

# New Chemistries for Pest Management

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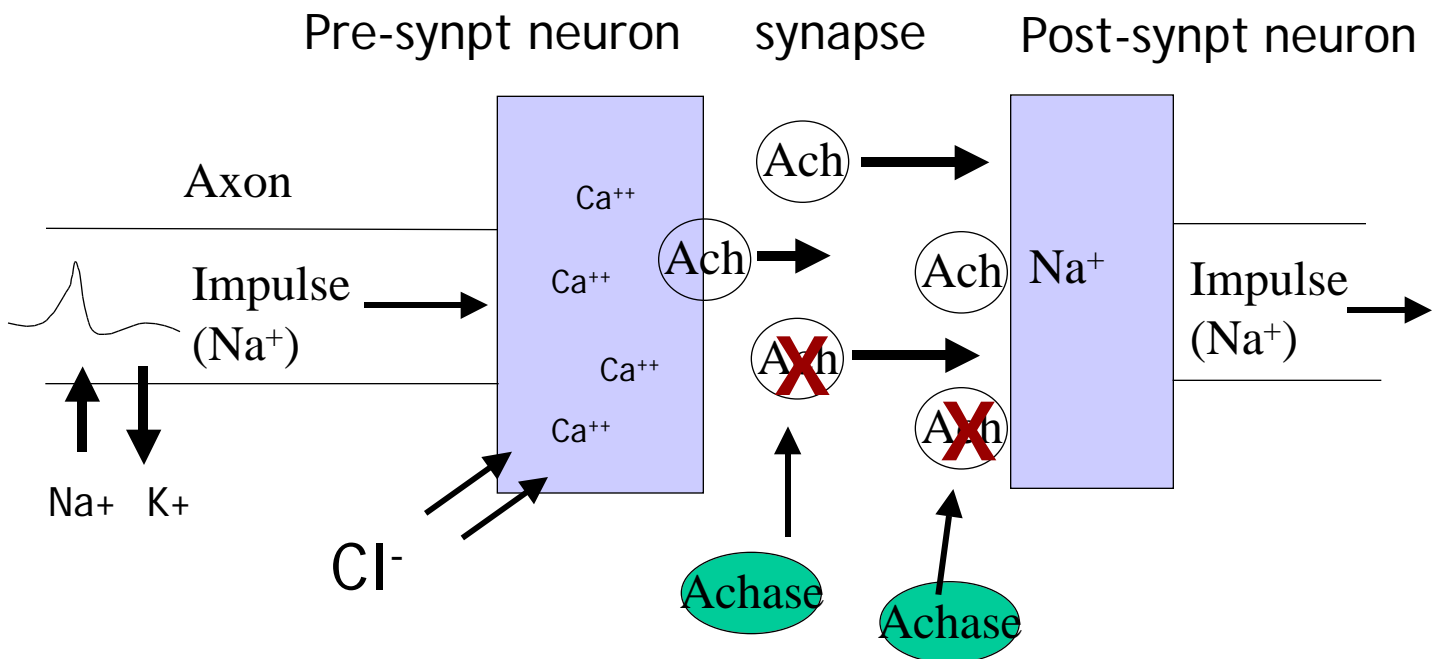
Tree Fruit Research and Extension Center



