World Health Organization

20, AVENUE APPIA – CH-1211 GENEVA 27 – SWITZERLAND – TEL CENTRAL +41 22 791 2111 – FAX CENTRAL +41 22 791 3111 – WWW.WHO.INT

Prequalification Unit Inspection Services
WHO PUBLIC INSPECTION REPORT
Finished Product Manufacturer

Part 1	**General information**
Manufacturers Details	
Name of manufacturer	**Micro Labs Limited**
Corporate address of manufacturer	Micro Labs Limited #31, Race Course Road, Bangalore - 560 001, India
Inspected site	
Address of inspected manufacturing site if different from that given above	Micro Labs Limited (Hosur, ML-03) # 92 SIPCOT Industrial complex Hosur, Tamil Nadu-623 126, India
Unit / block / plant number	Unit 3 (ML03)
Inspection details	
Dates of inspection	16 to 17 January 2025
Type of inspection	Follow up inspection
Introduction	
Brief description of the manufacturing activities	Manufacturing and quality control of non-sterile Oral Solid Dosage Forms (Tablets & Hard capsules) for human use.
General information about the company and site	Micro Labs Hosur site has three Units. Unit-3 was engaged in the manufacture of oral solid dosage forms i.e., tablets (coated and uncoated tablets) and hard gelatin capsules. The site is 35 km away from Bangalore City, where the corporate office is located.
History of Regulatory Inspections	The site had been inspected by WHO several times. The last WHO inspection was performed from12 to16 August 2024 at which critical observations were noted concerning change management, product release, stability study failure and product recall. The company had provided a response to WHO and the CAPAs to be essentially complete prior to this inspection.

Areas inspected	**Document review:** CAPAs assessment of the deficiencies made in WHO inspection in August 2024. **Site visit:** Finished product warehouse This report includes some information from the last WHO inspection report conducted in August 2024.
Restrictions	The inspection was restricted to Unit 3 (ML03) and focused on the implementation of CAPAs for critical and major deficiencies which were noted during the last WHO inspection.
Out of scope	Areas and products not related to the WHO PQ Programme were out of the scope of this inspection.
WHO product numbers covered by the inspection	1. TB348 Isoniazid Tablet, Dispersible 100mg 2. TB356 Levofloxacin Tablet, Dispersible 100mg 3. TB237 Levofloxacin Tablet, Film-coated 250mg 4. TB238 Levofloxacin Tablet, Film-coated 500mg 5. TB239 Protionamide Tablet, Film-coated 250mg 6. TB242 Ethionamide Tablet, Film-coated 250mg 7. TB323 Linezolid Tablet, Film-coated 600mg 8. TB368 Ethambutol Hydrochloride Tablet, Dispersible 100mg 9. TB389 Linezolid Tablet, Dispersible 150mg 10. TB355 Levofloxacin Tablet, Film-coated 750mg 11. TB263 Moxifloxacin (hydrochloride) Tablet, Film- coated 400mg 12. TB352 Ethionamide Tablet, Dispersible 125mg 13. TB335 Pyrazinamide Tablet, Dispersible 150mg 14. TB367 Ethambutol (hydrochloride) Tablet, Dispersible 50mg 15. TB349 Moxifloxacin (hydrochloride) Tablet, Dispersible 100mQ 16. TB347 isoniazid Tablet, Dispersible 50mg 17. TB171 Pyrazinamide Tablet 400mg 18. TB172 Pyrazinamide Tablet 500mg 19. TB173 Isoniazid Tablet 100mg 20. TB174 Isoniazid Tablet 300mg 21. TB331 Ethionamide Tablet, Film-coated 125mg

Abbreviations

ADE	acceptable daily exposure
AHU	air handling unit
ALCOA	attributable, legible, contemporaneous, original and accurate
API	active pharmaceutical ingredient
APQR	annual product quality review
AQL	acceptance quality limit
BET	bacterial endotoxin test
BDL	below detection limit
BMR	batch manufacturing record
BPR	batch packaging record

