

Application Topics

Single Nano Particle Size Analyzer IG-1000

No. 6

Measurement of Liposomes Using the IG-1000

When a drug is administered directly into the human body, the size distribution of the particles in the drug is significantly important, as this determines which parts of the body the drug can reach as the particles flow

with the blood stream and penetrate capillary walls into the surrounding tissue. Therefore, the particle size may greatly influence the effectiveness as well as the side effects of the drug.

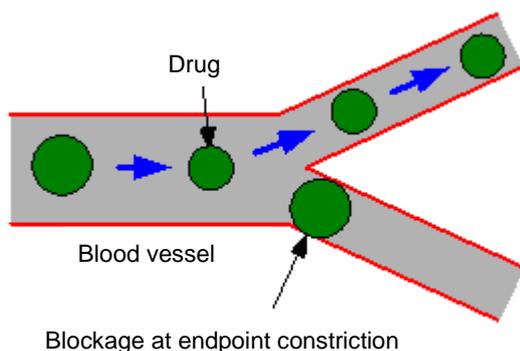


Fig. 1 Image of Drug Passage in Blood Vessel

For example, if particles larger than $12\ \mu\text{m}$ are administered into an artery, the active ingredients of the drug are released when the particles form a blockage at a constriction point in a vascular bed, a technique that is useful for treatment of liver and kidney cancer. If particles larger than $12\ \mu\text{m}$ are injected into a vein, the majority of the particles are captured in the capillary bed of the lungs. Particles of $0.1 - 3\ \mu\text{m}$ in diameter that are injected into an artery or vein pass through the lungs to reach the liver and spleen. In addition, when effectiveness at the cellular level is important, nano-level testing becomes necessary.

Aside from the obvious importance of new drug development (active ingredients) in the field of pharmacology, the issue of how a drug is administered is important from the viewpoint of the patient. In other words, the drug must be administered so as to attain a powerful effect at the diseased site, with as few side effects as possible. Drug delivery systems (DDS) are technologies that are designed to deliver just the

necessary amount of a drug in a concentrated manner to the required location at the necessary time. The control of the particle size (particle size distribution) is extremely important when using a DDS, and for this reason, accurate measurement of particle size distribution at the nano-level is critical.

In the development of DDS, liposomes are considered likely candidates as capsules for conveying active pharmacological ingredients. Liposomes are tiny bubbles with a 2-layer membrane consisting of phospholipids, the same substances comprising the cell membrane found in the human body.

Liposomes can be filled with a wide range of drugs, including those that are water-soluble, lipid-soluble, and those that contain macromolecules. In addition, the absorption of the drugs at specific locations in the body is possible by controlling the size (particle diameter) of the liposomes.

Here we introduce the results of measurement of liposomes using the IG-1000 nanoparticle analyzer, capable of measuring the size of a single nanoparticle.

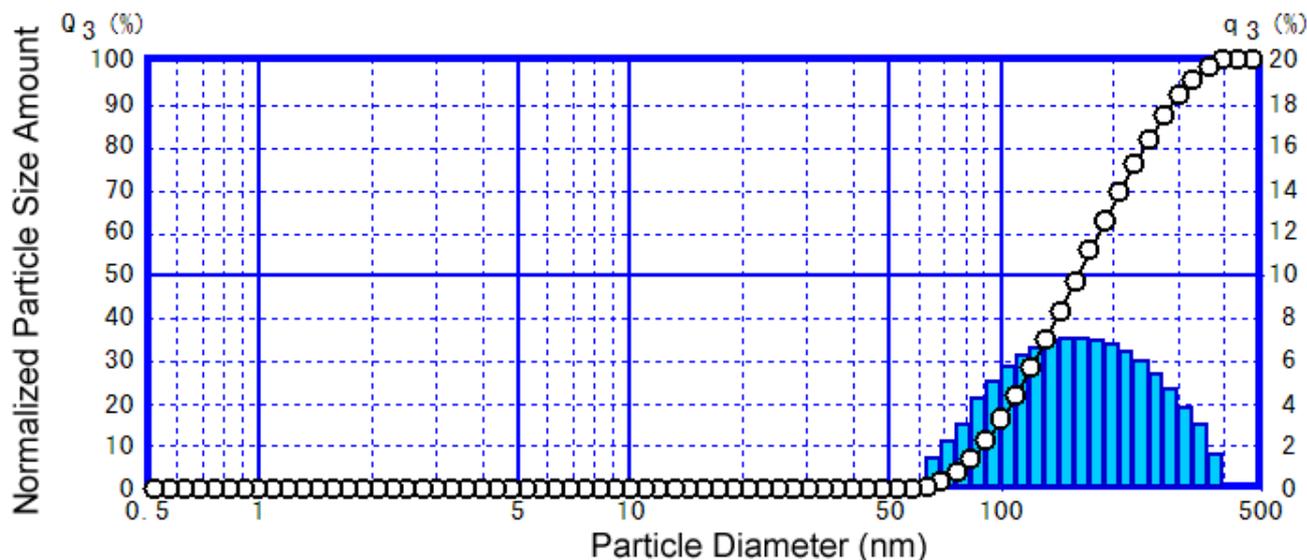


Fig. 2 Particle Size Distribution Measurement of Liposomes Using the IG-1000

Fig. 2 shows the results of particle size distribution measurement of commercial liposomes dispersed in purified water using the IG-1000. (The distribution is displayed based on volume distribution.)

The measurement results indicate a mean particle diameter of 160 nm, with the liposomes distributed over a wide range of particle sizes from 60 nm - 400 nm.

Measurement of samples having such a wide distribution range is difficult using the conventional DLS technique (Dynamic Light Scattering), which reportedly often involves trial-and-error

experimentation. However, this difficulty related to measurement over wide distribution range is greatly alleviated with the IG-1000.

For comparison, please refer to the following application news article which evaluates changes in liposome agglutination using the SALD-7101 nanoparticle size analyzer, in which measurement is based on the laser diffraction - light scattering technique. (Shimadzu Test CSC News No. 259 "Liposome Measurement Using the SALD-7101")

NOTES:

* This Application Topics has been produced and edited using information that was available when the data was acquired for each article. This Application News is subject to revision without prior notice.



SHIMADZU CORPORATION. International Marketing Division

3. Kanda-Nishikicho 1-chome, Chiyoda-ku, Tokyo 101-8448, Japan Phone: 81(3)3219-5641 Fax: 81(3)3219-5710

Cable Add: SHIMADZU TOKYO