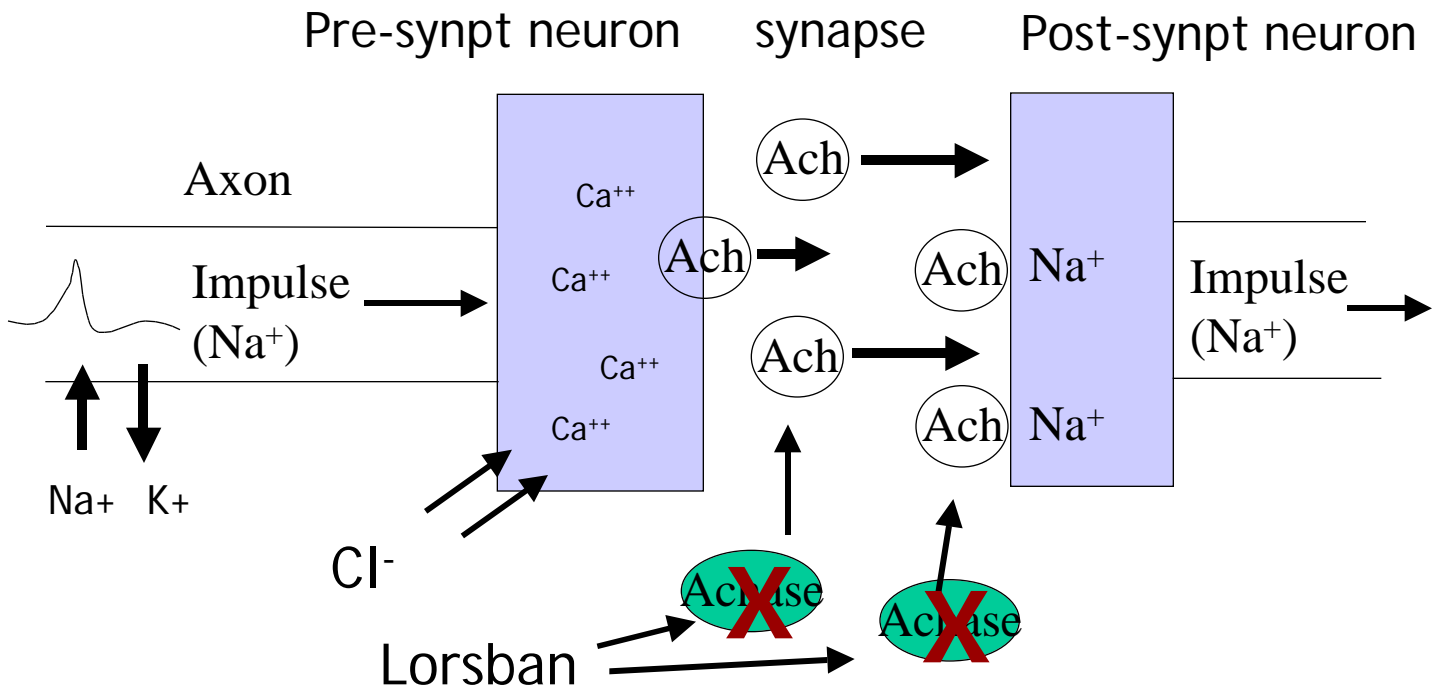
# Reality Check

- EPA has banned the use of Lorsban in the *post-bloom* on apple.
- Pre-bloom use of Lorsban still allowed.
- Historically 80-90% of Lorsban use has been in the pre-bloom period

# Normal Nerve Synapse



# Lorsban-MOA



- Acetyl cholinesterase inhibitor

# Lorsban-summer uses

- Leafroller
  - Long-time emergency product
  - Recently less effective
- Lacanobia fruitworm
  - Best product
- Codling Moth
  - Negative cross-resistance

# Detriments of Lorsban

- Neurotoxin
  - Broad-spectrum neuroactive OP
  - Worker safety issues
- Negative effects on natural enemies
  - WTLM parasitoid (*P. flavipes*)
  - Leafroller parasitoid complex (*C. florus*)
  - Aphid predators
    - Campylomma, deraeocoris

# Leafroller alternatives

- Bt- “old” product, effective and cheap
  - Success (spinosad)- v. good at Petal fall
  - Confirm, Intrepid- petal fall app. is best
  - Surround- effects behavior
  - Pyrethroids (Asana, Pounce)
  - Carbamates (Lannate)
  - Pheromones- MD and A&K
- } Disruptive to mite biocontrol

# Lacnobia alternatives

- Success
  - Best against young larvae, 14 d residual
- Thiodan
  - Most suitable “bail-out” product
- Confirm/Intrepid
  - Best against young larvae, 21 d residual
- Surround
  - Deters colonization of young larvae



# CM alternatives

- Guthion
    - Not free from regulatory concerns
  - Imidan
    - similar regulatory concerns as Guthion
  - Pheromones
    - Mating disruption and Attract & Kill
  - Horticultural oils
  - Esteem
  - Confirm/Intrepid
- } Suppression only,  
Use with mating disruption

# SJS Alternatives

- Delayed dormant oil
  - Very effective at controlling SJS all season
- Diazinon
  - Still under action of FQPA
  - Not highly active against SJS
- No new promising products

