathy is the most common toxic effect of isoniazid (see section 4.8). The frequency depends on the dose and on predisposing conditions such as malnutrition, impaired renal function, alcoholism or diabetes. Concomitant pyridoxine administration largely reduces the risk of developing neuropathy. Therefore, pyridoxine should be co-administered routinely at doses of 10 mg daily.

Cross-sensitivity

Patients hypersensitive to ethionamide, pyrazinamide, niacin (nicotinic acid), or other chemically related medications may also be hypersensitive to isoniazid.

Isoniazid should be used with caution in patients with seizure disorders, a history of psychosis or hepatic impairment.

Diabetes mellitus

Patients with diabetes should be carefully monitored, since blood glucose control may be affected by isoniazid.

Renal impairment

Patients with renal impairment, particularly those who are slow acetylators (see sections 4.2 and 5.2) may be at increased risk for isoniazid adverse effects such as peripheral neuropathy, and should be monitored accordingly. As in other patients, adequate supplementation with pyridoxine (see above) should be given to avoid neurotoxicity.

Excipient

Each tablet contains mannitol, which may have a mild laxative effect.

4.5. Interactions with other medicinal products and other forms of interaction

Isoniazid inhibits CYP2C19 and CYP3A4 in vitro. Thus it may increase exposure to drugs mainly eliminated through either of these pathways. The following list of interactions should not be considered exhaustive, but as representative of the classes of medicinal products where caution should be exercised.

Anticonvulsants

Phenytoin, carbamazepine, valproate: isoniazid decreases the apparent clearance of these drugs, and therefore increases drug exposure. Plasma concentrations of the anticonvulsant should be determined prior to and after initiation of isoniazid therapy; the patient should be monitored closely for signs and symptoms of toxicity and the dose of the anticonvulsant should be adjusted accordingly.

Concomitant intake of phenytoin or carbamazepine may increase the hepatotoxicity of isoniazid.

Sedatives

Benzodiazepines (e.g. diazepam, flurazepam, triazolam, midazolam): isoniazid may decrease the hepatic metabolism of benzodiazepines, leading to increased benzodiazepine plasma concentrations. Patients should be carefully monitored for signs of benzodiazepine toxicity and the dose of the benzodiazepine should be adjusted accordingly.

Phenobarbital: concomitant use with isoniazid may lead to increased hepatotoxicity.

Antipsychotics

Chlorpromazine: concomitant use with isoniazid may impair the metabolism of isoniazid. Patients should be carefully monitored for isoniazid toxicity.

Haloperidol: concomitant use with isoniazid may increase plasma levels of haloperidol. Patients should be carefully monitored for haloperidol toxicity and the dose of haloperidol should be adjusted accordingly.

Anticoagulants

Coumarin or indandione derivatives (e.g. warfarin and phenindione): concomitant use with isoniazid may inhibit the enzymatic metabolism of the anticoagulants, leading to increased plasma concentrations with an increased risk of bleeding. Therefore, INR should be closely monitored.

Opioids and anaesthetics

Alfentanil: isoniazid may decrease the plasma clearance and prolong the duration of action of alfentanil. The dose of alfentanil may need to be adjusted accordingly.

Enflurane: isoniazid may increase the formation of the potentially nephrotoxic inorganic fluoride metabolite of enflurane when used concomitantly.

Others

Theophylline: Concomitant use with isoniazid may reduce the metabolism of theophylline, thereby increasing its plasma levels. Therefore, theophylline plasma levels should be monitored.

Procainamide: Concomitant use with isoniazid may increase the plasma concentrations of isoniazid. Patients should be carefully monitored for isoniazid toxicity.

Corticosteroids (e.g. prednisolone): In one study, concomitant use with isoniazid decreased isoniazid exposure by 22–30%. Isoniazid dosage adjustments may be required in rapid acetylators.

Paracetamol: Concurrent use with isoniazid may increase hepatotoxicity.

Aluminium hydroxide: isoniazid absorption may be impaired. During therapy with isoniazid, acid-suppressing drugs or antacids that do not contain aluminium hydroxide should be used.

Disulfiram: concurrent use with isoniazid may result in increased incidence of effects on the central nervous system. Reduced dosage or discontinuation of disulfiram may be necessary.

Hepatotoxic medications: concurrent use of isoniazid with other hepatotoxic medications may increase hepatotoxicity and should be avoided.

Neurotoxic medications: concurrent use of isoniazid with other neurotoxic medications may lead to additive neurotoxicity and should be avoided.

