

Table 16.1 Liposome Nomenclature

Acronym	Vesicle diameter (μm)	Number of lamellae	Captured volume (ml/g)	Percent entrapped ^a
MLV	> 0.1	≥ 5	≥ 0.6	6 \leq < 70
SUV	0.03 < 0.06	1	0.6–1.9	6 < < 19
LUV	> 0.06	1	≥ 1.9	19 \leq < 70
OLV	> 0.06	1 < \leq 5	≥ 0.6	6 \leq < 70

^aCalculated for 10% lipid (w/v).

A. Liposome Specific Parameters

The *encapsulation volume* or *captured volume* is defined as the volume of entrapped discontinuous aqueous phase per unit mass of lipid phase, and is typically expressed in units of microliters per micromole lipid ($\mu\text{l}/\mu\text{mol}$) or milliliters per gram lipid (ml/g). It is often desirable to maximize drug entrapment with minimum lipid, and this can be achieved by formulating for the greatest possible captured volume. For a given quantity of lipid, the captured volume is increased by increasing the diameter of the liposomes and reducing the number of lamellae. The theoretical relationship between liposome diameter and captured volume of ideal, uniformly sized unilamellar liposomes is illustrated in Figure 1. These values represent the upper limit of captured volume. For liposomes with more than one lamella per vesicle, the captured volume will be reduced as a function of number of bilayers and the interbilayer repeat distance. In practice, the captured volume is determined by using a water-soluble marker (such as radiolabeled sucrose, inulin, or the drug of interest) of known concentration in the hydrating buffer. This buffer is added to a known amount of lipid. After the lipid is completely hydrated, the liposome-entrapped marker is separated from untrapped material by centrifugation, column chromatography, dialysis, or some other means. Final marker concentration and lipid concentration in the cleaned up preparation are determined by suitable methods. The captured volume is calculated from

$$M/(C \times L) = \text{captured volume} \quad [1]$$

where M is the total mass quantity of marker in the cleaned up liposome preparation, C is the original concentration of marker in