Drama Queens: *Exciting, Emotional and Unexpected*



Rebecca Masterman

Drama Queens was originally a UMN Bee Squad presentation. This version has been dramatically updated.

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Rebecca Masterman

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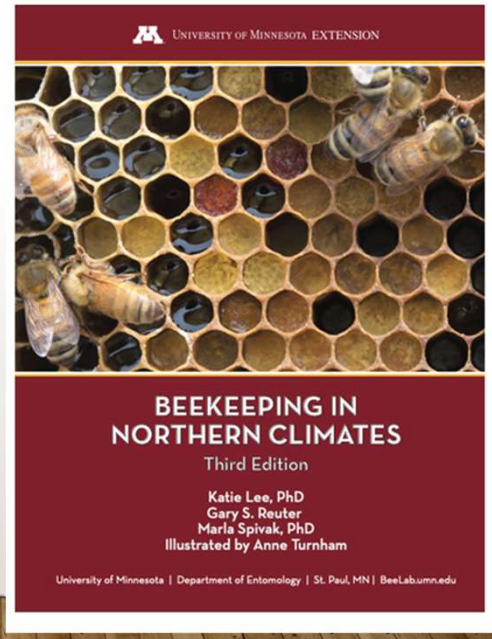
University of Minnesota Beekeeping Manual

https://beelab.umn.edu/manuals



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A honey bee queen is the difference between a box of bees and a colony of bees. *Unknown*



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Queen Drama- Excitement

- **Development**
- Orientation flight
- Mating
- Colony Control

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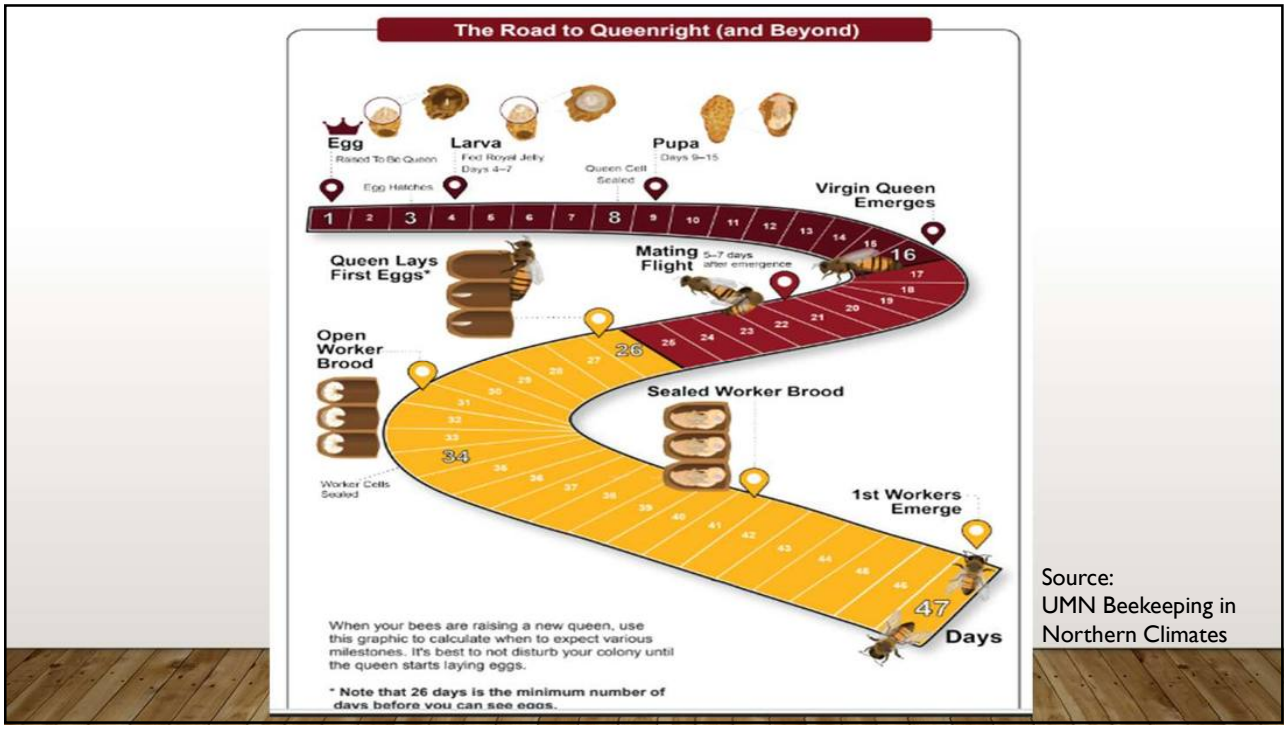

