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Prequalification Unit Inspection Services
WHO PUBLIC INSPECTION REPORT
(WHOPIR)
Finished Product Manufacturer
(VACCINES)

Part 1	**General information**
Manufacturers details	
Name of manufacturer	Biological E. Limited.
Corporate address of manufacturer	Road No. 35, Jubilee Hills, Hyderabad, 500033 Telangana, India.
Inspected site	
Name & address of inspected manufacturing site if different from that given above	**Shameerpet site**: Plot No.1, Biotech Park, Phase II, Kolthur Village, Shameerpet, Medchal-Malkajgiri District, Telangana State – 500078, India Latitude : 17.6650900, 78.6193950 Longitude : 17° 39' 54.32" N, 78° 37' 9.82" E D-U-N-S (Data Universal Numbering System) No.: 65-037-6874 **SEZ unit**: Sy. No. 549, 550 & 552 to 556, Kolthur Village, Shameerpet Mandal, Medchal-Malkajgiri District, Telangana State – 500078, India Latitude: 17.667635, 78.626586 Longitude: 17°40'03.5"N 78°37'35.7"E D-U-N-S (Data Universal Numbering System) No.: 65-037-6874
Inspection details	
Dates of inspection	22 to 26 January 2024
Type of inspection	Initial inspection for nOPV2 vaccine
Introduction	
Brief description of the manufacturing activities	Biological E. Limited (BE / BioE) was established in 1953 and was one of the first Indian pharmaceutical companies to be founded. BE manufactures a range of Childhood and Adult Vaccines, Pharmaceuticals (specifically anti-coagulants and anti-infective) and Active Pharmaceutical Ingredients (API). BE has been producing Tetanus Toxoid (TT) Vaccine since late 1960's, Diphtheria and Tetanus (DT) and Diphtheria, Tetanus and Pertussis (DTP) vaccines since mid-1970's. BE has been supplying the vaccines to the Extended Program for Immunization (EPI), ever since EPI commenced in India in the late 1970's. Later, the company has introduced other vaccines like Hepatitis-B Vaccine, Haemophilus Influenzae type-b Vaccine (Hib), Tetravalent Vaccine (DTP-Hep-B), Pentavalent Vaccine, Japanese Encephalitis (JE) Vaccine, Measles and Rubella vaccine and Typhoid Conjugate Vaccine & CORBEVAX Vaccine.
General information about the company and site	BE is approved by WHO for various vaccines to supply Single and Multiple Dosage presentations. It is estimated that approximately 7.0 billion doses of vaccines (TT, DTP, DT, Hep-B, DTPH, JE, Recon Pentavalent and Liquid Pentavalent Vaccines, MR & TCV) have been produced by BE till Dec 2022. BE has 4 manufacturing sites located surrounding Hyderabad city area:

