Preparation and Evaluation of Nanoparticles with HPLC Drug Assay

Practical 15 | Instrumental Methods of Analysis and Novel Drug Delivery Systems

Aim

To study Preparation and Evaluation of Nanoparticles with HPLC Drug Assay, and interpret the recorded observations.

Principle

- Nanoparticle formulation involves a carrier system whose size and drug association require separate measurements. HPLC can quantify extracted drug, but it does not directly determine particle diameter.
- A dosage form combines an active ingredient with excipients selected for processing, stability and performance.
- Preparation and evaluation are linked: changes in composition or process can alter the product quality attributes.
- Identify the carrier and the broad particle-formation method demonstrated.
- Record independent size/distribution observations such as the assigned light-scattering result.
- Review the separation and extraction recovery used for drug-association measurements.
- Quantify drug by HPLC and retain the exact denominator for loading or encapsulation.

Materials and Apparatus

- Instructor-approved carrier formulation, prepared dispersions, separation/size records and HPLC calibration.
- Assigned active ingredient, excipients and the instructor-approved master formula.
- Balance, mixing/preparation equipment, packaging materials and the assigned evaluation apparatus.

Method

1. Read the master formula and identify the purpose of each ingredient.
2. Calculate the quantities for the assigned laboratory batch and check ingredient identity.
3. Follow the specified order of addition and preparation process, recording actual quantities and process observations.
4. Measure the yield or finished quantity and package the laboratory preparation as specified.
5. Evaluate the product attributes listed for this dosage form with documented methods.
6. Compare the observations with the assigned specification and explain any difference.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Carrier/formula	_____
Size and distribution method	_____
Extracted-drug response	_____
Free/associated drug	_____
Loading measure	_____

Calculations and Interpretation

- Encapsulation efficiency (%) = associated drug amount/total drug amount introduced × 100.
- Drug loading (%) = associated drug mass/defined recovered formulation mass × 100.
- State whether the loading denominator is carrier mass or total dried product mass.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Record changes in process or composition; do not conceal a deviation.
- Use the specification assigned to the exact product and dosage form.
- A teaching batch is for laboratory evaluation and is not released for patient use.

Viva Questions

1. Why identify excipient functions?

Each excipient can influence processing, stability, release or acceptability.

2. Why is appearance alone insufficient for evaluation?

It does not establish content, performance, stability or microbiological quality.

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