Source:
UMN Beekeeping in Northern Climates

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Queen Drama- Excitement

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QUEEN ORIENTATION FLIGHTS

- In a commercial beekeeping operation queen drift study, 7 of 160 (4.4%) queens drifted on their maiden flights, with none of them drifting after a successful orientation flight.
- Entrance orientation and distance (2 m or 5 m) of side by side nucs did not impact drifting.
- If you leave colonies alone during the requeening process, queens are quite capable.

Perez-Sato, J., Hughes, W., Couvillon, M. et al. (2008) Effects of hive spacing, entrance orientation, and worker activity on nest relocation by honey bee queens. Apidologie 39, 708–713. https://doi-org.ezp2.lib.umn.edu/10.1051/apido:2008056

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Queen Drama- Excitement

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Mating

- Queens mate with multiple drones; studies show high variability of mate number
- Can lay up to 2,000 eggs per day



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Queen sperm use-

- Lifetime fecundity of queens is at approximately 1,500,000 fertilized eggs
- Median of 2 sperm used to fertilize each egg
- Sperm use decreases with age
- Queens do not manipulate sperm use. Researchers predict that haploid eggs in diploid comb might be an 'honest' signal that the queen should be replaced (superseded).

Boris Baer, Jason Collins, Kristiina Maalaps, Susanne P. A. den Boer. Ecology and Evolution. Sperm use economy of honeybee (*Apis mellifera*) queens First published: 22 March 2016 https://doi.org/10.1002/ece3.2075

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Queen Drama- Excitement

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- **Colony Control**

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Queen Pheromonal Control

- Pheromone is dispersed throughout colony for a sense of being "queen right"
- Queen pheromone suppresses worker ovariole development & keeps workers from raising new queens
- "Retinue behavior" describes the grooming, feeding and antennating behaviors of worker bees towards the queen

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QUEEN DRAMA- EMOTIONAL





Finding the queen

Not finding the queen

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Should you look for the queen?

No! Eggs present are a great sign the colony is queen right.

Yes! Locate the queen if you caging or replacing her.

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HOW TO FIND THE QUEEN

- Don’t push the bees to the bottom box. Instead, separate brood nest hive boxes (place on overturned covers or stand).
- Move slowly.
- Remove one frame at a time, starting at one edge.
- Give yourself and the frames space. Move inspected frames into an empty box.
- Bring a friend to help you!

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QUEENS WILL USUALLY BE NEAR FRAMES WITH EMPTY CELLS AND EGGS

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LOOK ON THE SIDE OF THE BOX, BOTTOM BOARD, QUEEN EXCLUDER, AND INNER COVER!



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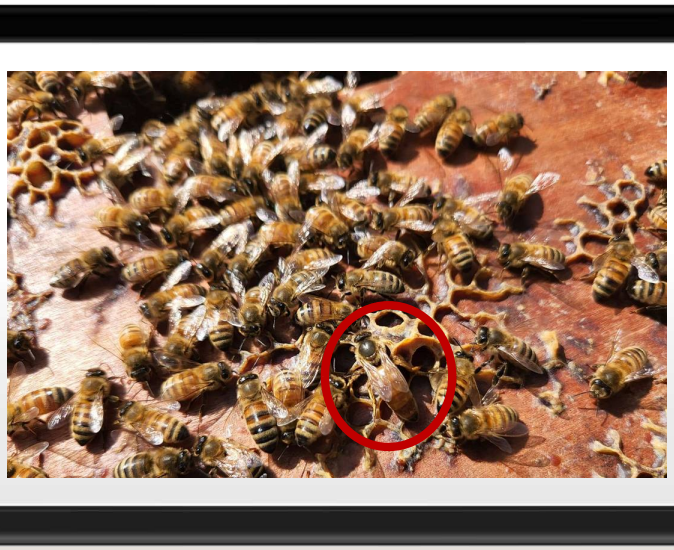