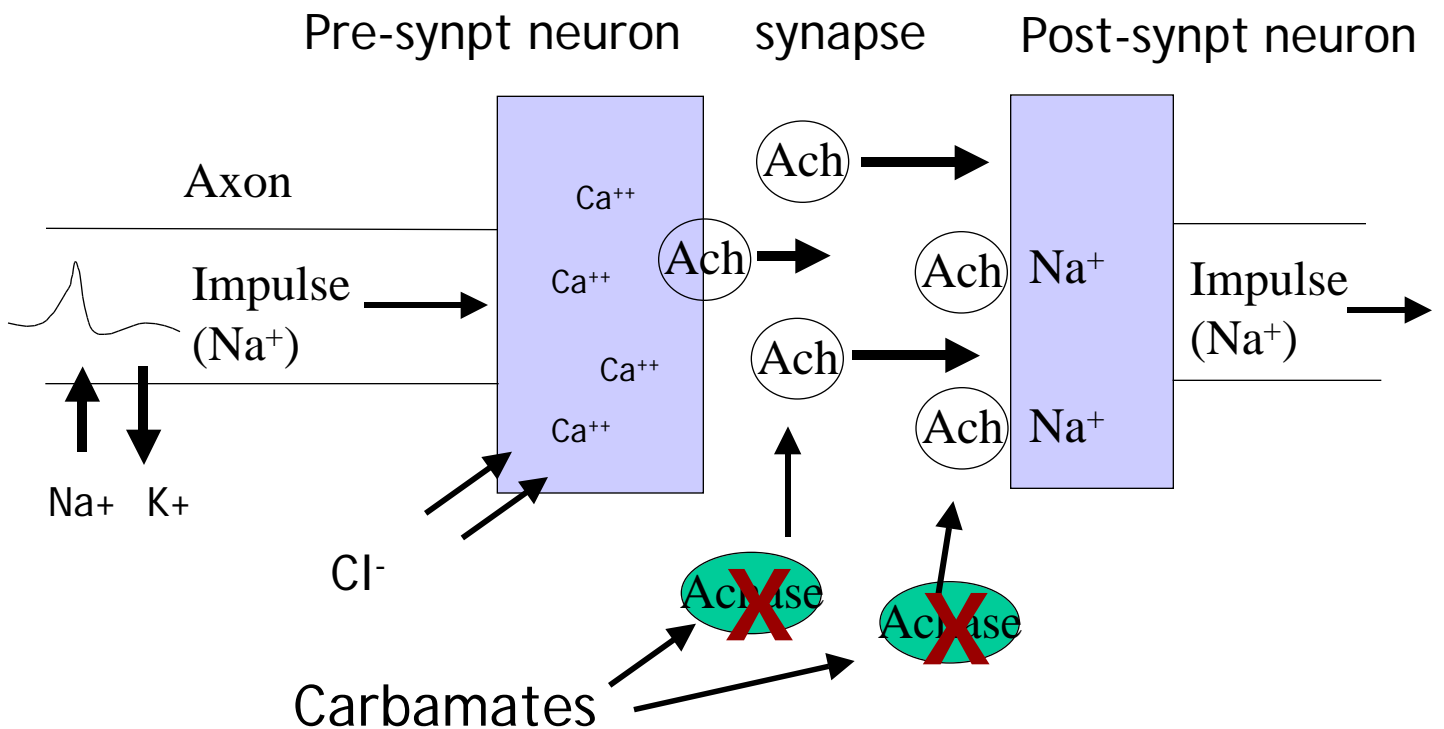
# WAA alternatives

- Diazinon
  - Still under action of FQPA
- Dimethoate
  - High human toxicity
  - Highly toxic to most natural enemies
- Horticultural oil
  - Suppresses colonies

# Organophosphates

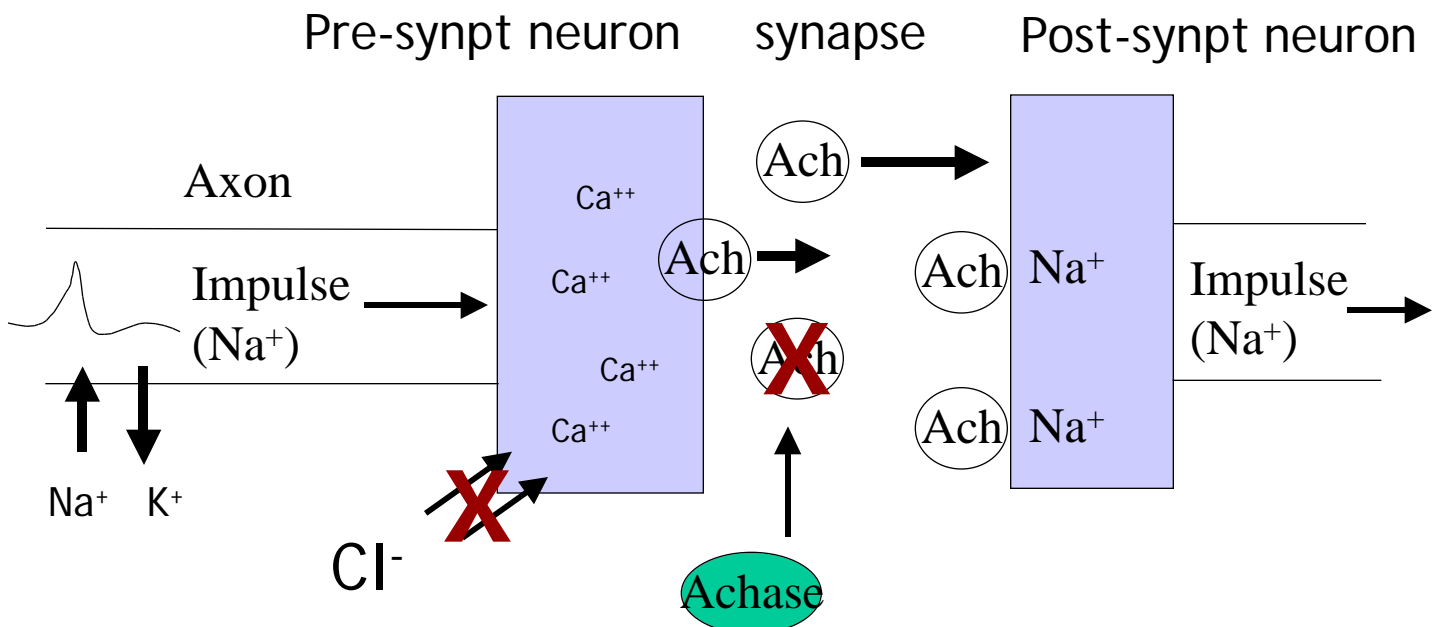
- Guthion, Imidan, Diazinon, Dimethoate
- MOA has been 1° target of FQPA thus far
  - Acetyl cholinesterase inhibitors
- Not free from regulatory actions
  - Common Modes of Action (aggregate exposure)
  - Worker Safety Standards (extended REI)
- CM, LR, Lacanobia resistant to Guthion

