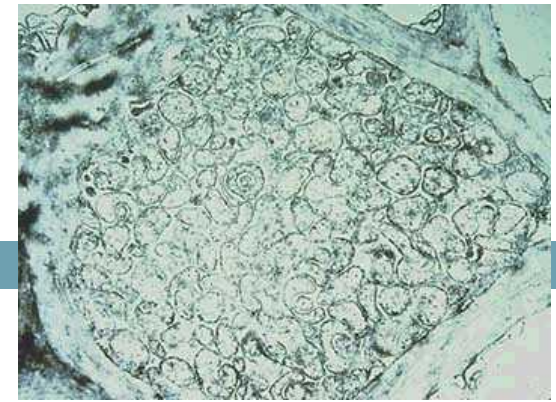


# VECTOR TRANSMITTED PHYTOPLASMAS

Nomination - NPDRS Plan

# Class Mollicutes



- ▣ Phytoplasmas, spiroplasmas & mycoplasmas
- ▣ Degenerate walled bacteria, not primitive precursors
- ▣ Clostridial /Bacillus precursors - **Reductive evolution**
- ▣ Osmotically fragile
- ▣ Morphology - **pleomorphic**
- ▣ Reside in phloem sieve tubes of infected plants, move systemically

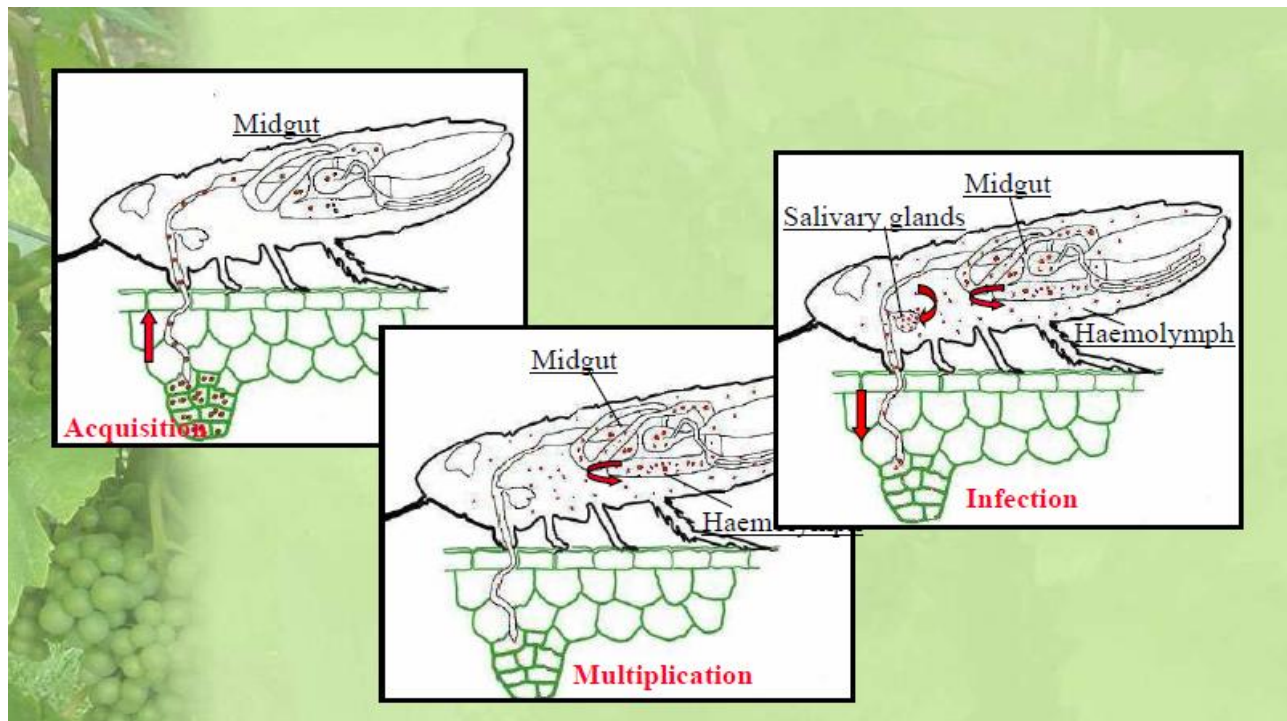
# Phytoplasma pathogenicity

- Genus *Phytoplasma* contains numerous “**candidatus**” species
- Not cultivable – **obligate parasites** of plants and insects
- Size ~500 nm diameter
  - ▣ Tiny genomes (530 -1 350 Kb)
  - ▣ AT rich, GC poor
  - ▣ Contain plasmids & viruses
- Not helical