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Queen Drama- Unexpected

- **Being Queenless**
- Finding Queen Cells
- Laying Workers, Drone Layers, and New Queens

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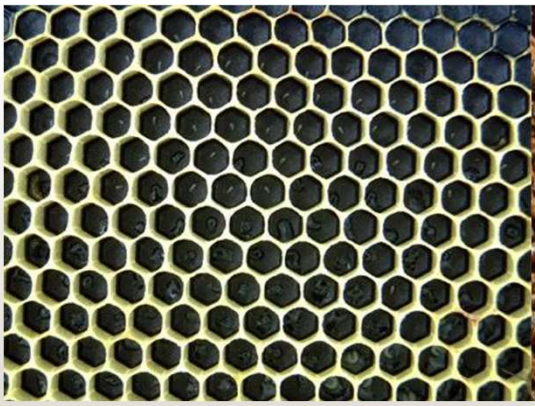
I can't find her! What do I do? Look for eggs!

If eggs seen, stop worrying
If no eggs, worry. And then look for queen cells.





Slide adapted from Marla Spivak's "Queen Issues 2018"

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ARE YOU SURE THE COLONY IS QUEENLESS?

Beekeepers often mistake colonies with virgin queens as queenless-

- Virgins are difficult to spot
- Queens may be on orientation or mating flights

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THE ART OF PATIENCE

After emergence, it takes **about 10 or more days** for a queen to mate and start laying.

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WHAT CAN DELAY LAYING QUEEN CONFIRMATION?

- Delayed orientation or mating flights (poor weather)
- Frequent colony checks can interrupt or harm the colony requeening process
- Need for multiple mating flights
- First eggs laid can be difficult for beekeepers to find
- Workers can cannibalize eggs in response to cold weather
- Need to see sealed worker pupae to ensure eggs are being fertilized

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WHEN TO INTERVENE

First - test for queenlessness. **DO NOT hesitate to use this test!**

Give colony a frame of eggs/ young larvae and watch for queen cells.

Mark the frame! Recheck in 4-7 days to see if you see new queen cells.

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Queen Drama- Unexpected

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- **Finding Queen Cells**
- Laying Workers, Drone Layers, and New Queens

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QUEEN REARING IMPULSES

Colonies may rear new queen bees under three impulses:

Swarming is usually a sign of hive congestion and in nature is the mechanism by which a colony reproduces (reproductive swarms).

Supersedure occurs when bees sense failing queen (depleted spermatheca, damaged, or diseased).

Emergency queen rearing occurs when the queen is suddenly removed or is killed.

From UMN's Beekeeping in Northern Climates

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Is it always easy to determine why a colony is raising queens?

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	Swarming	Supersedure	Emergency
Biological Basis for Colony Queen Rearing	Colony reproduction	Replacement due to perceived health of old queen	Replacement due to beekeeper accidentally killing queen or unplanned queen death
Time of Year	Most frequent in spring, early summer	Anytime there is brood	Anytime there is brood
Colony Population	Colony crowded, unless already swarmed	Colony likely not crowded	Colony may or may not be crowded
Queen Present or Not	Queen present, unless already swarmed	Queen may or may not be present, depending in part on the stage in the process	Queen *not* present
Eggs Present or Not	Eggs may be present before the colony swarms and possibly for a few days after swarming	Eggs may be present throughout the process	No eggs 3 days after queen's death
Brood Pattern*	Often a good brood pattern, except when the bees store nectar in the brood nest	May have a spotty brood pattern	Any type of brood pattern
Typical Location and Number of Queen Cells	Numerous queen cells typically on the bottoms of frames and edges of the brood nest	Queen cells found anywhere in brood nest. Usually fewer in number	Queen cells found anywhere in brood nest. Colony may raise a few or many cells

*See "How to Rate Honey Bee Brood Patterns" on page 131.

