

This part outlines the scientific assessment and knowledge about this product at the time of prequalification. Updates to this information are included in parts 1 to 5 and 8 of this WHOPAR.

## SCIENTIFIC DISCUSSION

<b>Name of the Finished Pharmaceutical Product:</b>	[TB308 trade name] <sup>1</sup>
<b>Manufacturer of Prequalified Product:</b>	Mylan Laboratories Limited Plot No. H-12 & H-13 MIDC, Waluj Industrial Area Aurangabad – 431136 Maharashtra State, India
<b>Active Pharmaceutical Ingredients (APIs):</b>	Isoniazid
<b>International Nonproprietary Name:</b>	Isoniazid 100 mg Tablets
<b>Pharmaco-therapeutic group (ATC Code):</b>	Antimycobacterial (J04AC01).
<b>Therapeutic indication:</b>	[TB308 trade name] is indicated for the treatment of tuberculosis caused by <i>Mycobacterium tuberculosis</i> .

<sup>1</sup> Trade names are not prequalified by WHO. This is the national medicines regulatory authority's responsibility  
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## 1. Introduction

[TB308 trade name] is indicated for the treatment of tuberculosis, caused by *Mycobacterium tuberculosis*. [TB308 trade name] is not indicated for use in patients with clinically significant hypersensitivity to isoniazid or to any of the components in the formulation, and in patients with acute liver disease, drug induced hepatic disease and previous isoniazid-associated hepatic injury.

Therapy is recommended only on the advice of a health care provider experienced in the treatment of tuberculosis.

## 2. Assessment of Quality

The assessment was done in accordance with the requirements of WHO's *Guidelines on submission of documentation for a multisource (generic) finished pharmaceutical product for the WHO Prequalification of Medicines Programme: quality part*.

### Active pharmaceutical Ingredient (API)

Based on scientific principles the WHO Prequalification Team – Medicines (PQTm) has identified isoniazid (up to 300mg oral dose) as a BCS class 3 API. The API is thus BCS highly soluble.

Isoniazid has been prequalified by WHO according to WHO's *Procedure for assessing the acceptability, in principle, of active pharmaceutical ingredients for use in pharmaceutical products* (WHO Technical Report Series No. 953, 2009, Annex 4). This procedure provides an assurance that isoniazid, used in the manufacture of Isoniazid 100mg Tablets, is of good quality and manufactured in accordance with WHO Good Manufacturing Practices. API prequalification consists of a comprehensive evaluation procedure that has two components: Assessment of the API master file (APIMF) to verify compliance with WHO norms and standards, and assessment of the sites of API manufacture to verify compliance with WHO GMP requirements.

### Other ingredients

Other ingredients used in the tablet formulation include mannitol, microcrystalline cellulose, croscarmellose sodium, povidone, pregelatinized starch, colloidal anhydrous silica and stearic acid, all being pharmacopoeial controlled. BSE/TSE compliance declarations were provided for all excipients

### Finished pharmaceutical product (FPP)

#### *Pharmaceutical development and manufacture*

The multisource product is a white to off-white, capsule shaped, biconvex, beveled 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 score-line is intended for subdivision of tablets when half a tablet dose is to be administered. The tablets are presented in HDPE bottles.

Two tablet strengths, proportionally similar in composition, were developed: 100 mg and 300 mg. The development, described below, focused on the higher strength.

The multisource product was developed as an immediate release, solid oral tablet dosage form that would be bioequivalent to the WHO PQTm recommended comparator product, Isoniazid 300 mg tablets of Sandoz marketed in the USA. The excipients selected are conventional for immediate release tablets and are included in the formulation at suitable levels for recognised purposes. The compatibility of the excipients with the API was demonstrated by API-excipient studies performed on binary mixtures.

Due to poor flow properties of isoniazid, an aqueous wet granulation process was selected for the manufacture of the tablets. The formulation and process parameters were optimised, targeting the profiles of the comparator product. Appropriate in-process controls were set to ensure batch-to-batch reproducibility.

The two strengths showed similar – very rapidly – dissolution profiles in the main BCS media, forming the basis of a biowaiver for the lower strength.

### *Specifications*

The finished product specifications are pharmacopoeial based and include tests for description, identification of the API (IR, UV), uniformity of dosage units (by mass variation), dissolution (UV detection), assay (UV at release, HPLC during stability), related substances (HPLC), loss on drying, microbial limits and uniformity of mass (on subdivided tablets). The test procedures have been adequately validated.

### *Stability testing*

Stability studies have been conducted at 30°C/75%RH (zone IVb) as long-term storage condition and for six months at 40°C/75%RH as accelerated condition in the packaging proposed for marketing of the product. The product proved to be stable at both long term and accelerated storage conditions with a slight increase in degradation products, though within agreed limits. Based on the available stability data, the proposed shelf life and storage conditions as stated in the SmPC are acceptable.

### **Conclusion**

The quality part of the dossier is accepted.

### **3. Assessment of Bioequivalence**

The following bioequivalence study has been performed in 2016 according to internationally accepted guidelines.