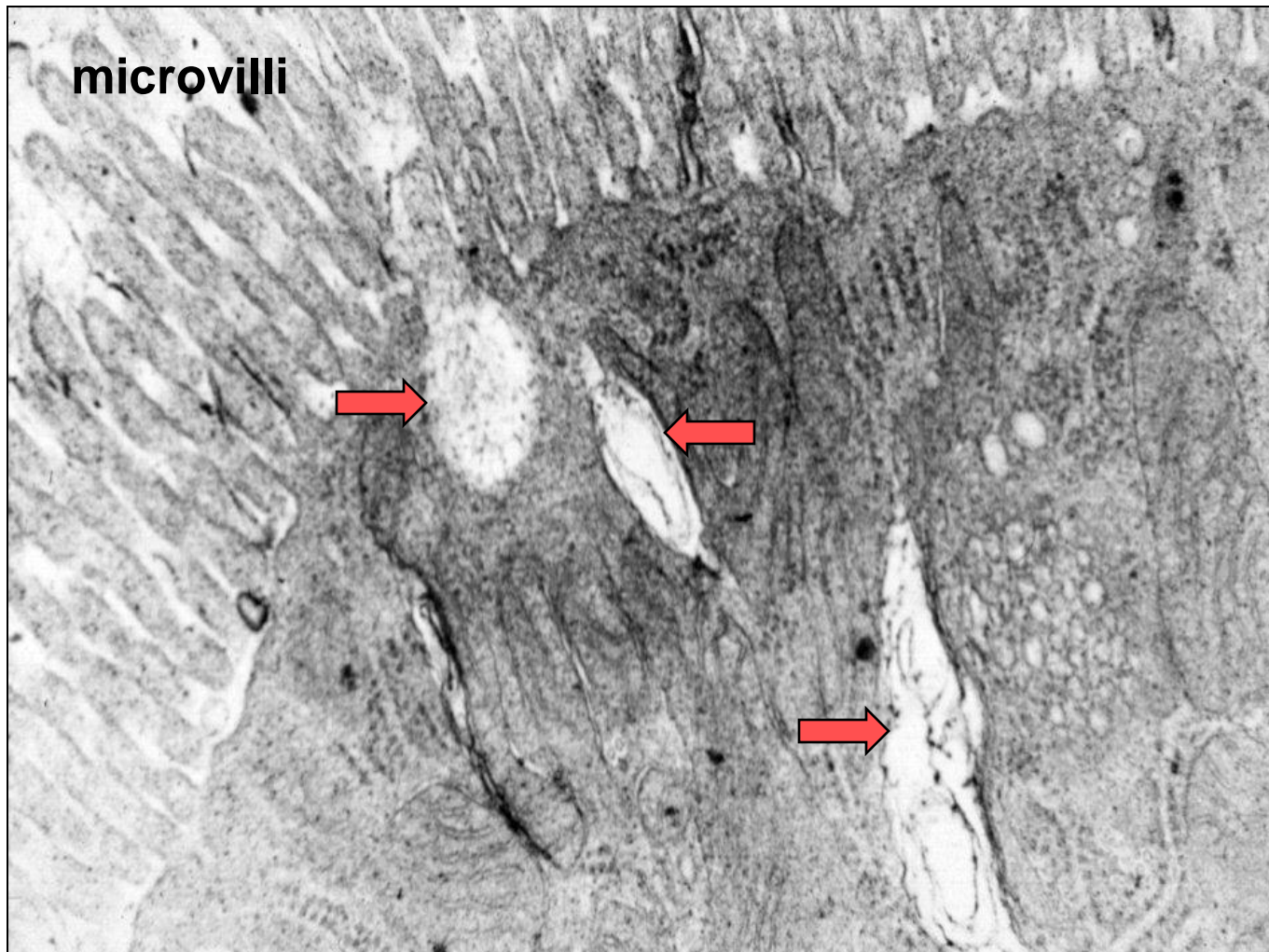
# Transmission - Insects



- LH are true alternate hosts
- Transmission is circulative – propagative
- Mollicute-leafhopper interaction varies



