Molecular Diagnosis of Infectious Diseases

Quality Requirements

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Molecular diagnostic assays have played and continuing to have a critical role in clinical laboratories in recent years

Many of Clinicians still have no fully trust to Molecular protocols

Are these test still has insufficient Sensitivity and specificity

Are they still under develop

OR

Molecular methods are running in unapproved conditions

This approach comes from insufficient knowledge and experiments in applied protocols

- Quality control of the molecular methods on three basic elements:
  - instruments and space
  - applied methods
  - skill of laboratory technicians.

Adequate physiopathology knowledge of infectious diseases is necessary.

Lack of this knowledge caused complexities in the interpretation of the results

Quality Control (QC) is a system of routine technical activities, to measure and control the quality of the inventory as it is being developed.

The QC system is designed to:

- (i) **Provide routine and consistent checks** to ensure data integrity, **correctness**, and completeness;
- (ii) **Identify and address errors and omissions**;
- (iii) **Document and archive inventory material and record all QC activities.**

REQUIRED PARAMETERS OF VALIDATION

- Specificity
  - Target selection , primers and probe evaluation, clinical evaluation with specimens
- Sensitivity,
- Reproducibility,
- Stability,
- Accuracy of applied instruments, and so on

METHOD VALIDATION; DEFINITION

- Method validation includes all of the procedures that demonstrate a particular method used for qualitative detection and quantitative measurement of analytes in a given biological matrix, such as blood, plasma, serum, or urine, is reliable and reproducible for the intended use.

Full Validation

Full validation is important when developing and implementing a bioanalytical method for the first time.

Partial Validation

- Partial validations are modifications of already validated methods. Partial validation can range from as little as one intra-assay accuracy and precision determination to a nearly full validation.

How the results can be acceptable?

- Method Validation and verification
- Standardization
- Quality Control of the

  instruments and space,

  applied methods in all steps and Protocols

  skill of laboratory technicians

Proper Documentation

- Quality Control Officer
  - The scheme provider shall **review the outcomes of every round of the scheme,** noting, for example, **any strengths, weaknesses, specific problems**, and opportunities for improvement Define Quality Control Program.

- Reference Materials
  - The bulk material prepared for the proficiency test must be sufficiently homogeneous and stable, in respect of each analyte

- Run Controls
  - The run controls under development are designed to be extracted and amplified in the same way as clinical samples, and to be included in each assay run. **They are intended to act as a low-level positive control.**

- Documentation
  - The scheme provider must document all practices, procedures and the results of the tests in their own quality manual, and a summary of relevant procedures must be supplied to all participants.

PERSONNEL

The person in charge shall be actively involved in:

- determining methods and procedures;
- staff training;
- quality control procedures;
- in reviewing and interpreting laboratory data;
- and in providing laboratory reports and clinical consultation.

- ✓ **The level of education and training;**
  - ✓ significant diagnostic or research experience
  - ✓ biological knowledge relevant to the discipline

- ✓ **Competency of senior practitioners appropriate to complex molecular tests.**
  - ✓ specific training, particularly in how to assess the validity of data
  - ✓ how to troubleshoot problems when they occur

AUTHORIZED PERSON

Adequate knowledge

- Technical ability
- aware of best practices, proper interpretation, limitations of techniques
- Physiopathology of infectious diseases
- Source of Errors

PROFICIENCY TEST

- Proficiency tests are used to ensure the reproducibility of clinical tests and to confirm the skill of a clinical or referral laboratory in performing such tests.

- Collaboration between laboratories

INSPECTION

Inspector Requirements

- Actively practicing molecular scientists preferred
- Familiar with Checklist and running protocols
- Technical and interpretive skills

Inspector Preparation

- Review Checklists: Molecular Pathology and Laboratory General
- Before arrival, ask lab director to have documents ready to review:
  - Test validation records
  - Procedure manuals
  - QC and maintenance records
  - Sampling of completed case records

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Case Record Review

- Ask for several recently completed cases for each main analyses offered
  - Normal and abnormal cases
  - Worksheets
  - Raw data
  - Gel photographs/Blots/Computer files
  - Completed reports

INSPECTING MOLECULAR PROCEDURES

- Proficiency Testing (PT)
- Validation Studies
- Ethics and Confidentiality
- Physician Orders - Residual Sample***s***

Look For:

- Report error
  - Document investigation
  - Revised report contains original findings and correction date
- QC records: tolerances specified
- Current and prior versions of procedure manual
  - Date of procedure change/retirement
- Record of deviations from standard procedure
- Turn-around time
- Critical limits specified
- Competency (technical skills, clinical judgment, communication skills) assessed periodically
  - Direct observation
  - PT results
  - Written exam
- Personnel requirements met
  - As described in standards or guidelines
  - Those not meeting requirements but gaining experience must work under direct supervision of qualified personnel


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