Interactions with food and drinks

Alcohol: concurrent daily intake of alcohol may result in an increased incidence of isoniazid-induced hepatotoxicity. Patients should be monitored closely for signs of hepatotoxicity and should be strongly advised to restrict intake of alcoholic beverages (see section 4.4).

Cheese and fish (histamine- or tyramine-rich food): concurrent ingestion with isoniazid may lead to inhibition of mono-/diamine oxidases by isoniazid, interfering with the metabolism of histamine and tyramine. Clinically, this may result in redness or itching of the skin, hot feeling, rapid or pounding heartbeat, sweating, chills or clammy feeling, headache, or lightheadedness.

Interactions with laboratory tests

Isoniazid may cause a false positive response to copper sulfate glucose tests; enzymatic glucose tests are not affected.

4.6. Pregnancy and lactation

Pregnancy

No adverse effects of isoniazid on the fetus have been reported. However, isoniazid is to be used in pregnancy only when the benefits outweigh the potential risks.

Lactation

Isoniazid is present in breast milk of lactating mothers. No adverse effects in the baby have been reported. Concentrations in breast milk are too low for breast-feeding to be relied upon for adequate tuberculosis prophylaxis or therapy for nursing infants.

4.7. Effects on ability to drive and use machines

No studies on the effects on the ability to drive and use machines have been performed. Nevertheless, the clinical status of the patient and the adverse reaction profile of this medicine, especially its

potential neurotoxicity, should be borne in mind when considering the patient's ability to drive or operate machinery.

4.8. Undesirable effects

The most important adverse effects of isoniazid are peripheral and central neurotoxic effects, and severe and sometimes fatal hepatitis.

The adverse events considered at least possibly related to treatment are listed below by body system, organ class and frequency. They are not based on adequately sized randomized controlled trials, but on published literature data generated mostly during post-approval use. Therefore, often no frequency data can be given. Frequencies are defined as very common (≥ 1 in 10), common (1 in 100 to 1 in 10), uncommon (1 in 1000 to 1 in 100), rare (1/10 000 to 1 in 1000), very rare ($\leq 1/10$ 000), 'not known'.

Nervous system disorders

<i>Very common</i>	peripheral neuropathy, usually preceded by paraesthesia of the feet and hands. The frequency depends on the dose and on predisposing conditions such as malnutrition, alcoholism or diabetes. It has been reported in 3.5 to 17% of patients treated with isoniazid. Concomitant pyridoxine administration largely reduces this risk (see section 4.4).
<i>Uncommon</i>	seizures, toxic encephalopathy
<i>Not known</i>	dizziness, headache, tremor, vertigo, hyperreflexia

Psychiatric disorders

<i>Uncommon</i>	memory impairment, toxic psychosis
<i>Not known</i>	confusion, disorientation, hallucination

Gastrointestinal disorders

<i>Not known</i>	nausea, vomiting, anorexia, dry mouth, flatulence, abdominal pain, constipation
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Hepatobiliary disorders

<i>Very common</i>	transient elevation of serum transaminases
<i>Uncommon</i>	hepatitis

Renal and urinary disorders

<i>Not known</i>	urinary retention, nephrotoxicity including interstitial nephritis
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Metabolic and nutritional disorders

<i>Not known</i>	hyperglycaemia, metabolic acidosis, pellagra
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General disorders

<i>Not known</i>	allergic reactions with skin manifestation (exanthema, erythema, erythema multiforme), pruritus, fever, leucopenia, anaphylaxis, allergic pneumonitis, neutropenia, eosinophilia, Stevens-Johnson syndrome, vasculitis, lymphadenopathy, rheumatic syndrome, lupus-like syndrome
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Blood and lymphatic system disorders

<i>Not known</i>	anaemia (haemolytic, sideroblastic, or aplastic), thrombocytopenia, leucopenia (allergic), neutropenia with eosinophilia, agranulocytosis.
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Respiratory, thoracic and mediastial disorders

Not known pneumonitis (allergic)

Musculoskeletal disorders

Not known arthritis

Eye disorders

Not known Optic atrophy or neuritis.

For recommendations on the management of side effects related to anti-tuberculosis therapy official national and international guidelines (e.g. WHO Guideline, available at http://whqlibdoc.who.int/publications/2010/9789241547833_eng.pdf) should be consulted.

4.9. **Overdose**

Symptoms

Anorexia, nausea, vomiting, gastrointestinal disturbances, fever, headache, dizziness, slurred speech, hallucinations or visual disturbances occur within 30 minutes to 3 hours after ingestion. With marked isoniazid overdoses (≥ 80 mg/kg body-weight) respiratory distress and CNS depression, progressing rapidly from stupor to profound coma, along with severe intractable seizures are to be expected. Typical laboratory findings are severe metabolic acidosis, acetonuria, and hyperglycaemia.