CAPA	corrective actions and preventive actions
CC	change control
CFU	colony-forming unit
CoA	certificate of analysis
Cpk	process capability index
DQ	design qualification
EM	environmental monitoring
EU	endotoxin unit
FAT	factory acceptance test
FG	finished goods
FMEA	failure modes and effects analysis
FPP	finished pharmaceutical product
FTA	fault tree analysis
FTIR	Fourier transform infrared spectrometer
GC	gas chromatograph
GMP	good manufacturing practice
HACCP	hazard analysis and critical control points
HPLC	high-performance liquid chromatograph
HVAC	heating, ventilation and air conditioning
ID	identity
IR	infrared spectrophotometer
IPC	In process control
IQ	installation qualification
KF	Karl Fisher
LAF	laminar air flow
LIMS	laboratory information management system
LoD	limit of detection
LOD	loss on drying
M	meter
MB	microbiology
MBL	microbiology laboratory
MF	master formulae
MR	management review
NIR	near-infrared spectroscopy
NMR	nuclear magnetic resonance spectroscopy
NRA	national regulatory agency
OQ	operational qualification
Ph. Eur	European Pharmacopoeia
PHA	preliminary hazard analysis
PM	preventive maintenance
Ppk	process performance index
PQ	performance qualification
PQR	product quality review

PQS	pharmaceutical quality system
PRC	product release certificate
PW	purified water
QA	quality assurance
QC	quality control
QCL	quality control laboratory
QMS	quality management system
QRM	quality risk management
RA	risk assessment
RABS	restricted access barrier system
RCA	root cause analysis
RH	relative humidity
RM	raw materials
RS	reference standard
SAP	system applications products for data processing
SFG	semi-finished goods
SMS	short message service
SOP	standard operating procedure
STP	standard test procedure
T	temperature
TAMC	total aerobic microbial count
TFC	total fungal count
TLC	thin layer chromatography
TMC	total microbial count
TOC	total organic carbon
UPS	uninterruptible power supply
URS	user requirements specifications
USP	United States Pharmacopeia
UV	ultraviolet-visible spectrophotometer
VMP	Validation Master Plan
WFI	water for injections
WS	working standard

Part 2	**Summary of the findings and comments**

1. Pharmaceutical quality system

Production and control operations were specified in written forms and GMP requirements were generally met. Product and processes were monitored, and the results were checked as part of the approval process for batch release.

PQRs

The company had in place a procedure for performing product quality reviews. Product Quality review was performed annually of all commercial pharmaceutical products following the SOP "Product Quality review" which was revised after last WHO inspection and considered acceptable.

QRM

The SOP "Quality risk management procedure" was in place. Common quality risk management methods and tools were included such as flow charts, failure mode and effect analysis (FMEA), risk ranking and selection, statistical tools, etc. The Risk Priority Number (RPN) acceptance criterion was specified. CAPAs related to Risk management were checked and considered acceptable.

DIRA

The DIRA policy and the SOP "Handling and control of data integrity" was available. The scope of Data integrity covered:

1. Manufacturing
2. Testing of materials and products
3. Qualification & validations
4. IT processes and
5. Quality assurance
6. Research & Development
7. Regulatory Affairs

Management review (MR)

The SOP "Quality system review" was available. According to the SOP, MR was constituted of several levels and was performed regularly at specified time interval. The CAPAs related to the review of regulatory commitment made to the WHO was checked and considered acceptable.

Change Controls (CC)

The SOP "Change control System" was available. According to the SOP, major changes should be subject to risk assessment, and national regulatory authorities and customers should be informed before implementation. SOP was applicable, but not limited to:

- Facility
- Equipment
- Utilities
- Instrument
- Material
- Document
- Production process
- PV
- Cleaning validation etc.

Changes were classified as:

- Critical
- Major
- Minor

The CAPAs to Observations related to Change control management and regulatory compliance
Were checked and considered acceptable.

OOS investigation

OOS was managed with a computerized system by following the procedure "Handling of Out-of-specification (OOS) test results". OOS registers were available. The CAPAs to Observations related to OOS investigation and handling OOS related to stability studies were checked and considered acceptable.

