To assemble or not to assemble: The changing rules of pneumovirus transmission

Cifuentes-Muñoz N.

Ellis Dutch R.

Pneumoviruses represent a major public health burden across the world. Respiratory syncytial virus (RSV) and human metapneumovirus (HMPV), two of the most recognizable pediatric infectious agents, belong to this family. These viruses are enveloped with a non-segmented negative-sense RNA genome, and their replication occurs in specialized cytosolic organelles named inclusion bodies (IB). The critical role of IBs in replication of pneumoviruses has begun to be elucidated, and our current understanding suggests they are highly dynamic structures. From IBs, newly synthesized nucleocapsids are transported to assembly sites, potentially via the actin cytoskeleton, to be incorporated into nascent virions. Released virions, which generally contain one genome, can then diffuse in the extracellular environment to target new cells and reinitiate the process of infection. This is a challenging business for virions, which must face several risks including the extracellular immune responses. In addition, several recent studies suggest that successful infection may be achieved more rapidly by multiple, rather than single, genomic copies being deposited into a target cell. Interestingly, recent data indicate that pneumoviruses have several mechanisms that permit their transmission en bloc, i.e. transmission of multiple genomes at the same time. These mechanisms include the well-studied syncytia formation as well as the newly described formation of long actin-based intercellular extensions. These not only permit en bloc viral transmission, but also bypass assembly of complete virions. In this review we describe several aspects of en bloc viral transmission and how these mechanisms are reshaping our understanding of pneumovirus replication, assembly and spread.

En bloc

Inclusion bodies

Nucleocapsids

Pneumoviruses

Spread

cell fusion

cell inclusion

genome analysis

human

immune response

intercellular space

nonhuman

Pneumovirus

polyploidy

priority journal

Review

virion

virus assembly

virus genome

virus nucleocapsid

virus replication

virus transmission

animal

cell line

genetics

Metapneumovirus

mouse

paramyxovirus infection

physiology

Pneumovirus

transmission

virus RNA

Animals

Cell Line

Humans

Metapneumovirus

Mice

Paramyxoviridae Infections

Pneumovirus

RNA, Viral

Virion

Virus Assembly

Virus Replication