SUMMARY OF PRODUCT CHARACTERISTICS
1. NAME OF THE MEDICINAL PRODUCT
Isoniazid 300 mg Tablets

2. QUALITATIVE AND QUANTITATIVE COMPOSITION
Each tablet contains 300 mg isoniazid

For a full list of excipients see section 6.1.

3. PHARMACEUTICAL FORM
White to off-white, circular, biconvex, uncoated tablets, plain on both sides.

No score line. Tablets should not be divided.

4. CLINICAL PARTICULARS

4.1 Therapeutic indication
Isoniazid 300 mg Tablets is indicated for the treatment of tuberculosis, caused by *Mycobacterium tuberculosis*.

Consideration should be given to official treatment guidelines for tuberculosis, e.g those of WHO: (http://apps.who.int/iris/bitstream/10665/130918/1/9789241548809_eng.pdf?ua=1&ua=1 and http://www.who.int/tb/areas-of-work/drug-resistant-tb/MDRTBguidelines2016.pdf?ua=1)

4.2 Posology and method of administration
Oral use.

**ACTIVE TUBERCULOSIS**
For the treatment of active tuberculosis, isoniazid must always be used in combination with other antituberculosis drugs.
As component of standard therapy for drug-susceptible tuberculosis

**Daily therapy:**

*Adults and adolescents:*
4-6 mg/kg body weight/day, maximum 300 mg/day
In patients weighing > 45 kg the daily dose is 300 mg, administered as a single dose.

Isoniazid 300 mg Tablets is not indicated for daily therapy of patients weighing < 45 kg, as appropriate dose adjustments cannot be made.

*Children:*
7-15 mg/kg body weight/day, maximum 300 mg/day
In children weighing > 21 kg the daily dose is 300 mg, administered as a single dose.

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1Trade names are not prequalified by WHO. This is the National Medicines Regulatory Agency’s (NMRA) responsibility. Throughout this WHOPAR the proprietary name is given as an example only.
Isoniazid 300 mg Tablets is not indicated for daily therapy of children weighing < 21 kg, as appropriate dose adjustments cannot be made. In these cases another formulation containing less isoniazid should be used.

As add-on agent to therapy for certain types of drug-resistant tuberculosis
In adults and adolescents:
High dose isoniazid: 16-20 mg/kg body weight/day
In patients weighing 30 to 35.9 kg: 600-1000 mg
In patients weighing 36 to 45.9 kg: 1000-1500 mg
In patients weighing 46 kg or more: 1500 mg

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 should be consulted.

LATENT TUBERCULOSIS (monotherapy)
Adults and adolescents:
5 mg/kg body weight, maximum 300 mg for 6 or 9 months

Children:
7-15 mg/kg body weight, maximum 300 mg for 6 or 9 months

Isoniazid 300 mg Tablets is not suitable for children weighing < 21 kg for this indication, as appropriate dose adjustments cannot be made. In these cases another formulation containing less isoniazid should be used.

Special populations
Renal impairment:
No dose adjustment in patients with renal impairment is generally recommended. 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 (ClCr <25 ml/min) or in those with signs of isoniazid toxicity (see sections 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 section 4.4).

Method of administration
Isoniazid 300 mg Tablets should be swallowed whole with water or another drink. The tablets should be taken on an empty stomach (at least one hour prior to or two hours after a meal).

Advice on missed dose
In case of missing a dose, this dose should be taken as soon as possible, unless the next regular dose is scheduled within 6 hours. Otherwise the missed dose should be skipped.

4.3 Contraindications
Isoniazid 300 mg Tablets is contraindicated in patients with
- hypersensitivity to the active substance or to any of the excipients listed in section 6.1.
- acute liver disease of any etiology
- 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 hepatitis associated with isoniazid therapy 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/or abdominal tenderness, especially of 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.

Patient groups 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 and
- injection drug users.

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

Furthermore, the following patients should be carefully monitored:

- patients with concurrent use of any chronically administered medication (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 therapy with Isoniazid 300 mg Tablets. 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 300 mg Tablets 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 per day.

Cross-sensitivity

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

Isoniazid should be used with caution in patients with pre-existing 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.

4.5 Interactions with other medicinal products and other forms of interaction
Isoniazid acts as an inhibitor of CYP2C19 and CYP3A4. 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.
Acetaminophen, paracetamol: Concurrent use with isoniazid may increase hepatotoxicity.
Aluminium hydroxide impairs the absorption of isoniazid. During therapy with Isoniazid 300 mg Tablets 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 Fertility, 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.

Breastfeeding
Isoniazid is excreted into the breast milk of lactating mothers. No adverse effects in the baby have been reported. Concentrations in breast milk are so low, that breast-feeding cannot be relied upon for adequate tuberculosis prophylaxis or therapy for nursing infants.

Fertility
There are no data on the effects of isoniazid on human male or female fertility. In animal studies, male fertility has been impaired by isoniazid (see section 5.3).