Deviations

The SOP "Handling of deviations" and deviation register were available. Deviations were classified as:

- Minor
- Major
- Critical

Deviations was tracked in a computerized system. The root cause identification followed a written procedure. CAPA should be recommended according to the CAPA SOP. The trending of deviation was required to be performed, and Key Performance Indicators were listed.

Root Cause Analysis

Root cause identification was performed according to a written procedure. Tools used included cause and effect analysis (Ishikawa diagram), 5Why analysis, brainstorming, and histogram (Pareto chart).

CAPA

The SOP "Handling of Corrective and Preventative Action" was checked. CAPAs were tracked in a computerized system. CAPAs could be triggered by noncompliance, including Audits, Regulatory Inspections, Lab Deviation, Training, PQR, Trend Reports, Deviations, OOS, and CC. CAPA phases were divided into:

- Phase I – Initiation
- Phase II- Implementation and Closure
- Phase III - Effectiveness

Timelines for implementing CAPA were defined on a case-by-case basis, but the default timeline was 30 days. Two requests for an extension of CAPA timelines were allowed. QA defined the need for a CAPA effectiveness check. CAPA system evaluation was performed by monitoring performance indicators presented during quality system review meetings. The trending of CAPAs was performed.

Product release

The SOPs "Creation, completion, review of BMR/BPR" and Batch Release" was checked. QA was responsible for the batch release. The batch release checklists were available. The OOS and deviation were required to be closed prior to the batch release.

The CAPAs to Observations related to product release were checked and considered acceptable.

2. Good manufacturing practices for pharmaceutical products

Good manufacturing practices were generally implemented. The necessary human and physical resources including adequate premises, equipment and utilities were provided for the current operational level of FPP activity. Manufacturing processes were adequately defined. The manufacturing processes followed procedures as defined and documented in the BMRs and BPRs. The personnel were appropriately qualified and adequate training is conducted.

3. Sanitation and hygiene

There were no issues noted during previous inspection, the CAPA for this section was not applicable.

4. Qualification and validation

Validation master plan (VMP)

The company had a policy to qualify and validate the manufacturing facility. The following items were subjected to qualification/validation but were not limited to:

1. HVAC System.
2. Water System.
3. Other utilities: Compressed air and Dust extraction system.
4. Major processing equipment.
5. Critical manufacturing processes: Process performance qualification/ Process Validation, continued process verification, and Process re-validation.
6. Cleaning of areas and equipment.
7. Critical QC instruments.
8. Computerized system

Process validation

The CAPA related to Process validation was checked. The SOP "Process validation" had been revised. The procedure specified that three PV batches are required for PV if the process was different from submission batches, and completion of PV before the batches to be released. When batches are not manufactured continuously for more than three years, a revalidation is required. The stability study requirement for PV batches was discussed. The CAPAs were considered acceptable.

Cleaning Validation

The procedure for Cleaning Validation was available. The worst case and the limits for cleaning validation were calculated via a commercial software package. All the genotoxic substances were also considered as worst cases. MACO was calculated based on dose, ADE, and 10 ppm. The stringent value was used. Cleaning effectiveness verification was performed for all changeover cleaning activities on an ongoing basis. New product introduction was evaluated by a risk assessment to check if the product could be manufactured in the shared facility.

CAPAs to Observation related to cleaning validation were checked and considered acceptable.

HVAC system qualification/validation

HVAC systems were qualified and re-qualified as per the inhouse procedure. Air supply, air change rates, and air recirculation were maintained as per the design criteria to maintain the air classification.

PW system qualification/validation

The water system was initially qualified in 2005. There were two major changes that required qualification in recent years:

- Expansion of the distribution loop in the new expansion area,
- A heat exchanger to control the purified water temperature below 25 degrees was installed, as well as a UV lamp and control panel.

Compressed air

The procedure for installation and operation of the compressed air system and the P and ID (process and instrumentation diagram) of the compressed air system were in place. The compressed air specification included the limits of particles, water, oil and microbiological, and analysis were carried out from sampling points in contact with products.

Analytical methods validation

The analytical method validation for "Cleaning method validation of Ethambutol tablet BP100mg and 400mg" was available. The LOD and LOQ of the method were determined and approved.