Study title: A randomized, open-label, balanced, two-treatment, two-period, two-sequence, single-dose, crossover oral bioequivalence study of Isoniazid tablets BP 300 mg of Mylan Laboratories Limited, India with Isoniazid tablets USP 300 mg of Sandoz Inc. Princeton, NJ 08540, in normal healthy adult human subjects under fasting conditions (study no. C16262).

The objective of the study was to compare the bioavailability of the stated Isoniazid 300 mg tablet manufactured for/by Mylan Laboratories Limited, India (test drug) with the reference formulation Isoniazid USP 300 mg tablet (Sandoz Inc.) and to assess bioequivalence. The comparison was performed as a single centre, open label, randomized, crossover study in healthy subjects under fasting conditions. Each subject was assigned to receive each of the following treatments in a randomized fashion:

- Treatment T: Test – 1 tablet Isoniazid 300 mg  
(isoniazid 300 mg)  
Batch no. 3046450
- Treatment R: Reference – 1 tablet Isoniazid USP 300 mg  
(isoniazid 300 mg)  
Batch no. ME150324

A 7 day wash-out period was observed between administration of test and reference. Serial blood samples (1 pre-dose sample and 21 samples within 36 h post dose) were taken during each study period to obtain bioavailability characteristics AUC, C<sub>max</sub> and t<sub>max</sub> for bioequivalence evaluation. Drug concentrations for isoniazid were analyzed using a validated LC-MS/MS method. The limit of quantification was stated to be about 50 ng/ml for isoniazid.

The study was performed with 28 participants; data generated from a total of 26 subjects were utilized for analysis to establish pharmacokinetic parameters and assess bioequivalence.

Arithmetic mean and geometric mean values of the pharmacokinetic variables for isoniazid as well as statistical results are summarised in the following table:

**Isoniazid**

Pharmacokinetic Parameter	Test formulation (T) arithmetic mean ± SD (* )	Reference (R) arithmetic mean ± SD (* )	log-transformed parameters	
			Ratio T/R (%)	Conventional 90% CI (ANOVAlog)
t <sub>max</sub> (h)	0.92 ± 0.76	0.72 ± 0.63	-	-
C <sub>max</sub> (ng/ml)	8323 ± 3637 (7754)	8647 ± 2418 (8358)	92.8	82.9 – 103.8
AUC <sub>0-t</sub> (ng.h/ml)	37158 ± 10194 (36439)	37009 ± 10678 (36077)	101.2	98.5 – 103.9
AUC <sub>0-inf</sub> (ng.h/ml)	38063 ± 10516 (35593)	37958 ± 11017 (35186)	101.0	98.4 – 103.7

\* geometric mean

The results of the study show that preset acceptance limits of 80 -125 % are met by both AUC and C<sub>max</sub> values regarding isoniazid. Accordingly, the test Isoniazid 100 mg tablet meets the criteria for bioequivalence with regard to the rate and extent of absorption and is therefore bioequivalent to the reference Isoniazid USP 300 mg (Sandoz Inc.).

A biowaiver was granted for the additional 100 mg tablet strength (Mylan Laboratories Limited, India) in accordance with WHO guideline. In comparison with the strength of the test product used in the bioequivalence study, the Isoniazid 100 mg tablet was determined to be qualitatively essentially the same, the ratio of active ingredient and excipients between the strengths is considered essentially the same and the dissolution profiles between the formulations for the API was determined the same.

**4. Summary of Product Safety and Efficacy**

*Background*

[TB308 trade name] has been shown to conform to the same appropriate standards of quality, efficacy and safety as those required of the reference product. According to the submitted data on quality and bioavailability it is pharmaceutically and therapeutically equivalent and thus interchangeable with the reference product Isoniazid USP 300 mg (Sandoz Inc.) for which benefits have been proven in terms of clinical efficacy.

The clinical safety of this product is considered to be acceptable when guidance and restrictions presented in the Summary of Product Characteristics are taken into consideration. Reference is made to the SmPC (WHOPAR part 4) for data on clinical safety.

**5. Benefit risk assessment and overall conclusion**

**Quality**

Physicochemical and biological aspects relevant to the uniform pharmaceutical characteristics have been investigated and are controlled in a satisfactory way.

The quality of this product is considered to lead to an acceptable clinical performance when [TB308 trade name] is used in accordance with the SmPC.

**Bioequivalence**

[TB308 trade name] fulfilled all the requirements for waiving in-vivo bioequivalence study as per relevant WHO guidance. Hence, [TB308 trade name] and Isoniazid USP 300 mg (Sandoz Inc.) can be considered bioequivalent.

### **Efficacy and Safety**

Regarding clinical efficacy and safety, [TB308 trade name] is considered effective and safe to use when the guidance and restrictions in the Summary of Product Characteristics are taken into consideration.

### **Benefit Risk Assessment**

Based on the WHO assessment of data on quality, bioequivalence, safety and efficacy the team of assessors considered that the benefit-risk profile of [TB308 trade name] was acceptable for the following indication: “treatment of tuberculosis caused by *Mycobacterium tuberculosis*” and has advised that the quality, efficacy and safety of [TB308 trade name] allow inclusion of [TB308 trade name], manufactured at Mylan Laboratories Limited, Plot No. H-12 & H-13, MIDC, Waluj Industrial Area, Aurangabad – 431136, Maharashtra State, India in the list of prequalified medicinal products.