# Lannate (Carbamate)



- Acetyl cholinesterase inhibitor

# Asana/Pounce (Pyrethroids)

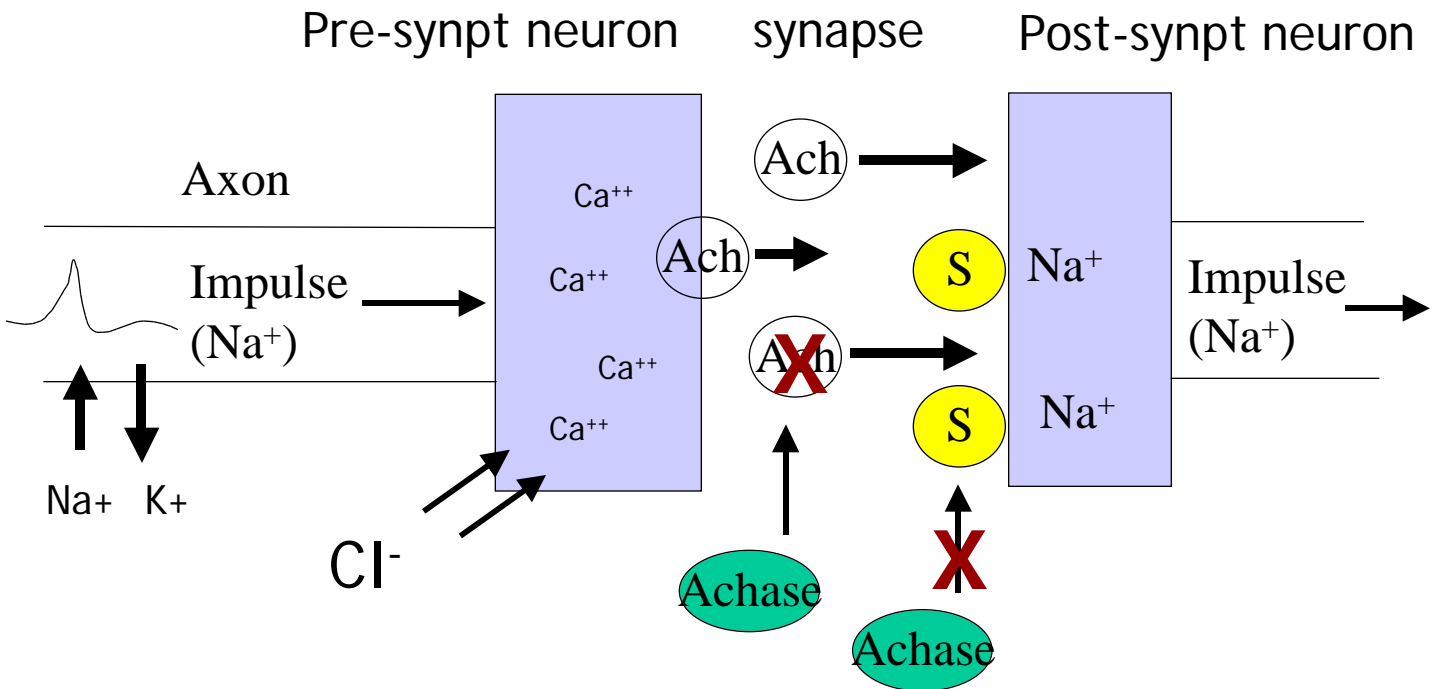


- Pyrethroids block the Cl channel
  - Excessive Ca<sup>++</sup> induced release of Ach

# Thiodan

- Similar MOA as pyrethroids
  - Blocks the chloride channel
  - No means of suppressing Ach release
- Chlorinated hydrocarbon, “old” chemistry at risk under FQPA
- Toxic to apple rust mites