Validation of computerized systems

The computerized systems were used in material management, QA and QC, including but not limited to the following:

- TrackWise
- Material tracking system
- SAP
- Cleen
- Document library system
- Document management system
- Learning management system Auto storage and retrieval system
- Empower 3 FR5
- Lab solution
- LIMS

Computerized system validation followed a written procedure. The computerized system validation was not reviewed in this inspection.

5. Complaints

The SOP "Handling of market complaints", together with the complaints registers and compliant trends were available. Trending of complaints was carried out following the procedure. Complaints were classified as:

- Critical
- Major
- Minor

According to the SOP complaints should be closed within specified timeframe. For critical complaints, a decision on recall had to be made within 3 working days and completed within 7 working days. All complaints were evaluated by the Pharmacovigilance Dept to allow for input. Communication with the authorities and WHO was stated for critical and major complaints. Complaints have been tracked in a computerized system.

Product recalls

The CAPAs to Observation related to product recall were checked. The SOP "Product recall for the export market" was revised. The procedure described the classification and execution of recalls. The follow-up and tracking requirements for product recall were added to the procedure. In the case of the WHO PQ product recall, communication with the WHO was the responsibility of Corporate QA. The head of CQA shall notify WHO regarding the recall within specified days of recall initiation.

Recalls were classified as:

- Class I – recall should be initiated within 24 hours
- Class II – recall should be initiated within 48 hours
- Class III – recall should be initiated within 10 working days.

CAPAs were considered acceptable.

7. Contract production, analysis and other activities

The manufacturing of FPPs was not contracted out. The SOP "Approval of contract laboratory for testing" was available. For WHO products, the contract labs had to be WHO-certified. The list of approved contract laboratories was available.

8. Self-inspection, quality audits and suppliers' audits and approval

Self-inspection/internal audit

The procedure for Self-inspection was available. Self-inspection was not reviewed in this inspection.

Suppliers' approval and audits

CAPAs to Observations related to Supplier management were checked. The SOP "Vendor approval" was revised after the last inspection. The vendors for PQ products and the summary protocol of commitment made to WHO were checked. The CAPAs were considered acceptable.

9. Personnel

The site had an adequate number of personnel with the necessary qualifications and practical experience. Job descriptions were available. According to the company presentation, 349 employees were employed at the time of this inspection.

10. Training

GMP and job-specific training according to a written procedure and schedule were provided to all personnel. Newly recruited personnel received training appropriate to the duties assigned to them. Approved training programs were available; training records were kept. Training effectiveness was evaluated by exams and open and multiple-choice questions. The SOP 'Training management" was available.

11. Personal hygiene

The SOP 'Personnel hygiene" was available. Personnel was trained in the practices of personal hygiene according to the written procedure. Any person shown at any time to have an apparent illness or open lesions that may adversely affect the quality of products was not allowed to handle starting materials, packaging materials, in-process materials, or medicines. Direct contact was avoided between the operator's hands and starting materials, primary packaging materials, and intermediate or bulk products. Personnel wore clean body coverings, including hair covering. Smoking, eating, drinking, chewing, and keeping plants, food, drink, smoking material, and personal medicines were not permitted in production, laboratory, and storage areas. Health checks were required to be performed annually.

12. Premises

Production operations were carried out in one building. The ML03 facility was multi-product and not dedicated. Exposed surfaces were smooth, impervious, and unbroken to minimize the shedding or accumulation of particles or microorganisms and permitted the repeated application of cleaning. The classified areas were monitored for temperature, relative humidity, and pressure differentials for environmental control manually. Access to production premises was restricted to authorized personnel.

QC laboratories were separated from production areas. Adequate storage space was provided for samples, reference standards, solvents, reagents, and records. The microbiology laboratory (MBL) was also separated from the QC laboratory.

Utilities

Manufacturing areas were ventilated with air control units. Air supplied was filtered through terminal HEPA filters. The air supplied to processing areas was cooled and dehumidified and was appropriate to the processes carried out. The procedure and a plan for maintenance/ servicing of Air Handling Units was in place.

