tive- and negative- sense RNA (i.e., completing a replication cycle in vitro) been accomplished for positive-sense RNA viruses ***(11)***. This will permit testing of hypotheses concerning motifs thought to be important in RNA transcription or replication, by targeted mutagenesis of infectious cDNA clones and identification of host plant proteins involved in virus replication.

5.2. Movement From Cell to Cell Within a Plant

Animal viruses commonly enter cells by receptor-mediated endocytosis of whole virions. Nucleic acid is then released from the virion within the invaded cell. In contrast, most plant viruses appear to invade adjacent cells as nonencapsidated nucleic acid, probably complexed with membrane-associated proteins that bind to the viral nucleic acid in a sequence-nonspecific manner ***(12)***. This explains how viruses with considerably greater minimum dimensions than the maximum diameter of plasmodesmata can pass through these cellular connectors. However, results of substantial research makes it clear that whole virus particles in some cases move across the cell wall barrier. Thus, multiple mechanisms must be invoked to explain cell-to-cell movement in different plant virus groups ***(13)***.

5.3. Movement from Plant to Plant

Viruses most often enter whole plants through microscopic healable wounds. These wounds may be created by physical contact, such as an infected plant rubbing against a noninfected plant, or, more commonly, by invertebrate vectors. Among the vectors that may carry viruses from plant to plant are members of the sucking insect order Homoptera (especially aphids and leafhoppers), mites, mealybugs, whiteflies, beetles, and thrips. Soil-borne viruses may be transmitted by nematodes or fungi. Several plant viruses are pollen-borne, allowing direct infection of the healthy plant or infection of subsequent generations through seed.

Transmission properties differ considerably among different vector–virus combinations. Common terms used particularly to describe transmission by aphids include “nonpersistent” (meaning the virus can be acquired within seconds and must be transmitted within minutes), “semipersistent” (the virus is acquired quickly and may be transmitted over a period of several hours), or “persistent” (virus is acquired slowly and may be transmitted for days or weeks, but only after a latent period within the insect).

Mechanisms for transmission are quite different among different viruses (*see* **ref.** ***14*** for review). Vector transmission and specificity in some cases requires only viral nucleic acid encapsidated in full-length CP molecules (e.g., cucumoviruses); transmission of other viruses requires virus-encoded helper component protein provided *in trans* (e.g., potyviruses). Still other viruses