	1. Shameerpet site - Manufacture and Testing of Bulk Vaccines; Blending, Filling, Testing, Packing and Distribution of Licensed Vaccines. 2. Gaganpahad site - Manufacture, Testing and Distribution of Bulk Purified Tetanus Toxoid (BPTT) and Antisera bulk 3. Azamabad site - Registered office and Manufacture, Testing and Distribution of JE Bulk Vaccine and AntiSera DP. 4. SEZ Unit - Manufacturing and Testing of Licensed Vaccines which includes Blending, Filling, Testing, Labelling, Packing and Distribution. BE's Shameerpet and SEZ manufacturing sites are approximately 40 Km away from Hyderabad city center in the suburbs towards north and very near to each other. The administrative support is taken from the corporate office located at Jubilee Hills (within the Hyderabad city). Shameerpet site was commissioned in 2002 and is licensed for several vaccines from 2006 onwards. The site has several manufacturing blocks/ suites to produce the vaccine antigens and also has several lines for formulation, filling, labelling and packaging. The site is situated in a 20.24 hectares of area located in Biotech Park, an industrial park dedicated for biotechnology companies. A new manufacturing site under Special Economic Zone (SEZ) was set up to import antigen and to manufacture (Blending, Filling, sealing, testing, labelling, Packing and distribution) vaccines that are also approved at BE's Shameerpet site, Gaganpahad site and Azamabad site. The SEZ site is situated in 11.33 Hectare and Built-up area is 3.4 Hectares, located in Sector specific SEZ for Biotechnology and Biopharmaceuticals Kolthur village, Shameerpet. This is an industrial park dedicated for biotechnology and pharmaceutical organizations. The initial production operations were started in the Year 2019.
History	The last WHO Inspection was conducted in March 2022 for the EUL of the COVID-19 vaccine. Last routine GMP inspection was conducted in February 2019. This is the initial inspection for SEZ site. In the past 3 years Biological E sites have been inspected by Indian NRA (CDSCO), DCA-Telangana, US-FDA, SAHPRA (South Africa) and ANVISA (Brazil).
Brief report of inspection activities undertaken – Scope and limitations	
Areas inspected	• Blending and Filling Line-1 of SEZ unit • SEZ Warehouse • QC Micro lab at SEZ site • Block-D at Shameerpet Site • QC lab at Shameerpet Site
Restrictions	The inspection was restricted to the nOPV2 vaccine.
Out of scope	Products other than nOPV2 vaccine.
WHO products covered by the inspection	Novel Oral Poliomyelitis Vaccine Type 2 (nOPV2)

Abbreviations	Meaning
AHU	Air handling unit
ALCOA	Attributable, legible, contemporaneous, original and accurate
API	Active pharmaceutical ingredient
APR	Annual product review
APS	Aseptic process simulation
BMR	Batch manufacturing record
BPR	Batch production record
CC	Change control
CFU	Colony-forming unit
CIP	Cleaning in place
CoA	Certificate of analysis
CpK	Process capability
DQ	Design qualification
EDI	Electronic deionization
EM	Environmental monitoring
FMEA	Failure modes and effects analysis
FPP	Finished pharmaceutical product
FTA	Fault tree analysis
GMP	Good manufacturing practices
GPT	Growth promotion test
HEPA	High efficiency particulate air
HPLC	High performance liquid chromatography (or high performance liquid chromatography equipment)
HVAC	Heating, ventilation and air conditioning
IQ	Installation qualification
LAF	Laminar air flow
LIMS	Laboratory information management system
MB	Microbiology
MBL	Microbiology laboratory
MF	Master formulae
MFT	Media fill Test
MR	Management review
NC	Non conformity
NRA	National regulatory agency
OQ	Operational qualification
PHA	Process hazard analysis
PLC	Programmable logic controller
PM	Preventive maintenance
PQ	Performance qualification
PQR	Product quality review
PQS	Pharmaceutical quality system
PW	Purified water
QA	Quality assurance
QC	Quality control
QCL	Quality control laboratory

QMS	Quality management system
QRM	Quality risk management
RA	Risk assessment
RCA	Root cause analysis
RO	Reverse osmosis
SIP	Sterilization in place
SMF	Site master file
SOP	Standard operating procedure
URS	User requirements specifications
UV	Ultraviolet-visible spectrophotometer
WFI	Water for injection

Part 2	**Summary of the findings and comments (where applicable)**

1. Pharmaceutical quality system

In general, an appropriate quality system was in place. The firm's commitment to quality was stated in the Quality Policy. The quality unit coordinated for effective implementation and execution of quality attributes in a systematic and approved manner in line with regulatory and cGMP requirements. The PQS was common throughout the Vaccine sites (Biologics division). Some global procedures were in place. Nevertheless, some deficiencies were identified in its implementation, particularly related to consistency, documentation practices and application of quality risk management. Appropriate corrective and preventive actions (CAPA) were taken to address these gaps.

