

Cell and Molecular Biology of Plant Virus Infection: Early Events and Mechanisms of Pathogenesis

Roger Beachy
Donald Danforth Plant Science Center
St. Louis, Missouri
RnBeachy@danforthcenter.org



Examples of Severe Plant Virus Infections

Cassava Mosaic Disease



Papaya Ringspot Virus



Tomato Mosaic Virus

Disease results from infection of the inoculated cell(s), followed by local (cell-cell) and long distance spread of the infection.
What is the process?
Focus of this lecture is on infection and cell-cell spread.

Cell and Molecular Biology of Cell – Cell Spread: Tobacco Mosaic Virus, a Model RNA Virus

- Type member of tobamovirus family, many different strains with wide host range
- Simple virus: ssRNA of ~6400 n.t
- Encapsidated by 2140 capsid molecules
- Rod-shaped, helical arrangement of capsids
- Transmitted mechanically to wide range of hosts, including tomato, peppers, potato, cucumbers, Arabidopsis

A Primer on TMV

RdRp

MP

CP

RNA Dependent Polymerase/replicase Movement Protein Coat/Capsid Protein

Replication from a molecular Perspective

A Primer on TMV

RdRp

MP

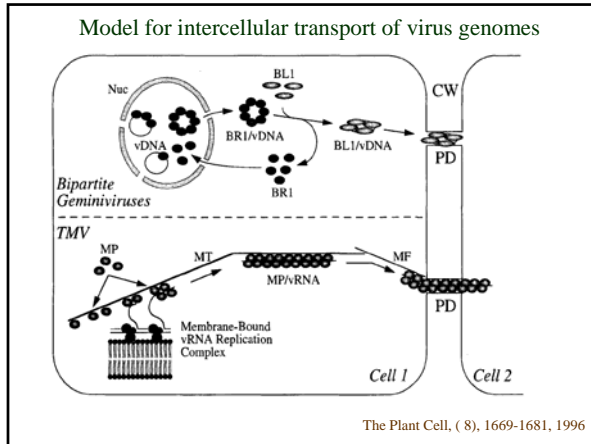
CP

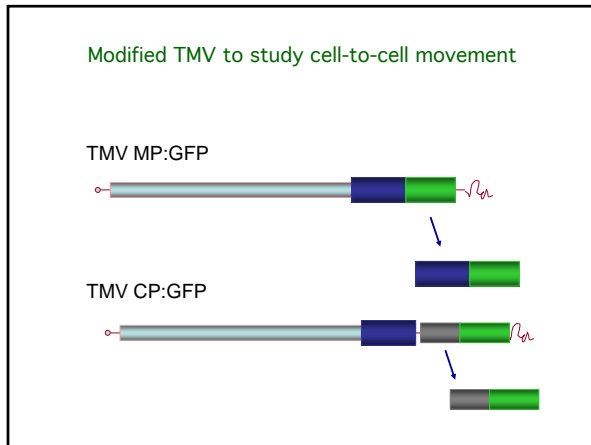
RNA Dependent Polymerase/replicase Movement Protein Coat/Capsid Protein