# Success



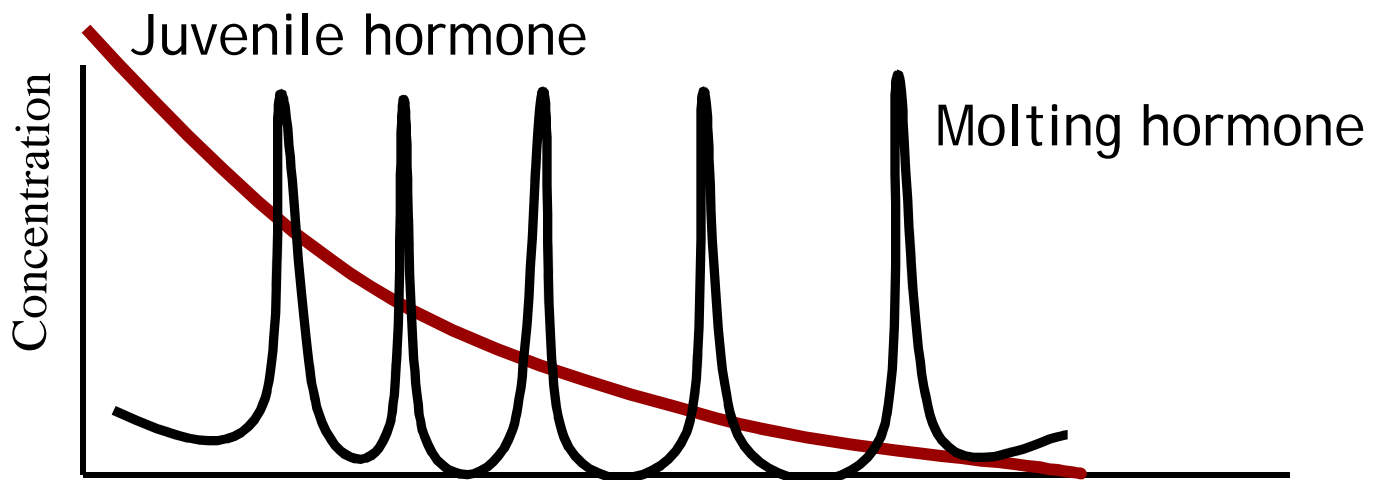
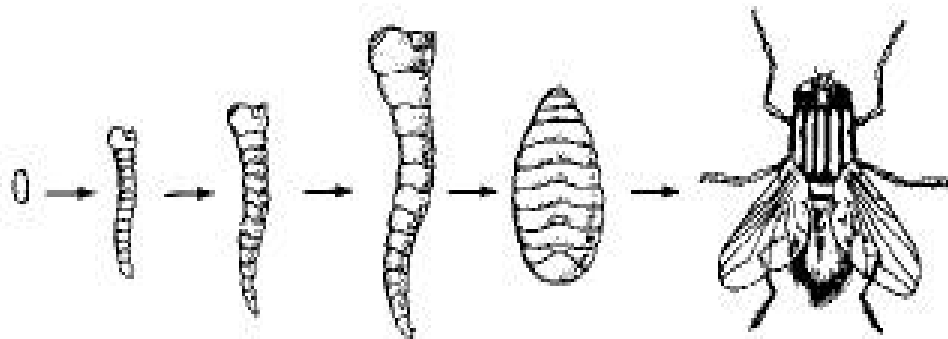
- Competes with acetylcholine on post-synaptic m/b
- Not removed by Achase



# Success

- Naturally derived fermentation product
- Stomach poison, must be ingested=  
moderately selective
  - Large compound that doesn't easily penetrate skin
- Relatively low mammalian toxicity
- Danger of resistance

# Insect Growth Regulators



# Insect Growth Regulators

- Very safe and selective (must be ingested)
- Juvenile Hormone Mimic
  - Esteem
    - Similar to Comply
    - Die as larval-pupal intermediary
- Molting Hormone
  - Confirm/Intrepid (Molt Accelerating Cmpds)
    - Premature, lethal molt
    - Intrepid more active than Confirm
- Neem products
  - New formulations appear to be more effective

# *B. thuringiensis*

- Effective and cheap
- Specific to lepidopteran
  - Alkaline gut
  - Highly selective
- Target young larvae
  - Actively feeding
  - 10 d residual
- Sublethal effect on normal phenology

# Surround (kaolin)

- Effects behavior
  - Colonization of young larvae
  - Oviposition of adults?
  - Some mortality
- Additive effect of multiple applications
- Moderately selective
  - Mites
  - Leafminer parasitoid