Purified water

P&ID drawing for purified water generation and distribution system and schematic drawing of purified water generation & distribution system were documented.
The raw water sourced from the bore well was filtered through several steps of pretreatment before passed through the reverse osmosis (RO) system. The purified water was collected in a Stainless Steel (SS) 316L tank. The water was distributed and circulated through a closed loop system in continuous flow at a temperature between 20 to 25°C.
CAPAs to Observations related to PW system were checked and considered acceptable.

Lighting

Lighting was adequate in all areas visited during the inspection.

13. Equipment

Equipment installed in the facility was multi-purpose and each piece of equipment had a unique identification number. Equipment was located, designed, constructed, adapted, and maintained to suit the operations to be carried out. The equipment viewed appeared to be of suitable design and construction for the allocated process in general.

Equipment maintenance

The equipment viewed during the last WHO inspection appeared to have been suitably maintained and in good condition. Equipment status labels were available. The current drawing of critical equipment and support systems was maintained. The equipment preventive maintenance was managed by following written standard operating procedures.

Equipment calibration

The calibration schedule for the QC lab and production equipment was performed following in-house procedure.

14. Materials

Incoming materials and finished products were quarantined after receipt or processing until they were released for use or distribution. Materials and products were stored under the specified conditions established by the manufacturer. Rejected materials and products were clearly marked as such and stored separately in restricted areas.

CAPAs to Observation related to product and material management were checked. Finished product warehouse was briefly visited. The batches of Ethambutol tablets 100mg and Isoniazid 300mg kept under the quarantine area were checked. CAPAs were considered acceptable.

15. Documentation

Documents were designed, prepared, reviewed and distributed with care. Documents were approved, signed, and dated. Documents were regularly reviewed and kept up to date. Records were required to be made or completed when any action was taken.

16. Good practices in production

The manufacturing processes were performed and recorded according to instructions in the batch production records. Tablet's manufacturing steps, including material dispensing, granulation, compression, coating, and primary and secondary packaging areas and finished product storage rooms, were inspected. Manufacturing records of the products under production were spot checked and found acceptable. During processing, materials, bulk containers, major items of equipment, rooms, and packaging lines being used were labeled with the product or material being processed, its strength, and the batch number. Main production equipment like granulators, compression machines, and coating pans were equipped, and processes were controlled by HMI or PLCs.

Handling of materials and products, such as receipt and cleaning, quarantine, sampling, storage, labeling, dispensing, processing, packaging, and distribution, was performed in accordance with written procedures and instructions and recorded. In-process controls were performed within the production area. Access to production premises was restricted to authorized personnel.

17. Good practices in quality control

The QC function was independent of other departments. The QC laboratories were separated from production areas. The microbiology laboratory was segregated from the chemistry laboratory.

Sample register and the information for receiving and distribution were managed in LIMS following the procedure "Operation and handling of sample manager. QC was responsible for testing data review and followed by QA review. The procedure "Testing of samples and reporting results of analysis" was available.

Instrument calibration

The SOP "Calibration of HPLC" and the Calibration schedule for QC lab equipment were available. The procedure defined the calibration frequency of lab instruments.

Instrument maintenance

The SOP "Maintenance of equipment and analytical instrument" was available. The maintenance of analytical instruments was performed at specified time intervals.

Retention samples

Retention samples (Control samples) from each batch of finished products in their final packaging were kept following a written procedure. The samples' retention time were defined. Retention samples of materials and products were of a size sufficient to permit at least two full analyses.

The Retention samples room was access-controlled and located in the QC building. The sampling log was registered in the LIMS system.

Stability study

Stability chambers were located in the QC building. The company had available two stability chambers for long-term stability studies at 30ºC/75%RH, one used as routine and another as backup. One stability chamber for accelerated studies (40 ºC/75%RH) was also available. Chambers were qualified once a year, and sample logs were managed by the LIMS system.

Microbiology Laboratory

The Microbiology lab carried out the microbiological testing and approval of incoming materials, intermediate products, finished products, water, and environmental monitoring samples. The media used was tested for growth promotion for each preparation or upon receipt. ATCC strains were used for growth promotion, with no more than five subcultures allowed. Skip testing for finished products was conducted when explicitly permitted by the dossier. Microorganism identification was carried out. All incubators used were qualified.

