interest such as patch removal, sunscreen, and other products and toxins being washed and removed from the skin, when the assumption can be made that there has not been a significant (>10%) depletion in the concentration of solute at the surface. The amount absorbed into a systemic circulation across the skin from the time the dosage form is removed is given by:

$$Q(t) = M_\infty \left\{ 1 - \frac{4}{\pi^3} \sum_{n=0}^{\infty} \frac{(-1)^n}{\left[n + (1/2)\right]^3} \exp\left[-\frac{t}{t_d} \pi^2 \left(n + \frac{1}{2} \right)^2 \right] \right\} \tag{2.23}$$

where $M_\infty = K_m C_v A h_m/2 = k_p A C_v t_d/2$ is the amount of solute present in the skin before removal of the vehicle. The Laplace domain equivalent of this expression is:

$$\hat{Q}(s) = \frac{M_\infty}{s^2} \frac{2}{t_d} \left(1 - \frac{1}{\cosh \sqrt{s t_d}} \right) \tag{2.24}$$

The corresponding equations for flux are:

$$J_s(t) = k_p C_v \frac{2}{\pi} \sum_{n=0}^{\infty} \frac{(-1)^n}{n + (1/2)} \exp\left[-\frac{t}{t_d} \pi^2 \left(n + \frac{1}{2} \right)^2 \right] \tag{2.25}$$

$$\hat{J}_s(s) = \frac{k_p C_v}{s} \left(1 - \frac{1}{\cos h \sqrt{s t_d}} \right) \tag{2.26}$$

Figure 2.6 shows the amount and flux–time profiles associated with donor phase removal.

The mean time for absorption of solute from the skin in this case is given by:

$$\text{MAT} = \frac{\int_0^\infty J_s(t) t \, dt}{\int_0^\infty J_s(t) \, dt} = -\lim_{s \to 0} \frac{d}{ds} \ln(\hat{J}_s) = \frac{5 h_m^2}{12 D_m} = \frac{5}{12} t_d \tag{2.27}$$

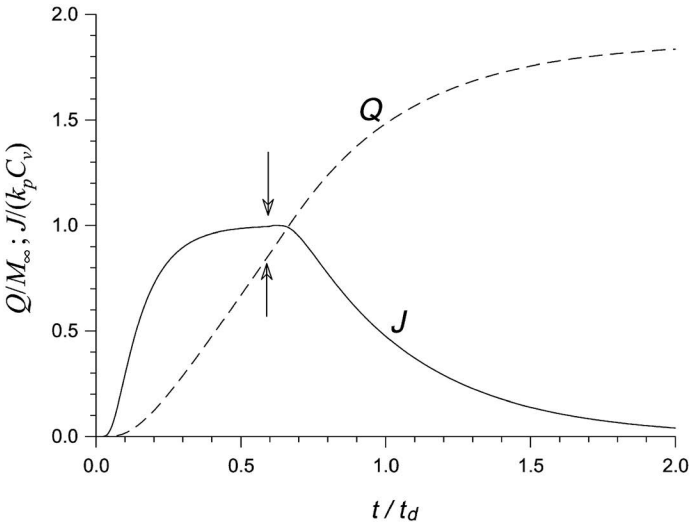

FIGURE 2.6 Changes in normalized cumulative amounts penetrating (Q/M_∞) and flux ($J/k_p C_v$) when the vehicle is removed (as indicated by *arrows*) at a specific normalized time (t/t_d) after application.