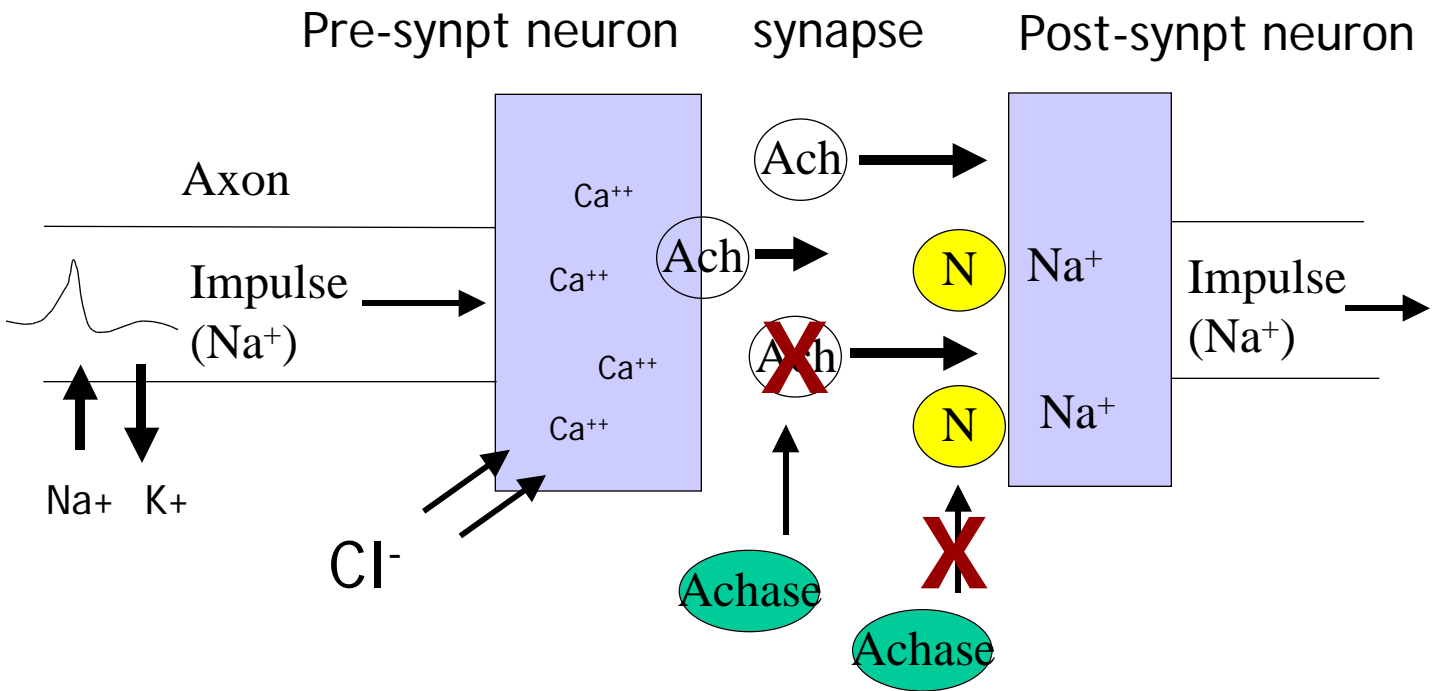
# Pheromones

- Highly selective
- Several options of MD
  - Not all tested in Washington
- New delivery techniques
  - Puffers, sprayable
- Attract and Kill
  - Limited experience
  - Issues remain with delivery system

# Horticultural oil

- High safety
- Highly selective
  - 1° effect on exposed eggs
- Multiple applications necessary
  - Concerns over plant health