Management review

Periodic management reviews were conducted to evaluate the suitability and effectiveness of the PQS and to ensure ongoing oversight of quality performance. These reviews included evaluation of key quality indicators such as audit outcomes, customer feedback, process performance, CAPA status and regulatory updates. Evidence confirmed that reviews were conducted at defined intervals and documented appropriately.

Product Quality Review

A system for annual product quality review (APQR) was established, including statistical trending of quality attributes using electronic tools. For newly introduced products, APQRs were not yet available due to limited production history, which was considered acceptable.

Quality Risk Management (QRM)

A formal QRM procedure was in place and aligned with cGMP principles. Risk assessments, including failure mode and effects analysis (FMEA), were applied to manufacturing processes using defined scoring systems for severity, occurrence and detectability. However, deficiencies were noted in the practical application of QRM. The manufacturer addressed the issues before the publication of this WHOPIR.

Contamination Control Strategy (CCS)

A documented contamination control strategy was established and periodically reviewed. However, weaknesses were identified in implementation; the manufacturer addressed the issues before the publication of this WHOPIR.

Deviation Management

A formal system for deviation management was implemented and managed electronically. Deviations were required to be recorded, investigated and closed within defined timelines. Investigations generally identified root causes and appropriate CAPAs. However, some deficiencies were observed related to occasional delays in deviation closure, incomplete initial impact assessments and insufficient scientific justification in certain investigations. Trending of deviations was routinely performed and reviewed during management review. The manufacturer implemented appropriate CAPAs to strengthen investigation quality, reinforce timelines, and ensure scientifically robust impact evaluations.

CAPA Management

CAPA management was integrated within the deviation system and generally compliant with cGMP. CAPAs were tracked electronically and reviewed periodically. Effectiveness checks were applied primarily to critical CAPAs, while recurrence trending was used as a secondary mechanism. Improvements were initiated to strengthen effectiveness verification and oversight of CAPA extensions.

Change Control

A formal change control system was in place to evaluate changes affecting facilities, equipment, materials, processes and analytical methods. Although the system was functional, deficiencies were noted regarding the incomplete impact assessments in some changes, open changes with extended timelines and insufficient definition of qualification activities in certain cases. CAPAs were initiated and considered acceptable.

Complaints and Recall

Systems for handling product complaints and recalls were established. Complaints were investigated and linked to CAPA when required. Product recall procedures were defined and had been successfully implemented. Mock recalls were conducted periodically.

Self-Inspection and Audits

A risk-based self-inspection program was implemented, covering all departments on a defined schedule. Audits were performed by trained and qualified personnel independent from the audited area. Observations were documented, and CAPAs were required within defined timelines. Supplier qualification and audit processes were established, including risk-based categorization of materials and suppliers. Some deficiencies were identified during the inspection, which were addressed through CAPAs and considered acceptable.

Outsourced Activities and Quality Agreements

Quality agreements were in place for outsourced activities and generally covered roles, responsibilities and GMP expectations.

Personnel and Training

An organizational structure ensuring independence of the quality unit from production was established.

Training systems were in place, including electronic training management for permanent staff. Personnel hygiene, health monitoring and immunization programs were established. Improvements were implemented to ensure full compliance with immunization requirements prior to assignment in manufacturing areas.

Documentation and Data Integrity

A document management system was implemented and aligned with GMP requirements. Data integrity principles (ALCOA+) were defined and generally applied. Some weaknesses in document control practices were observed, which were addressed by CAPA and considered acceptable

Batch Release

A formal batch release system was implemented with QA responsibility for certification after review of manufacturing and quality data. Regulatory authority approval was required prior to distribution.

2. Production system

The manufacturing strategy was defined in two phases, with initial production of the drug product using externally sourced drug substance, followed by transition to in-house drug substance manufacturing. Drug product manufacturing was performed in a dedicated blending and filling line within the production facility.