# Mollicute entering leafhopper gut cells



A. Wayadande

# Mollicute path within the insect vector

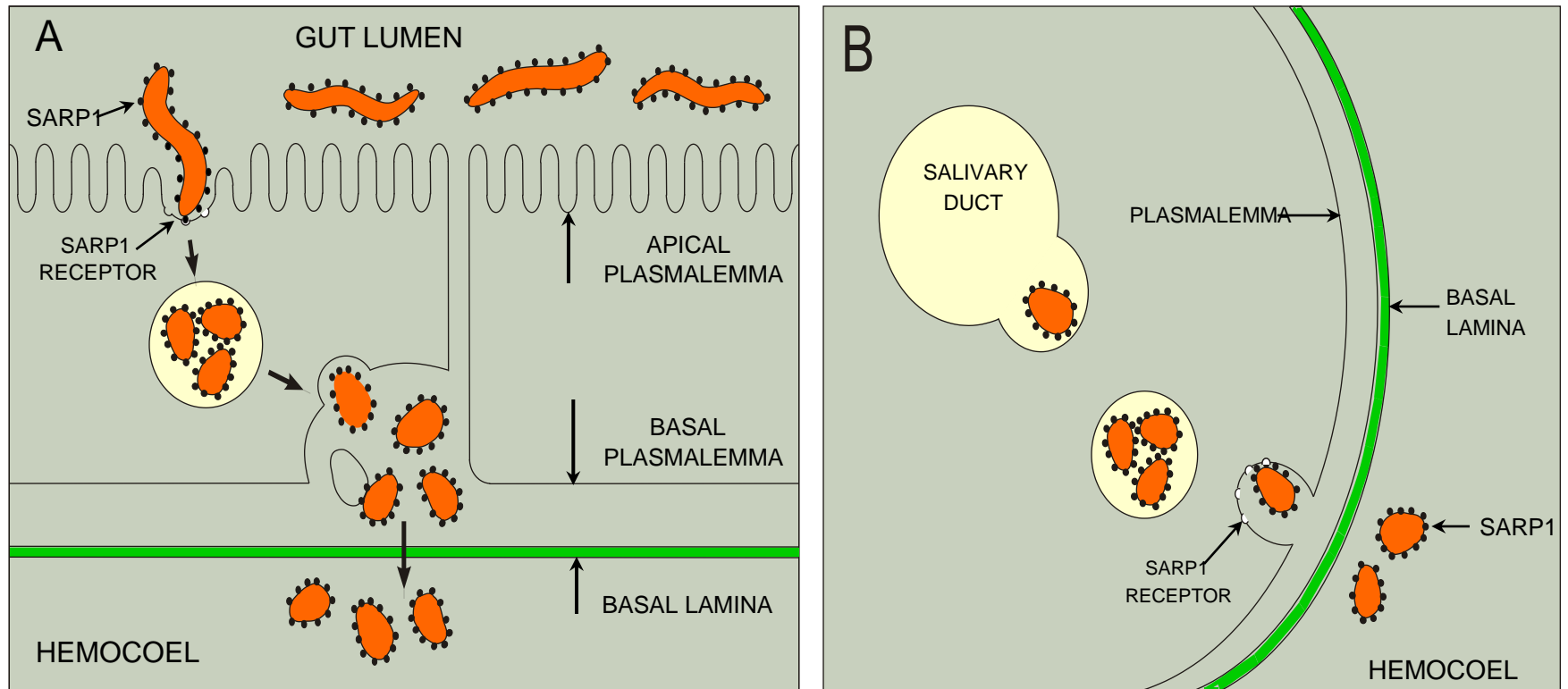


Diagram: A. Wayadande

# All phytoplasmas are phytopathogens...

Pathogen	Disease	Host	Vector(s)
<i>Candidatus</i> Phytoplasma mali	Apple proliferation	Apple	Several leafhoppers, planthoppers, psyllids
<i>Candidatus</i> Phytoplasma asteris	Aster yellows	Many vegetables, fruits, ornamentals	<i>Macrosteles</i> <i>quadrilineatus</i> (Aster leafhopper)
<i>Candidatus</i> Phytoplasma australiense	Grapevine yellows	Grapes	<i>Scaphoideus titanus</i>

...and all are transmitted by insects

# Aster yellows



**Aster yellows in carrot**



***Macrosteles quadrilineatus***



**Aster yellows in lettuce**



# Grapevine yellows



## *Scaphoideus titanus*



Cabernet-Sauvign  
Phytoplasma positi



Photo by Robert E. Davis  
August 25, 2010

# Apple proliferation phytoplasma



**Witches' broom**

*Fieberiella florii* is reported in parts of the United States and Canada.



**Fruits small,  
off-color**



# April 9, 2013

## New Apple Disease Found In Canada

The USDA Animal and Plant Health Inspection Service (APHIS) has been notified by the Canadian Food Inspection Agency (CFIA) that they have detected apple proliferation phytoplasma in an apple orchard near Kentville, Nova Scotia. The affected orchard has been placed under quarantine. *The affected trees are Pacific Gala and were imported into Canada from the U.S. in 2008.* This is the first APP detection in North America.

# Management of apple proliferation

- APP, or '*Ca. P. mali*', is a quarantine pest in both Canada and the U.S.
- Use clean propagation material
  - ▣ Budding and grafting
  - ▣ Trade of infected rootstock, scionwood, or budwood
- Use of resistant cultivars
- Insect control
- Cultivation practices
  
- **Note:** APP genome has been sequenced – approx 600 kb