Table 5 in UMN Beekeeping in Northern Climates

Table 5: Typical characteristics of the three different types of queen cells. Use the table to help identify the reason a colony is raising queen cells. However, keep in mind that these are guidelines and not hard rules.

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Queen Cups vs Queen Cells

- Empty "play" cups are common and although they do not need management, data suggest that queen cup building increases prior to supersedure

- Cups with eggs/ larvae will probably become queen cells

- Think before destroying queen cells

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Spring: Swarms

Note: Don't destroy queen cells unless you see the queen, as the colony may have already swarmed.



Photo from UMN Beekeeping in Northern Climates

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Preventing Swarms

- Spring divides (splits) when the colony is ready – not a calendar event!
- Space for queen to lay
- Space for incoming resources (pollen/nectar)
- Watch for queen cells

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How to avoid spring crowding

- Anticipate space needs
- Make additional divides (1 colony to 2, 3, or even 4!)
- Add supers
- Brood break/ requeen
- Check out the Demaree method -

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Imminent Swarming

One option:

- Find the queen and move her to a new hive set up.

- Make one or more splits or nucs.
  - Grow to single deep colonies with naturally mated queens as replacement queens (if you need to requeen later in the season).
  - Winter single deeps (feed 2:1 syrup in the fall!)
  - Remember: tendency to swarm can be a heritable trait

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NOTE TO SELF:

Next year, do your divides earlier ☺

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Commonly Confused with Swarms

- Bearding
- Orientation flights
- Robbing
- Supersedure queen cells
- Emergency queen cells

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Supersedure

- When the workers raise a new queen to replace the old queen
- A normal process for older colonies to maintain their health long term
- Studies demonstrate pesticide exposure and high varroa mite and virus levels can increase supersedure levels.

Visit: https://www.sandhillbees.com/help-i-need-a-queen for more information.

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Emergency queen cells

Built when the queen dies suddenly (often a beekeeper initiated queen loss)

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Queen Drama- Unexpected

- Being Queenless
- Finding Queen Cells
- ***Laying Workers, Drone Layers, and New Queens- Oh my!***

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What do you see?



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Laying Workers

- If the colony cannot raise new queen, some worker ovarioles will develop and they will start laying haploid (unfertilized) eggs
- Unfertilized eggs develop into drones



Slide from University of Minnesota Bee Lab

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Laying Workers

- No queen in colony for multiple weeks
- No worker larvae
- Worker ovarioles released from suppression without queen presence
- Multiple eggs in cells; often on sides of cell
- Poor brood pattern
- Laying workers do produce some queen pheromone

(Tan, K., Yang, M., Wang, Z. *et al.* The pheromones of laying workers in two honeybee sister species: *Apis cerana* and *Apis mellifera* . *J Comp Physiol A* **198**, 319–323 (2012). https://doi-org.ezp3.lib.umn.edu/10.1007/s00359-012-0710-9)

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Laying Workers

Solutions:

- Requeening is thought to be lost cause from a beekeeping management perspective.
- It is possible to do it, but it uses valuable resources from other colonies and time.
- Many suggest shaking frames of bees from laying worker colonies in front of another colony/combining.

Make sure the laying worker colony will not be a source of disease and pests.

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Drone Layer Queens

- Queen present; out of viable sperm (depleted or dead)
- Normal egg pattern
- Drone brood in worker comb
- Workers don't always sense problem: queen pheromone is present

Solution: find queen, remove and replace.



Figure from UMN Beekeeping in Northern Climates

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NEW QUEENS

- Sometimes lay double eggs in cells or lay eggs in pollen cells
- Sometimes lay drone brood in worker cells if larger cells haven't been drawn

- **Solution: Give them some time.**



Photo from UMN Beekeeping in Northern Climates. Photo credit: Jessica Helgen.

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Reasons to Requeen

- Defensive colony
- Poor brood pattern
- If you want to incorporate different genetic lines or subspecies into your operation
- In spring if you want young queens
- When you identify emergency queen cells
- When there are no eggs AND no developing, capped, or emerged queen cells AND there isn't a virgin queen present (test for queenlessness first!)