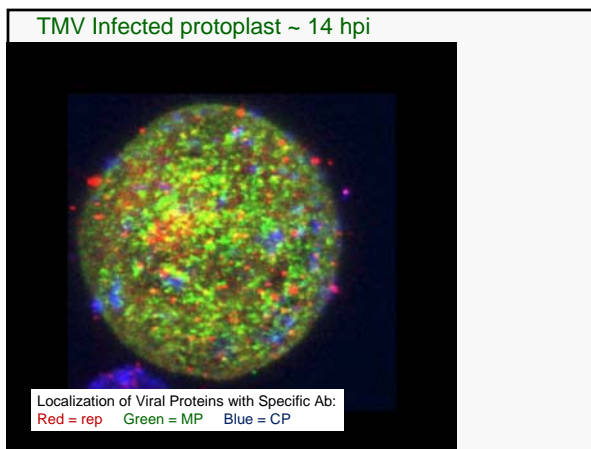
Replication from a cellular Perspective

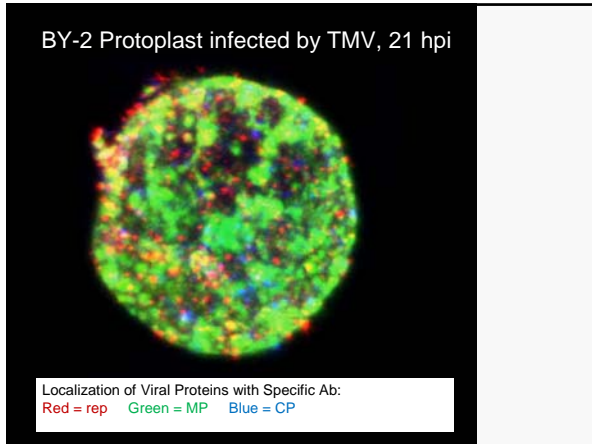
Bernard L. Epel Tel Aviv University

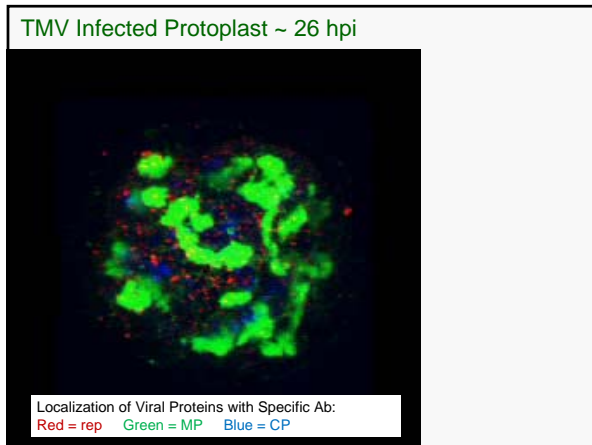
Concepts of architecture of plasmodesmata between plant cells.

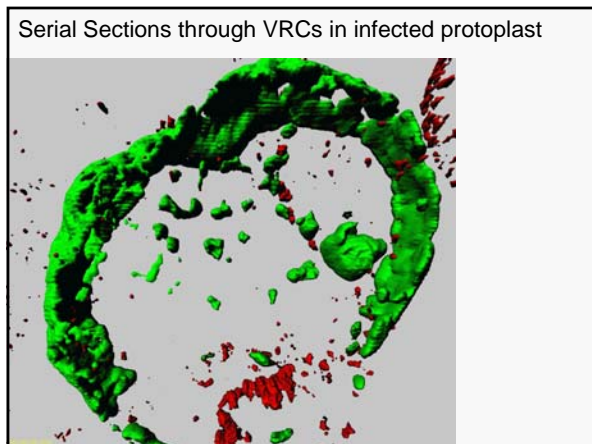




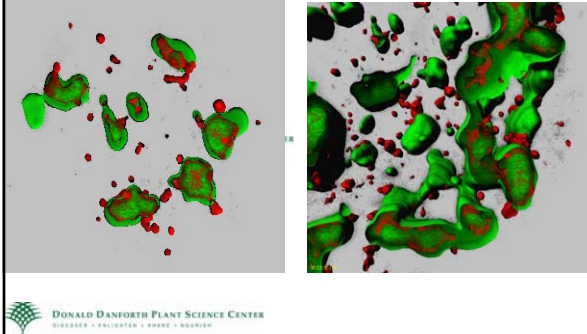




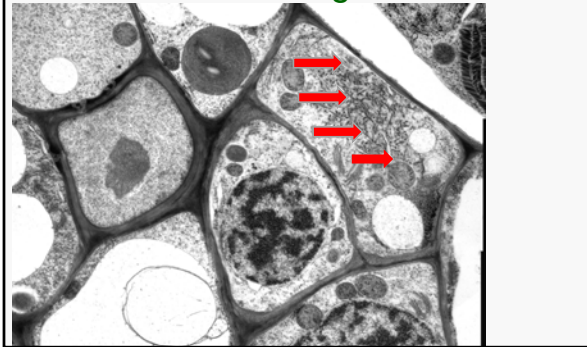




VRCs Structures are assembled around ER, with replicase and MP in close association with ER and each other

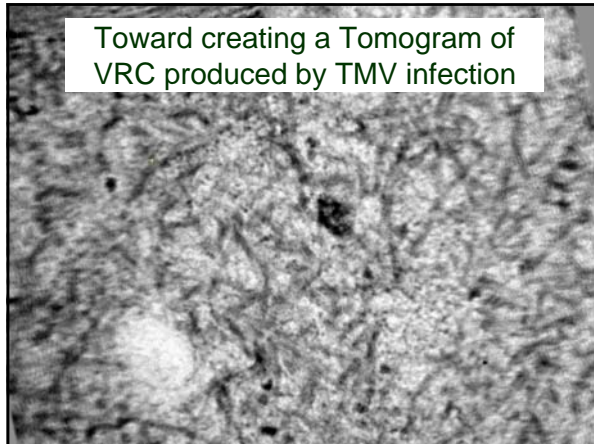


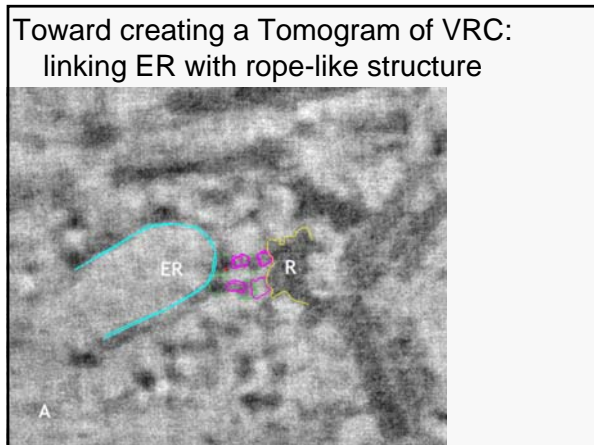
Thin Section TEM of Infected Tissue Showing VRC



