

**TABLE 11.2**  
**Surfactants Used in Oral Lipid-Based Formulations**

Chemical or Common Name	Trade Name	HLB
Polyoxyethylene 20 sorbitan monolaurate	Polysorbate 20 (Tween 20)	16.7 <sup>a</sup>
Polyoxyethylene 20 sorbitan monopalmitate	Polysorbate 40 (Tween 40)	15.6 <sup>a</sup>
Polyoxyethylene 20 sorbitan monostearate	Polysorbate 60 (Tween 60)	14.9 <sup>a</sup>
Polyoxyethylene 20 sorbitan monooleate	Polysorbate 80 (Tween 80)	15.0 <sup>a</sup>
Polyoxyethylene 20 sorbitan trioleate	Polysorbate 85 (Tween 85)	11.0 <sup>a</sup>
Sorbitan monooleate	SPAN 80	4.3 <sup>a</sup>
Sorbitan trioleate	SPAN 85	1.8 <sup>a</sup>
Sorbitan monostearate	SPAN 60	4.7 <sup>a</sup>
Sorbitan monopalmitate	SPAN 40	6.7 <sup>a</sup>
Sorbitan monolaurate	SPAN 20	8.6 <sup>a</sup>
Polyoxyl 35 castor oil	Cremophor EL	12–14 <sup>a</sup>
Polyoxyl 40 hydrogenated castor oil	Cremophor RH40	14–16 <sup>a</sup>
Polyoxyethylene polyoxypropylene block copolymer	Poloxamer 188 (Pluronic F68);	29 <sup>b</sup>
	Poloxamer 407 (Pluronic 127)	22 <sup>b</sup>
Unsaturated polyglycolized glycerides	Labrafil M2125, M1944	4 <sup>b</sup>
Saturated polyglycolized glycerides	Gelucire 44/14, 50/13	13–14 <sup>b</sup>
PEG-8 Caprylic/capric glycerides	Labrasol	14 <sup>b</sup>
PEG-8 Caprylic/capric glycerides	Labfac CM10	10 <sup>b</sup>
Tocopherol PEG succinate	Vitamin E TPGS	13 <sup>b</sup>
Polyoxyl 40 stearate	Myrj 52	16.9 <sup>a</sup>
Phosphatidyl choline	Phospholipon	
Glyceryl caprylate/caprato	Capmul® MCM	5–6
Glycerol monooleate	Capmul® GMO	4–5
Propylene glycol monolaurate	Capmul® PG-12; Lauroglycol	4

<sup>a</sup> Handbook of Pharmaceutical ingredients.

<sup>b</sup> Vendor information (Abitec Corp.; BASF Corp.; Gattefosse SAS; Uniqema).

droplet size on addition to an aqueous phase, since in the initial stages of the dilution path, water will be taken up into the formulation, with intermediate formation of a water-in-oil emulsion before phase inversion. Monoglycerides and propylene glycol monoesters, lipids described earlier, also have surfactant properties as low HLB emulsifiers; thus these are also included in Table 11.2. Strickley (2004) has written a comprehensive review of commonly used lipids and emulsifiers with product examples.

## COSOLVENTS

Hydrophilic cosolvents (e.g., ethanol, propylene glycol, polyethylene glycol 400 [PEG 400]) may be used in lipid-based oral formulations if needed to improve drug solubilization. These hydrophilic components may also aid dispersion by facilitating ingress of water into the formulation. An important advantage of lipid-based systems with a co-solvent over formulations consisting only of cosolvents is that after dissipation of the hydrophilic components, the lipids will remain to prevent drug precipitation, whereas in the absence of lipids, drug precipitation is likely. Figure 11.1 illustrates this point for a lipophilic drug RO-15-0778, for which a lipid-based self-emulsifying drug delivery systems (SEDDSs) exhibited a fourfold enhancement in