# Future Hope



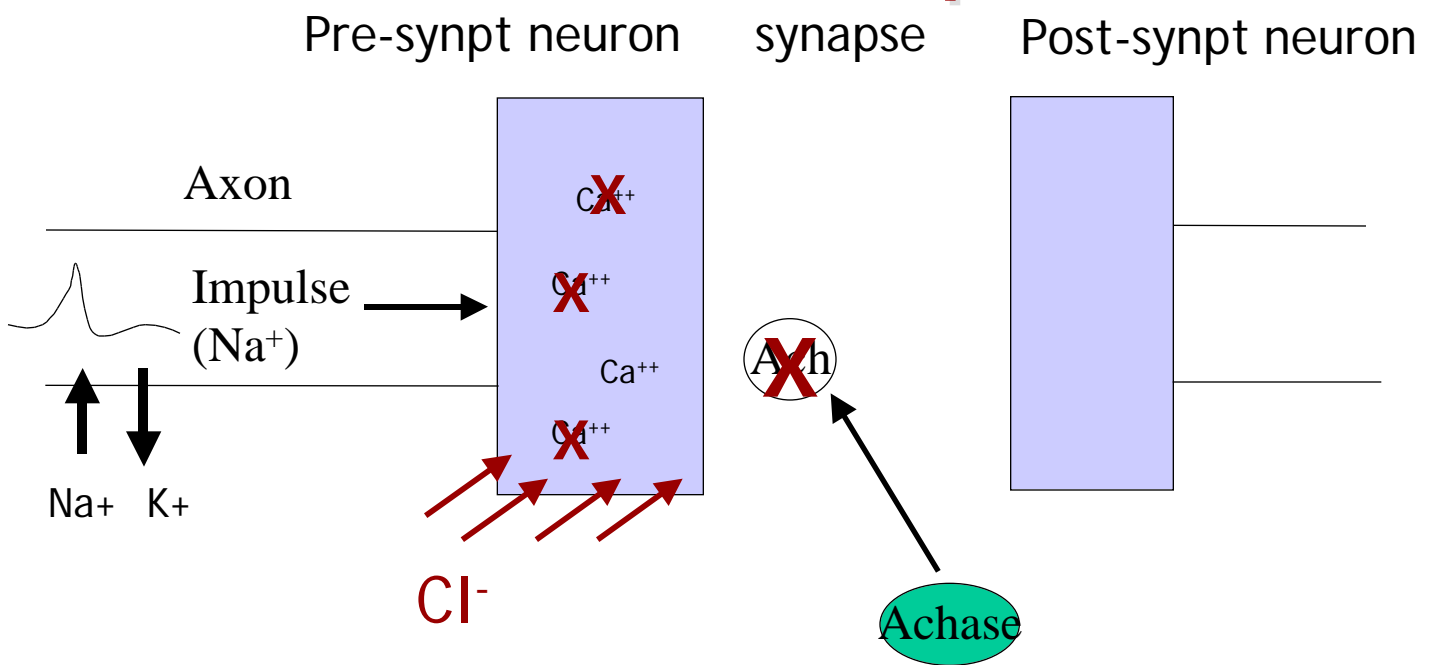
- Neonicitinoids
  - Compete with Ach on post-synpt m/b



# Future Hope

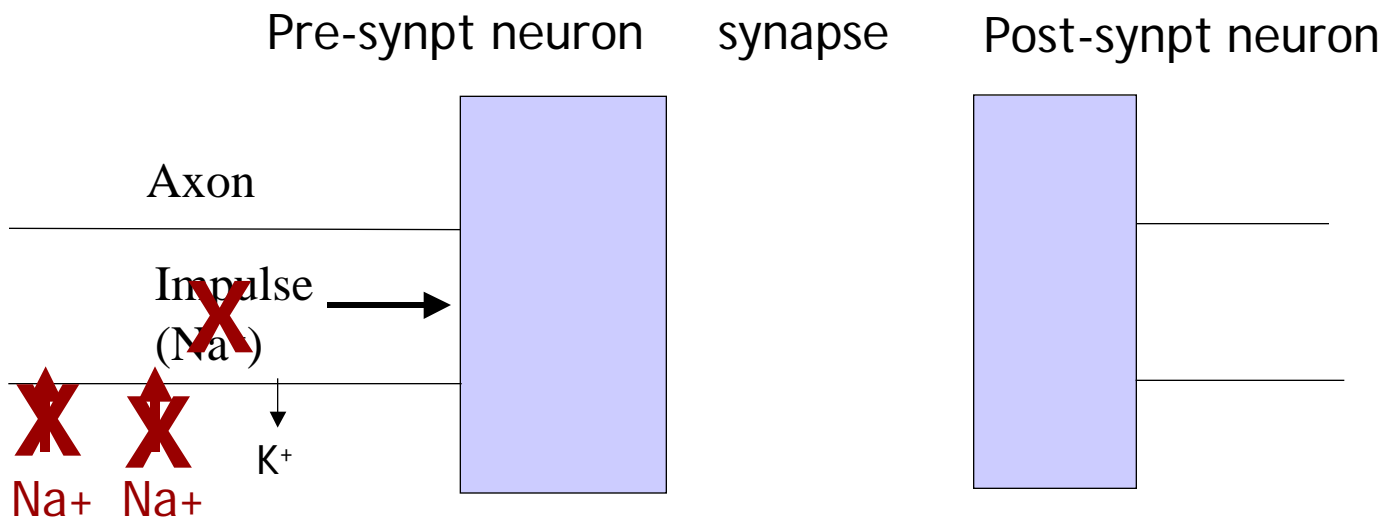
- Neonicitinoids
  - Provado-like, with broader spectrum of activity
  - **Actara, Platinum (thiamethoxam)**
    - Active against GMB, possible section 18
  - **Assail (acetamiprid), Calypso (thiacloprid)**
    - Lepidopteran activity
  - Safe OP Replacement, close to registration

# Future Hope



- Proclaim (emamectin benzoate)-
  - enhanced flow of Cl<sup>-</sup>, stopping release of Ach
  - Agrimek-like with lepidopteran activity

# Future Hope



- **Avaunt (indoxacarb)**
  - Sodium channel blocker
  - PLR and Lacanobia, but **NOT** OBLR