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Don’t Requeen when:

- There are laying workers (she won’t be accepted)
- There might be a virgin present
- You just can’t find the queen, but you see a good brood pattern of eggs and larvae in diploid (worker) comb

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LONG LIVE THE QUEEN! (TIPS)

- Gentle management (gloveless!) to avoid squishing bees
- Keep a detailed journal including dates and brood seen (elp - eggs, larvae, pupae)
- If curious, buy a marked queen or mark your queen to keep track of supersedure
- Trust your bees

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Are queen management recommendations up to date?

QUEEN QUESTION

"Although queens have a 3–4 year adult lifespan, diminished longevity of queens (<1 year) is commonly and increasingly observed. As such, commercial beekeepers typically replace their queens every 1–2 years because of the critical importance of a vigorous queen to colony survival and productivity."

Amiri, Esmaeil, Micheline K. Strand, Olav Rueppell, and David R. Tarpy. 2017. **"Queen Quality and the Impact of Honey Bee Diseases on Queen Health: Potential for Interactions between Two Major Threats to Colony Health**" *Insects* 8, no. 2: 48. https://doi.org/10.3390/insects8020048

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Are current queen management recommendations up to date?

QUEEN QUESTION

"Once more, the conclusion from this very large sample of beekeepers from many countries is that a greater level of queen replacement is associated with less colony loss."

Gray, A., Adjlane, N., Arab, A., Ballis, A., Brusbardis, V., Bugeja Douglas, A., … Brodschneider, R. (2022). **Honey bee colony loss rates in 37 countries using the COLOSS survey for winter 2019–2020: the combined effects of operation size, migration and queen replacement.** *Journal of Apicultural Research*, *62*(2), 204–210. https://doi.org/10.1080/00218839.2022.2113329

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MAYBE YOU SHOULD KEEP A SPARE QUEEN?

- Raising a spare queen in a nuc or single deep is an excellent training tool
- Learn to locate a queen in a smaller nest (more success!)
- Practice picking up queens
- Observe the queen development process
- If you don't use the replacement queen, you can practice wintering a single deep colony.

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Beekeeping Today Podcast

Queen Series

https://www.beekeepingtodaypodcast.com/honey-bee-queen-biology-breeding-management/

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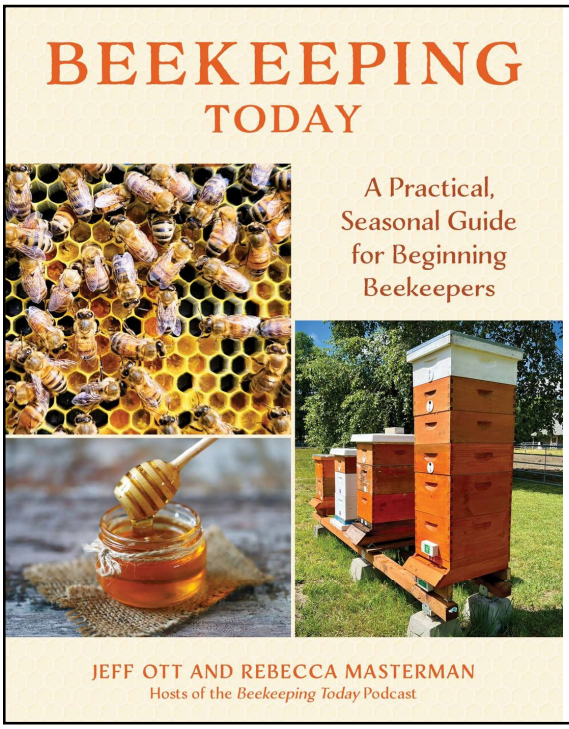

Thank you!

Becky@BeekeepingTodayPodcast.com

Book release date January 2027

https://www.globepequot.com/9781493091362/beekeeping-today/

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Chapman, A., McAfee, A., Tarpy, D.R. *et al.* Common viral infections inhibit egg laying in honey bee queens and are linked to premature supersedure. *Sci Rep* **14**, 17285 (2024). https://doi.org/10.1038/s41598-024-66286-5

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