

Assembly of Capsid and Virus Release

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Synthesis and Assembly of Virus Capsids

- Some **late genes direct the synthesis of capsid proteins, and these spontaneously self-assemble to form the capsid just as in bacteriophage morphogenesis.**
- The addition of poliovirus RNA to an extract prepared from uninfected human cells (HeLa cells) results in the formation of new, infectious poliovirus virions.
- It appears that during icosahedral virus assembly empty **procapsids are first** formed; then the nucleic acid is inserted in some unknown way.
- The site of morphogenesis varies with the virus.
- **Large** paracrystalline clusters of complete virions or procapsids are often seen at the site of virus maturation.

...Synthesis and Assembly of Virus Capsids

- **The assembly of** enveloped virus capsids is generally similar to that of naked virions, except for poxviruses.
- These are assembled in the cytoplasm by a lengthy, complex process that begins with the enclosure of a portion of the cytoplasmic matrix through construction of a new membrane.
- Then newly synthesized DNA condenses, passes through the membrane, and moves to the center of the immature virus.
- Nucleoid and elliptical body construction takes place within the membrane.

Virion Release

- Mechanisms of virion release differ between naked and enveloped viruses.
- Naked virions appear to be released most often by host cell lysis.
- In contrast, the formation of envelopes and the release of enveloped viruses are usually concurrent processes, and the host cell may continue virion release for some time.
- First, virus-encoded proteins are incorporated into the plasma membrane.
- Then the nucleocapsid is simultaneously released and the envelope formed by membrane budding.
- **In several virus families**, a special M protein or matrix protein attaches to the plasma membrane and aids in budding.
- Although most envelopes arise from an altered plasma membrane, in herpesviruses, budding and envelope formation usually involves the nuclear envelope.
- The endoplasmic reticulum, Golgi apparatus, and other internal membranes also can be used to form envelopes.

...Virion Release

- Interestingly, it has been discovered that actin filaments can aid in virion release.
- Many viruses alter the actin microfilaments of the host cell cytoskeleton.
- For example, vaccinia virus appears to form long actin tails and use them to move intracellularly at up to 2.8 μm per minute.
- The actin filaments also propel vaccinia through the plasma membrane. In this way the virion escapes without destroying the host cell and infects adjacent cells.

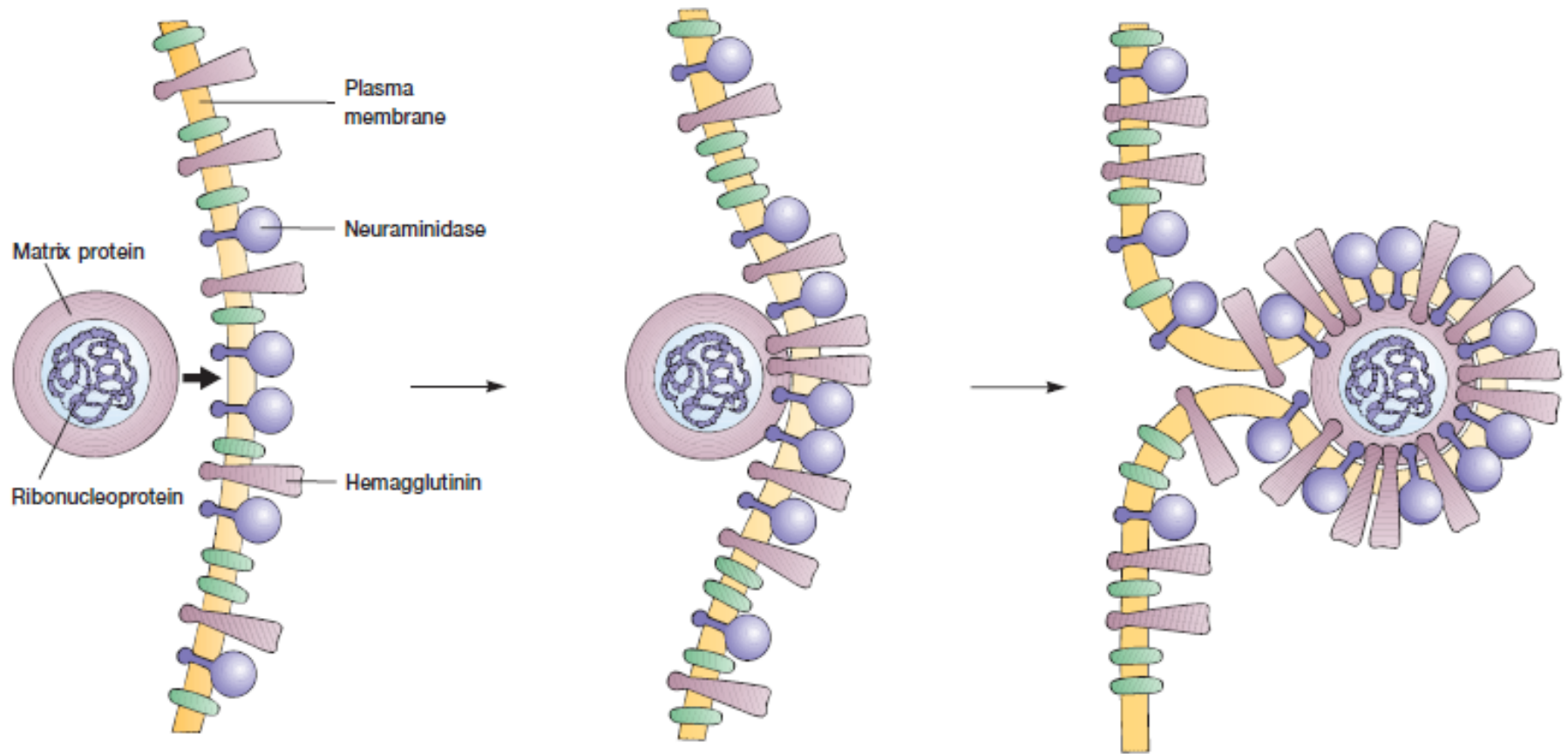


Figure 18.9 Release of Influenza Virus by Plasma Membrane Budding. First, viral envelope proteins (hemagglutinin and neuraminidase) are inserted into the host plasma membrane. Then the nucleocapsid approaches the inner surface of the membrane and binds to it. At the same time viral proteins collect at the site and host membrane proteins are excluded. Finally, the plasma membrane buds to simultaneously form the viral envelope and release the mature virion.