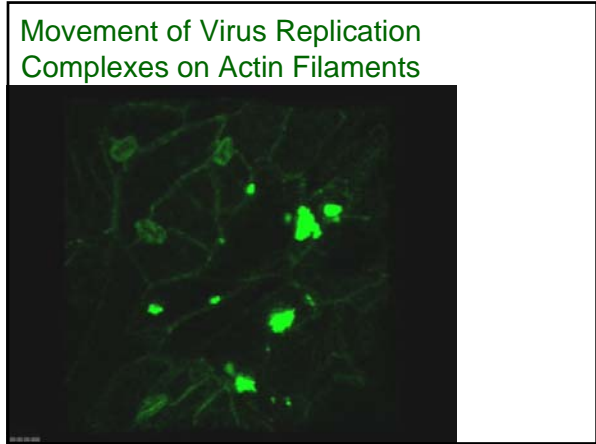
Enlarged VRC – note rope-like structures

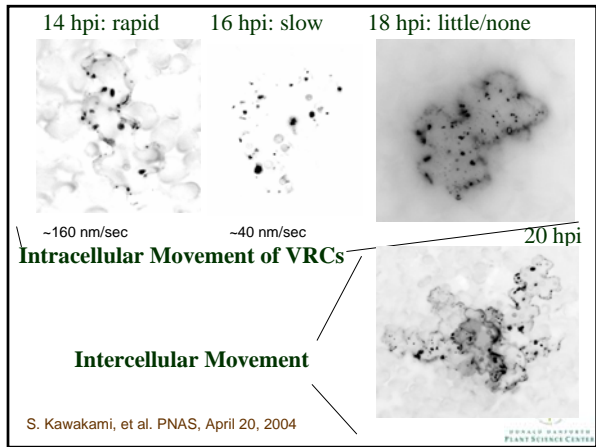


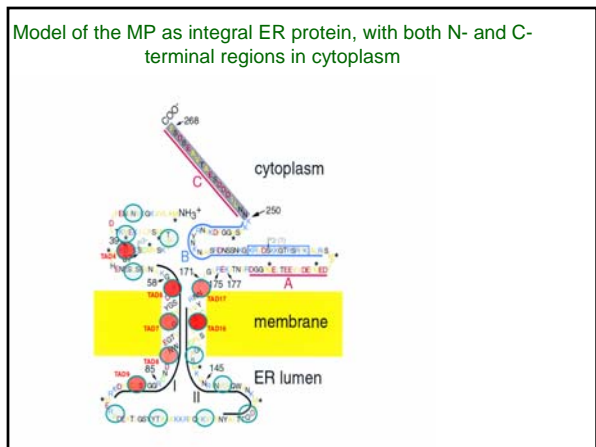


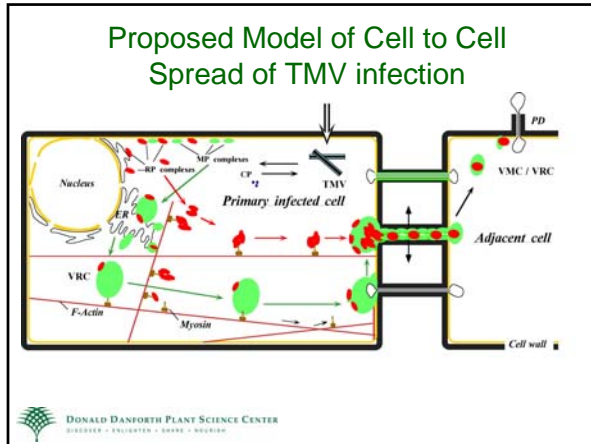












- ### Many Questions Remain . . .
- How do replicase, MP and ER interact in the VRCs?
 - What host proteins are in the VRCs, and what role do they play in attachment of replicase, MP and other viral components?
 - How do VRCs attach to actin-myosin fibers for transport to and through plasmodesmata?

Credits and Recognition

S. Asurmendi, Ph.D. Microscopy/Imaging
 A. Bazzini, Ph.D. Howard Berg, Ph.D. Dir.
 M. Fujiki, Ph.D. Integrated Microscopy
 S. Kawakami, Ph.D. Facility
 M. Soto, Ph.D.

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