# Future Hope

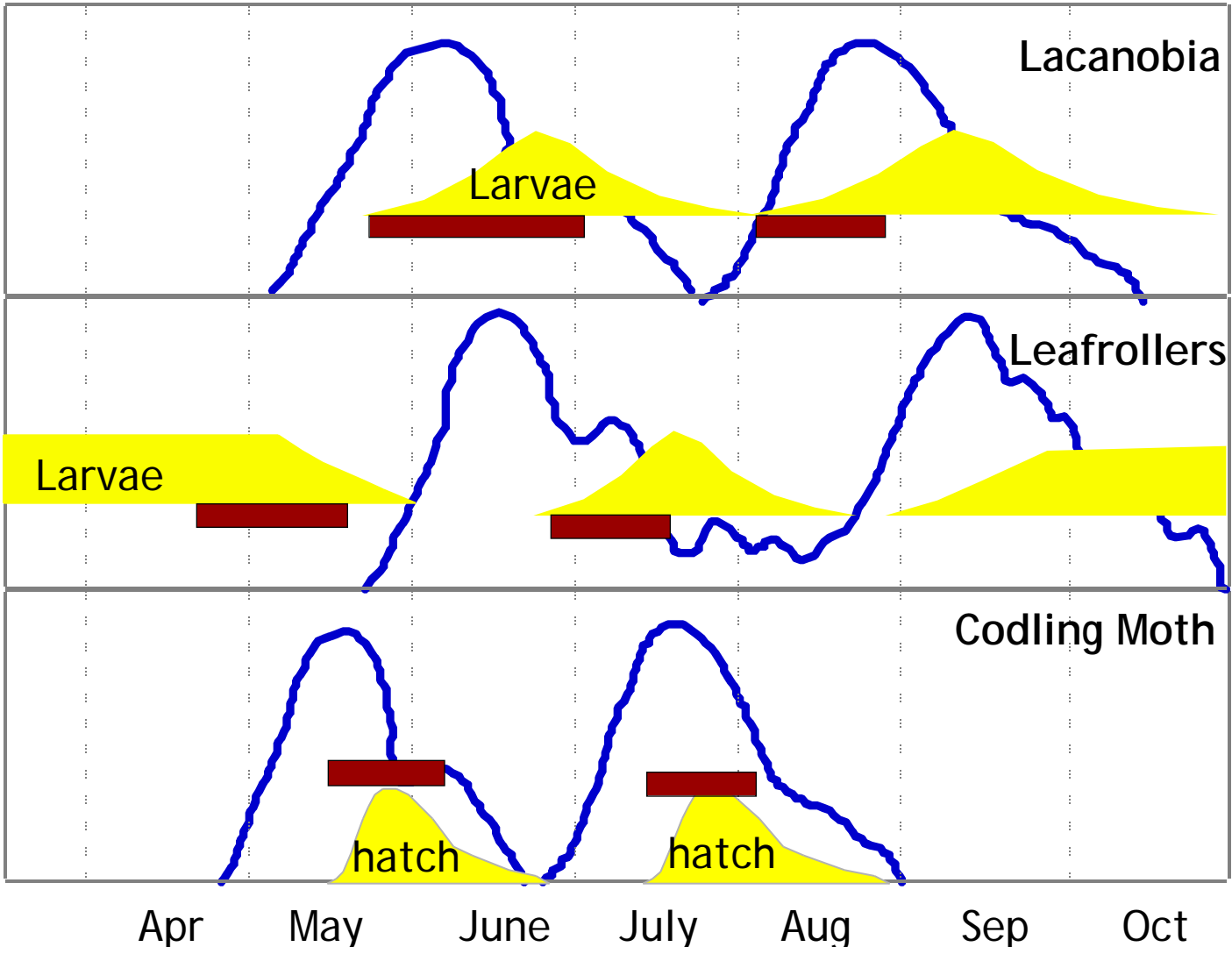
- Pirimor (pirimicarb)
- Fulfill (pymetrozine)
  - Aphicides
  - Prevent insects from inserting their stylus into the plant, paralyze food pump.
- Applaud (buprofezin)
  - Aphids, psylla, leafhopper
  - IGR
    - Chitinase inhibitor/chitin deposition (Dimilin-like)
  - IR4 list

# Future Hope

- Aphistar (triazamate)
  - Aphicide, esp WAA
  - Achase inhibitor
  - Somewhat selective to natural enemies
  - Registration possible in 2001

# Future Hope

- CM granulosis virus (Carpovirusine)
  - registered in US, effectively used in Europe
  - Specific to CM
    - Other species affected by specific granulosis viruses
  - Potential supplement to MD.



# Summary

- Replacements for broadspectrum insecticides being developed and getting registered
- “Softer” nerve poisons
  - Success, Neonicitinoids, Proclaim, Pirimor
- Insect growth regulators
  - Intrepid, Confirm, Esteem, Ecozin (neem), Applaud
- Behavior modifiers
  - Mating Disruption, Surround
- Miscellaneous
  - Oil, Bt, Virus