CAPAs to observation related to environmental monitoring was checked and considered acceptable.

Part 3	**Initial conclusion – Inspection outcome**

Based on the areas inspected, the people met and the documents reviewed, and considering the findings of the inspection, including the observations listed in the Inspection Report, ***Micro Labs (Hosur) – ML03,*** located at ***# 92 SIPCOT Industrial Complex, Hosur, Tamil Nadu-623 126, India,*** was considered to be operating at an acceptable level of compliance with WHO GMP guidelines.

All the non-compliances observed during the inspection that were listed in the full report as well as those reflected in the WHOPIR, were addressed by the manufacturer, to a satisfactory level, prior to the publication of the WHOPIR.

This WHOPIR will remain valid for 3 years, provided that the outcome of any inspection conducted during this period is positive.

Part 4	List of GMP Guidelines referenced in the inspection report

1. WHO good manufacturing practices for pharmaceutical products: main principles. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-eighth Report Geneva, World Health Organization, 2014 (WHO Technical Report Series, No. 986), Annex 2. ***Short name: WHO TRS No. 986, Annex 2***

2. WHO good manufacturing practices for active pharmaceutical ingredients. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-fourth Report. Geneva, World Health Organization, 2010 (WHO Technical Report Series, No. 957), Annex 2. ***Short name: WHO TRS No. 957, Annex 2***

3. WHO Good Manufacturing Practices: water for pharmaceutical use. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-fifth Report. Geneva, World Health Organization, 2021 (WHO Technical Report Series, No. 1033), Annex 3. ***Short name: WHO TRS No. 1033, Annex 3***

4. WHO guidelines for sampling of pharmaceutical products and related materials. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Thirty-ninth Report. Geneva, World Health Organization, 2005 (WHO Technical Report Series, No. 929), Annex 4. ***Short name: WHO TRS No. 929, Annex 4***

5. Guidelines on heating, ventilation and air-conditioning systems for non-sterile pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-second Report Geneva, World Health Organization, 2018 (WHO Technical Report Series, No. 1010), Annex 8. ***Short name: WHO TRS No. 1010, Annex 8***

6. WHO good practices for pharmaceutical products containing hazardous substances. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-fourth Report. Geneva, World Health Organization, 2010 (WHO Technical Report Series, No. 957), Annex 3. ***Short name: WHO TRS No. 957, Annex 3***

7. WHO good manufacturing practices for sterile pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-sixth Report Geneva, World Health Organization, 2022 (WHO Technical Report Series, No. 1044), Annex 2. ***Short name: WHO TRS No. 1044, Annex 2***

8. WHO guidelines on technology transfer in pharmaceutical manufacturing. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-sixth Report Geneva, World Health Organization, 2022 (WHO Technical Report Series, No. 1044), Annex 4. ***Short name: WHO TRS No. 1044, Annex 4***

9. Model guidance for the storage and transport of time-and temperature-sensitive pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-fifth Report Geneva, World Health Organization, 2011 (WHO Technical Report Series, No. 961), Annex 9. ***Short name: WHO TRS No. 961, Annex* 9**

10. General guidelines for the establishment maintenance and distribution of chemical reference substances. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-first Report Geneva, World Health Organization 2007 (WHO Technical Report Series, No.943) Annex 3. ***Short name: WHO TRS No. 943, Annex 3***

11. WHO good practices for pharmaceutical microbiology laboratories. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-fifth Report Geneva, World Health Organization, 2011 (WHO Technical Report Series, No. 961), Annex 2. ***Short name: WHO TRS No. 961, Annex 2***

12. WHO guidelines on quality risk management. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-seventh Report Geneva, World Health Organization, 2013 (WHO Technical Report Series, No. 981), Annex 2. ***Short name: WHO TRS No. 981, Annex 2***

13. WHO guidelines on variation to a prequalified product. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-seventh Report Geneva, World Health Organization, 2013 (WHO Technical Report Series, No. 981), Annex 3. ***Short name: WHO TRS No. 981, Annex 3***

14. WHO guidelines for drafting a site master file. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-fifth Report Geneva, World Health Organization, 2011 (WHO Technical Report Series, No. 961), Annex 14. ***Short name: WHO TRS No. 961, Annex 14***