Treatment

Emesis, gastric lavage and activated charcoal may be of value if instituted within a few hours of ingestion. Subsequently, pyridoxine (intravenous bolus on a gram-per-gram basis, equal to the isoniazid dose; if isoniazid dose is unknown an initial dose of 5 g in adults or 80 mg/kg in children should be considered), intravenous diazepam (in case of seizures not responding to pyridoxine) and haemodialysis may be of value. Further treatment should be supportive, with special attention to monitoring and support of ventilation and correction of metabolic acidosis. There is no specific antidote.

5. **Pharmacological Properties**

5.1. **Pharmacodynamic properties**

Pharmacotherapeutic group: Antimycobacterial

ATC Code for isoniazid: J04AC01

Mechanism of action

Isoniazid is highly active against *Mycobacterium tuberculosis*. It is bactericidal in vitro and in vivo against actively dividing tubercle bacilli. Its primary action is to inhibit the synthesis of long-chain mycolic acids, which are unique constituents of mycobacterial cell wall. Resistance to isoniazid occurs rapidly if it is used alone in the treatment of clinical disease due to mycobacteria.

5.2. **Pharmacokinetic properties**

Absorption

After oral administration isoniazid is rapidly absorbed with a bioavailability of $\geq 80\%$, and peak serum concentrations is reached after 1–2 hours. The rate and extent of absorption are reduced when isoniazid is administered with food. Isoniazid undergoes appreciable presystemic (first-pass) metabolism in the wall of small intestine and liver.

No pharmacokinetic data are available for Isoniazid Tablets BP 100 mg. Following single-dose Isoniazid Tablets BP 300 mg administration in healthy volunteers, the mean (\pm SD) isoniazid C_{\max} value was 8323 ng/ml (\pm 3637), and the corresponding value for $AUC_{0-\infty}$ was 38063 ng·hour/ml (\pm 10516). The mean (\pm SD) isoniazid t_{\max} value was 0.92 (\pm 0.76) hours.

Distribution

Isoniazid is distributed in the body with an apparent volume of distribution volume of 0.57 to 0.76 litre/kg. Protein binding is very low (0–10%).

Metabolism

Isoniazid undergoes extensive metabolism that takes place in the mucosal cells of the small intestine and in the liver. First isoniazid is inactivated through acetylation. Subsequently acetyl-isoniazid is further hydrolysed. Isoniazid acetylation is dependent on the genetically determined metabolic rate of the individual patients, termed either fast or slow acetylators (this is due to genetic polymorphism in the metabolising enzyme N-acetyl transferase). The proportion of acetylator phenotypes varies among different ethnic groups. Acetylator status is the main determinant of isoniazid exposure at a given dose. At recommended doses, exposure in fast acetylators is about half that in slow acetylators.

Excretion

Up to 95% of ingested isoniazid is excreted in the urine within 24 hours, primarily as inactive metabolites. Less than 10% of the dose is excreted in the faeces. The main excretion products in the urine are N-acetylisoniazid and isonicotinic acid.

Renal impairment

The documentation of the pharmacokinetics of isoniazid and its metabolites in patients with renal impairment is incomplete. However, the half-life of isoniazid is prolonged and exposure is increased, in slow acetylators. Exposure to the (inactive) metabolites of isoniazid is likely to be increased in both fast and slow acetylators.

5.3. Preclinical safety data

Non-clinical data reveal no special hazard for humans at recommended doses based on conventional studies of safety pharmacology, repeated-dose toxicity, genotoxicity, carcinogenic potential, and toxicity to reproduction.

6. Pharmaceutical Particulars

6.1. List of Excipients

Colloidal anhydrous silica, croscarmellose sodium, mannitol, microcrystalline cellulose, povidone, pregelatinized starch and stearic acid.

6.2. Incompatibilities

Not applicable.

6.3. Shelf life

24 months

6.4. Special precautions for storage

Do not store above 30°C. Keep in a well-closed container, protected from light. Store the tablets in blisters in the provided carton.

6.5. Nature and contents of container

HDPE bottle:

Tablets are packed in a round wide mouth white HDPE bottle with white opaque polypropylene screw cap with aluminium induction sealing liner wad.

Adsorbent cotton: Well bleached cotton fibre, soft, hair like white filaments Pack size: 100 tablets.

Blister pack:

Tablets are packed in clear transparent PVC/PVDC-Al blister pack of 10 tablets. Such 10 blisters in a carton box.

6.6. Special precautions for disposal

No special requirements

7. Supplier

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