physicochemical property of a compound that cannot be changed by altering the formulation employed for dosing.

Additional formulation options that can be explored in an attempt to design delivery methods capable to producing the desired clinical outcome include specialty tablets and capsules. Multilayer tablets that produce an initial burst of the candidate compound followed by a slow, sustained release can be created by embedding the API into two different matrices with different dissolution rates (one fast, one slow, Figure 9.11).[33] Osmotic pumps

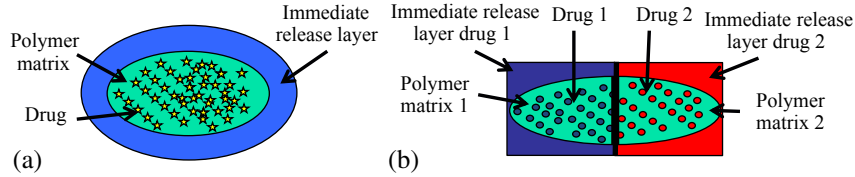

FIGURE 9.11 (a) An immediate release outer layer provides an immediate burst of drug substance. Once the outer layer is gone, the core of the tablet is exposed. The polymer matrix containing the drug is dissolved slowly, releasing the remainder of the drug over an extended period of time. (b) Two different medications coat the outside of the tablet, both of which are released to provide an immediate burst of drug substance. Exposure of the inner core leads to slow release of the two medications from their respective polymer matrices. The rate of release of each drug will be determined by the nature of each polymer matrix.

systems that encapsulate the API in a semipermeable membrane can also be an effective tool in delivering a drug. In a simple system, water enters the capsule through a semipermeable membrane as a result in the difference in osmotic pressure between the inside and the outside of the pill. The water dissolves the API, which then moves out of the capsule through microdrilled orifices in the walls of the pill (Figure 9.12(a)).

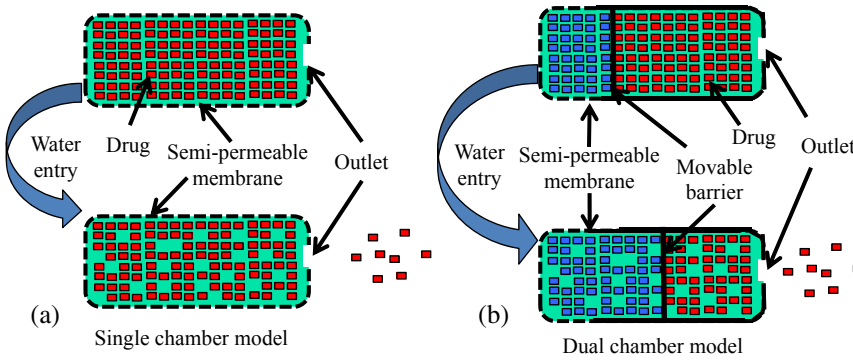

FIGURE 9.12 (a) In the single chamber osmotic pump system, differences in osmotic pressure lead to release of the drug substance (red) through microdrilled holes. (b) In the two chambered system, drug release (red) is promoted by movement of barrier between the two chambers of the pill. Osmotic pressure differences causes water to enter the "push chamber," which expands, forcing drug substance out of the drug chamber.