Cell and Seed Bank System

Cell and seed banks were stored under controlled conditions, including liquid nitrogen storage and monitored freezers, with restricted access and defined procedures for handling and maintenance. Inventory records and logbooks were maintained, and environmental parameters were monitored. Some deficiencies were observed and addressed by the manufacturer through CAPA.

Drug Substance Manufacturing

As routine production was not ongoing at the time of inspection, simulated operations were performed to demonstrate process steps, including inoculation, harvesting, clarification, filtration, and bulk storage. Procedures for cleaning, material preparation, and handling were in place. Bulk storage facilities with controlled temperature conditions were available. Deficiencies in drug substance operations and controls were identified. The manufacturer addressed the issues through CAPA, which was considered acceptable.

Drug Product Manufacturing (Blending and Filling)

Blending and aseptic filling operations were conducted in classified areas using defined processes, including thawing and preparation of bulk materials; filtration and formulation under controlled conditions; sterile filtration prior to filling; aseptic filling, stoppering, and sealing. In-process controls and monitoring were implemented throughout manufacturing.

Visual Inspection

Manual visual inspection was carried out by trained and qualified personnel under controlled lighting conditions, with defined inspection times and defect classification. Acceptance criteria were defined, with plans for further refinement based on increased production data.

Process Validation

A validation framework was established, including process validation lifecycle stages and validation of critical steps such as sterile filtration. Supporting studies demonstrated filter integrity, compatibility, and microbial retention capacity. Deficiencies in validation practices and documentation were identified. The manufacturer committed to strengthening validation strategies, ensuring completeness of documentation, and improving alignment with ongoing production activities.

Reprocessing and Reworking

Procedures were in place allowing reprocessing under defined conditions. Deficiencies in implementation and control of reprocessing activities were identified. The manufacturer committed to reinforcing controls and ensuring compliance with defined procedures.

Batch Documentation

Batch manufacturing records were reviewed for selected batches. Some deficiencies were noted regarding incomplete documentation of certain activities. The manufacturer addressed the issues through CAPA, which was considered acceptable.

3. Facilities and equipment system

Drug substance manufacturing was performed in a multipurpose facility with campaign-based production, supported by validated product changeover procedures to prevent cross-contamination. Drug product filling operations were conducted in a dedicated aseptic processing line equipped with washing, depyrogenation, and filling systems operating under controlled environments, including barrier protection and laminar airflow.

Water Systems

Water systems for pharmaceutical use were appropriately designed, including generation, storage, and distribution of purified water, water for injection, and pure steam. Systems were monitored using automated controls, with defined procedures for sanitization, sampling, and routine monitoring. Validation was in an ongoing monitoring phase, with generally acceptable performance and investigations conducted for occasional out-of-limit results. A deficiency related to water system management was identified. The manufacturer implemented corrective actions, which were considered satisfactory.

Qualification and Validation

A validation master plan was in place covering facilities, utilities, equipment, processes, and analytical methods, following established lifecycle approaches. Qualification activities were conducted according to standard phases and supported by approved protocols and reports. Responsibilities for qualification activities were defined across engineering, validation, and quality units.

Aseptic process simulations

Aseptic process simulations were performed initially and periodically, demonstrating adequate control of aseptic operations. Media simulations and environmental monitoring supported the maintenance of aseptic conditions.

HVAC Systems

HVAC systems were designed to maintain appropriate environmental conditions and cleanroom classifications. Qualification included verification of air pressure difference between rooms, HEPA

filter integrity test, cleanroom classification (non-viable particle counting – NVPC) at rest and in operation and airflow volume measurement. Airflow visualization studies were conducted periodically and following changes to confirm appropriate airflow patterns.

Critical Equipment Qualification

Key equipment used in aseptic processing, including the autoclave, depyrogenation tunnel, washing machine and filling equipment, were qualified and periodically requalified. Qualification studies included performance testing under routine and worst-case conditions. Equipment qualification and performance were generally adequate, with established maintenance and monitoring programmes.