15. Good Manufacturing Practices: Guidelines on validation. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-third Report Geneva, World Health Organization, 2019 (WHO Technical Report Series, No. 1019), Annex 3. ***Short name: WHO TRS No. 1019, Annex 3***

16. WHO General guidance on hold-time studies WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-ninth Report Geneva, World Health Organization, 2015 (WHO Technical Report Series, No. 992), Annex 4. ***Short name: WHO TRS No. 992, Annex 4***

17. WHO Technical supplements to Model Guidance for storage and transport of time – and temperature – sensitive pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-ninth Report Geneva, World Health Organization, 2015 (WHO Technical Report Series, No. 992), Annex 5. ***Short name: WHO TRS No. 992, Annex 5***

18. WHO Recommendations for quality requirements when plant – derived artemisinin is used as a starting material in the production of antimalarial active pharmaceutical ingredients. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-ninth Report Geneva, World Health Organization, 2015 (WHO Technical Report Series, No. 992), Annex 6. ***Short name: WHO TRS No. 992, Annex 6***

19. Guideline on data integrity. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-fifth Report Geneva, World Health Organization, 2021 (WHO Technical Report Series, No. 1033), Annex 4. ***Short name: WHO TRS No. 1033, Annex 4***

20. WHO general guidance on variations to multisource pharmaceutical products. *WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fiftieth Report* Geneva, World Health Organization, 2016 (WHO Technical Report Series, No. 996), Annex 10. ***Short name: WHO TRS No. 996, Annex 10***

21. Stability testing of active pharmaceutical ingredients and finished pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-second Report Geneva, World Health Organization, 2018 (WHO Technical Report Series, No. 1010), Annex 10. ***Short name: WHO TRS No. 1010, Annex 10***

22. Guidelines on heating, ventilation and air-conditioning systems for non-sterile pharmaceutical products. Part 2: Interpretation of Guidelines on heating, ventilation and air-conditionning systems for non-sterile pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-third Report Geneva, World Health Organization, 2018 (WHO Technical Report Series, No. 1019), Annex 2. ***Short name: WHO TRS No. 1019, Annex 2***

23. Points to consider when including Health-Based Exposure Limits in cleaning validation. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-fifth Report Geneva, World Health Organization, 2021 (WHO Technical Report Series, No. 1033), Annex 2. ***Short name: WHO TRS No. 1033, Annex 2***

24. Points to consider for manufacturers and inspectors: environmental aspects of manufacturing for the prevention of antimicrobial resistance. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-fourth Report Geneva, World Health Organization, 2020 (WHO Technical Report Series, No. 1025), Annex 6. ***Short name: WHO TRS No. 1025, Annex 6***

25. Production of water for injection by means other than distillation. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-fourth Report. Geneva, World Health Organization, 2020 (WHO Technical Report Series, No. 1025), Annex 3. ***Short name: WHO TRS No. 1025, Annex 3***

26. Good chromatography practice. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-fourth Report. Geneva, World Health Organization, 2020 (WHO Technical Report Series, No. 1025), Annex 4. ***Short name: WHO TRS No. 1025, Annex 4***

27. WHO good practices for research and development facilities of pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-sixth Report Geneva, World Health Organization, 2022 (WHO Technical Report Series, No. 1044), Annex 6. ***Short name: WHO TRS No. 1044, Annex 6***

28. WHO good manufacturing practices for investigational products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-sixth Report Geneva, World Health Organization, 2022 (WHO Technical Report Series, No. 1044), Annex 7. ***Short name: WHO TRS No. 1044, Annex 7***

29. WHO good manufacturing practices for excipients used in pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-fourth Report. Geneva, World Health Organization, 2024 (WHO Technical Report Series, No. 1052), Annex 2. ***Short name, WHO TRS No. 1052, Annex 2***

30. WHO good practices for pharmaceutical quality control laboratories. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-fourth Report. Geneva, World Health Organization, 2024 (WHO Technical Report Series, No. 1052), Annex 2. ***Short name, WHO TRS No. 1052, Annex 4***