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 reactions considered at least possibly related to treatment with the components of Isoniazid 300 mg Tablets from clinical trial and post-marketing experience are listed below by body system organ class and absolute frequency. Within each frequency grouping, undesirable effects are
presented in order of decreasing seriousness. Frequencies are defined as very common (≥ 1/10),
common (≥ 1/100, < 1/10), uncommon (≥ 1/1,000, < 1/100), rare (≥ 1/10,000, < 1/1,000) or very rare
(< 1/10,000) including isolated reports, or not known (identified through post-marketing safety
surveillance and the frequency cannot be estimated from the available data).

Nervous system disorders
Very common: Peripheral neuropathy, usually preceded by paraesthesias 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).
Uncommon: seizures, toxic encephalopathy
Not known: dizziness, headache, tremor, vertigo, hyperreflexia.

Psychiatric disorders
Uncommon: memory impairment, toxic psychosis
Not known: confusion, disorientation, hallucination.

Gastrointestinal disorders
Not known: nausea, vomiting, anorexia, dry mouth, flatulence, abdominal pain, constipation.

Hepatobiliary disorders:
Very common: Transient increases of serum transaminases.
Uncommon: hepatitis.

Renal and urinary disorders
Not known: urinary retention, nephrotoxicity including interstitial nephritis.

Metabolic and nutrition disorders
Not known: hyperglycaemia, metabolic acidosis, pellagra.

General disorders
Not known: 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.

Blood and lymphatic systems disorders
Not known: anaemia (haemolytic, sideroblastic, or aplastic), thrombocytopenia, leucopenia (allergic),
neutropenia with eosinophilia, agranulocytosis.

Respiratory, thoracic and mediastinal 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/or international guidelines should be consulted.
4.9 Overdose

Symptoms
Anorexia, nausea, vomiting, gastrointestinal disturbances, fever, headache, dizziness, slurred speech, hallucinations and/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 latter dose is unknown an initial dose of 5 g in adults or 80 mg/kg BW 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/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 ≥80%, and peak serum concentrations 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.

Following single dose Isoniazid 300 mg Tablets administration in healthy volunteers, the mean (± SD) isoniazid Cmax value was 7.46 µg/ml (± 2.38), and the corresponding value for AUC was 30.9 µg.h/ml (± 13.5). The mean (± SD) isoniazid tmax value was 0.68 (± 0.39) hours.

*Distribution*
Isoniazid is distributed in the body with an apparent volume of distribution volume of 0.57 to 0.76 l/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, who are termed either fast or slow acetylators (this is due to a genetic polymorphism in the metabolising enzyme N-acetyl transferase). Different ethnic groups contain differing proportions of acetylator phenotypes. Acetylator status is the main determinant of isoniazid metabolism.
exposure at a given dose. At recommended doses, exposure in fast acetylators is about half that seen 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.

Special populations

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. The 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, toxicity to reproduction. In male rats spermatogenesis impairment and abnormalities in testicular histopathology was seen

6. PHARMACEUTICAL PARTICULARS

6.1 List of Excipients
Microcrystalline cellulose, maize starch, crospovidone, colloidal silicon dioxide and magnesium stearate.

6.2 Incompatibilities
Not applicable.

6.3 Shelf life
24 months

6.4 Special precautions for storage
For blister pack
Do not store above 30°C. Store the tablets in the blisters in the provided cartons in order to protect from light.

For bottle pack
Do not store above 30°C. Protect from light, in tightly closed container.

6.5 Nature and contents of container
Blister pack
Tablets are packed in PVC/PVDC-Alu blister of 10 or 28 tablets. Each carton may contain 10 blisters of 10 tablets or 24 blisters of 28 tablets along with leaflet.

Bottle pack
Tablets are packed in triple laminated pouch containing 500 or 1000 tablets, packed in HDPE bottle with cap along with leaflet.
6.6 Special precautions for disposal
No special requirements

Any unused product or waste material should be disposed of in accordance with local requirements.

7. SUPPLIER
Cadila Pharmaceuticals Limited
1389, Trasad Road
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India

8. WHO REFERENCE NUMBER (PREQUALIFICATION PROGRAMME)
TB276

9. DATE OF FIRST PREQUALIFICATION
29 October 2015

10. DATE OF REVISION OF THE TEXT
May 2017

Detailed information on this medicine is available on the World Health Organization (WHO) web site: https://extranet.who.int/prequal

References:
Companion handbook to the WHO guidelines for the programmatic management of drug-resistant tuberculosis
http://apps.who.int/iris/bitstream/10665/130918/1/9789241548809_eng.pdf?ua=1&ua=1
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ATS, CDC, and IDSA, Treatment of Tuberculosis, MMWR 2003; 52
Thompson: Micromedex, Drugdex 2007, Isoniazid (systemic)
Fachinformation Isozid Tabletten (Fatol Arzneimittel GmbH), June 2001

References for specific sections of the SmPC
4.4
On the hepatotoxicity of TB drugs:

4.5
On drug interactions:
The SPHINX Drug Interaction Database. Available at:
http://drugdb.janusinfo.se/sfinx/interactions/index_menus.jsp

4.6

4.8

5.2
On isoniazid pharmacokinetics in renal failure:
Ellard GA. Nephron 1993;64:169-81
Gurumurthy P et al. Inf J Tu. 1991;7992:221-228