Product Changeover

Validated cleaning and changeover procedures were implemented to ensure removal of residues and prevent cross-contamination between products manufactured in the same facility. Some deficiencies were noted and addressed through CAPA.

Disinfectant and Fumigation Validation

Disinfectant efficacy studies were conducted using standard strains and environmental isolates. Validation included bactericidal and virucidal assessments, as well as fumigation studies to demonstrate effective decontamination of cleanroom areas. Some deficiencies were observed and addressed through CAPA.

4. Laboratory control system

Quality Control (QC) operated as an independent function across multiple sites, with shared responsibilities for testing of raw materials, packaging materials, intermediates, finished products, and critical utilities. QC also performed environmental monitoring and stability studies.

Sampling of raw materials was conducted in dedicated areas in accordance with established procedures, followed by testing against predefined specifications. Materials were released or rejected based on compliance with these specifications, with full testing performed at defined intervals.

Testing of in-process, intermediate, and finished products was performed according to approved methods and procedures. Sample management, result reporting, and data handling were controlled through standardized procedures and supported by a laboratory information management system to ensure traceability and data integrity throughout the analytical workflow.

Procedures were in place for the investigation and handling of non-conforming results, including OOS, OOL, and sterility test failures. Investigations were conducted in accordance with GMP principles, with defined timelines and documentation requirements.

Microbiological testing, including sterility testing, was conducted under controlled conditions in classified areas.

Environmental monitoring programmes were implemented across production and laboratory environments, including viable and non-viable monitoring, with defined sampling locations, frequencies, and alert/action limits. Trending of environmental monitoring data was performed periodically.

Analytical methods for identity and potency testing were established and subject to validation. Reference standards were available and used for testing purposes.

The laboratory control system was generally established with appropriate structures, procedures, and analytical capabilities; Some deficiencies were noted and addressed through CAPAs to a satisfactory level prior to publication of the WHOPIR.

5. Materials system:

A materials management system was established and supported by an electronic system to control inventory, material status, and traceability. Storage locations were assigned and managed electronically, and materials were clearly identified and segregated according to their status (e.g. quarantine, released, rejected). Rejected materials were stored in a dedicated, secure area with restricted access.

Procedures were in place for receipt, inspection, sampling, testing, and release of materials. Incoming materials were verified against approved supplier lists and assigned identification labels. Sampling was performed by Quality Control, and materials remained under controlled status until testing was completed and a disposition decision was made.

Bulk materials and finished products were stored under defined temperature-controlled conditions, and materials were issued to production in accordance with approved procedures. Inventory management, including raw materials, packaging materials, intermediates, and finished products, was controlled through the electronic system.

Warehouse facilities were designed with controlled access and defined storage conditions for raw materials, intermediates, and finished products, including ambient, refrigerated, and frozen storage. Large-scale storage units were available for drug substance storage, with qualified temperature control and monitoring systems. Sampling and dispensing areas were established with appropriate environmental controls.

Cold rooms, freezers, and large-scale storage units were qualified and monitored, including temperature mapping, alarm verification, and performance under stress conditions such as power failures and door openings. Storage systems were generally adequate, with appropriate qualification and monitoring.

Distribution and international shipping processes were defined with dedicated areas for secondary and tertiary packaging and temperature-controlled storage prior to dispatch. Procedures were in place for packaging, storage, and transport, aligned with applicable requirements for vaccine distribution.

The materials management system was generally well established with effective electronic control and traceability; however, some deficiencies were observed and addressed through CAPAs to a satisfactory level prior to publication of the WHOPIR.

6. Packaging and labeling system

Bulk drug substance was stored in appropriate containers with attached labels. Following filling, vials were sealed and transferred to visual inspection, where segregation and identification of units were ensured using a controlled tray-based system. Label controls were implemented, including use of pre-printed labels and controlled printing of variable information. Storage and handling of intermediate and finished products, including tray identification and segregation of accepted and rejected units, were defined and implemented.

Visual inspection processes included segregation of accepted and rejected units, with defined storage conditions before and after inspection. Accepted units were transferred to labelling and packaging areas, while rejected units were securely controlled.

Label management included procurement of pre-printed labels and controlled printing of variable data, with reconciliation based on production volumes. Packaging operations were performed in designated

areas, with controlled storage conditions for intermediate and finished products, including temperature-controlled environments.
Specific controls were in place for vaccine vial monitors (VVMs), including qualified storage equipment, temperature control, and inventory management through an electronic system.
The labelling, packaging, and distribution system was generally established with appropriate controls; however, some deficiencies were noted and addressed through CAPAs to a satisfactory level prior to publication of the WHOPIR.

Part 3	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, **Biological E. Limited**, located at Sy. No. 549, 550 & 552 to 556, Kolthur Village, Shameerpet Mandal, Medchal-Malkajgiri District, Telangana State – 500078, India **(SEZ unit)** and Plot No.1, Biotech Park, Phase II, Kolthur Village, Shameerpet, Medchal-Malkajgiri District, Telangana State – 500078, India **(Shameerpet site)** 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 WHO 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-eight 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 biological products. WHO Expert Committee on Biological Standardization. Sixty-sixth Report Geneva, World Health Organization, 2016 (WHO Technical Report Series, No. 999), Annex 2. ***Short name: WHO TRS No. 999, Annex 2***

3. 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***

4. WHO good manufacturing practices for active pharmaceutical ingredients (bulk drug substances). 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***

5. 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***

6. 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***

7. 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***

8. WHO Good Practices for Pharmaceutical Quality Control Laboratories. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-fourth Report. Geneva, World Health Organization, 2010 (WHO Technical Report Series, No. 957, Annex 1.
Short name: WHO TRS No. 957, Annex 1

9. 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

10. WHO guidelines on transfer of technology in pharmaceutical manufacturing WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-Fifth Report Geneva, World Health Organization, 2011 (WHO Technical Report Series, No. 961), Annex 7. ***Short name: WHO TRS No. 961, Annex 7***

11. 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***

12. 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***

13. 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***

14. 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***

15. 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***

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

19. 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***

20. 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***

21. 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***

22. 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***

23. WHO Recommendations, Guidelines and other documents related to the manufacture, quality control and evaluation of biological products. WHO Expert Committee on Biological Standardization. Seventy-first Report. Geneva, World Health Organization, 2021 (WHO Technical Report Series, No. 1028), Annex 1. ***Short name: WHO TRS 1028, Annex 1***

24. New and replacement WHO international reference standards for biological products. WHO Expert Committee on Biological Standardization. Seventy-first Report. Geneva, World Health Organization, 2021 (WHO Technical Report Series, No. 1028), Annex 4. ***Short name: WHO TRS 1028, Annex 4***

25. Points to consider when including Health-Based Exposure Limits (HBELs) 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 1033, Annex 2***

26. 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 1033, Annex 3***

27. 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 1033, Annex 4***

28. Procedure for assessing the acceptability, in principle, of vaccines for purchase by United Nations agencies. WHO Expert Committee on Biological Standardization. Sixty-first report. Geneva, World Health Organization, 2013 (WHO Technical Report Series, No. 978), Annex 6. ***Short name: WHO TRS No. 978, Annex 6***

29. Guidelines for independent lot release of vaccines by regulatory authorities. WHO Expert Committee on Biological Standardization. Sixty-first report. Geneva, World Health Organization, 2013 (WHO Technical Report Series, No. 978), Annex 2. ***Short name: WHO TRS No. 978, Annex 2***

30. Recommendations to assure the quality, safety and efficacy of poliomyelitis vaccines (oral, live, attenuated). WHO Expert Committee on Biological Standardization. Seventy-sixth report. Geneva, World Health Organization, 2023 (WHO Technical Report Series, No. 1045), Annex 2. ***Short name: WHO TRS No. 1045, Annex 2***