

The Queen Bee

February 19, 2008

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Queen

- Lays 1000 to 1500 eggs per day
- 360 ovarioles – an egg producing tube in the ovary
- Stores 5-6 million sperm in both ovaries



Queen Rearing Situations

Supersedure Natural replacement of old queen by a daughter	Emergency 	Swarming 
Old or failing queens diseases	Queen loss	Seasonal Peak populations
Reduced pheromones	Found near center of frame	Found on bottom of frames

Making Eggs

- The Queen's abdomen is packed with a pair of ovaries, each consisting of about 180 thread-like ovariole tubes. A prospective egg, called an oocyte, moves through a tubule becoming larger at the expense of about 48 other cells called nurse cells that supply food to the developing egg.

Fertilized Eggs

- Eggs pass down oviduct into the vagina.
- Just before the queen deposits an egg in a cell, she can fertilize it with sperm stored in a special organ called the spermatheca.
- Eggs pass valvifold-one-way valve releasing sperm to be mixed with egg for fertilization (worker or queen).
- If valvifold is not opened, the egg passes into the vagina without being fertilized(drone)

Honey Bee Egg

- A honey bee egg is about one and a half millimeters long, cylindrical shaped, somewhat like a sausage, pearly white, and slightly bowed in the middle.

Egg position during development

- When the queen deposits an egg in a cell, it stands upright with one end glued to the floor.
- Larval development appears inside the egg with its head in the upper part away from the cell floor.
- While the lower end of the egg remains fixed to the cell floor, the upper part begins to move back and forth slowly, bending a little each time



Egg position during development (Continued)

- This bending motion of the upper part continues until the larva's head touches the cell floor, forming a tiny arch with only the head and tail touching the cell
- From this position, the larva gently falls over on one side, forming a "c" on the bottom of the cell

Brood Food Production

- Nurse bees digest pollen and nectar.
- Nutrients are processed by hypopharyngeal glands and mandibular glands in the head.

Brood Rearing

- Worker Larvae
- 140 feedings in 5 days
- Are fed Worker Jelly
- High sugar, low protein
- Queen Larvae
- 1600 feedings in 4 days
- Are fed Royal Jelly
- High protein, Low sugar
- Contains: Proteins, Fatty Acids, AA, Vit. B complex

Well developed mandibular glands

- Greatest in days 1-14 days old of worker bees
- Milky substance low sugar, high protein



Nurse bee food

- Well developed in hypopharyngeal gland—a pair of glands found in the worker bees head
- Greatest in bees 5-12 days old a clear fluid with high sugar, low protein

Queen Larvae Fed Royal Jelly

- Initially fed RJ w/ high sugar content
- this stimulates high rate of feeding
- this stimulates activity of the corpora allata—a pair of endocrine glands along side the esophagus which produces JH(juvenile hormone)
- JH stimulates the production of queen specific proteins thus the queen caste differentiation is determined.

Caste Determination by day #3

- JH level at 72 hours 10X higher in queen larvae
- JH regulates growth, development, and metamorphosis
- Induces queen specific proteins and enzymes resulting in 50 different morphological characteristics.

Time period (days 4 - 12) approximately 192 hours.

The Larvae and Pre-Pupa stage

Day 4 Larva c sized Time to graft larvae and place into cell cup and cell builder.	Day 5 Larva is now clearly visible and growing rapidly.	Day 6 Larva fills Cell -- Too old to graft.	Day 8-9 Cell sealed over	Day 9 - 12 Larvae begins spinning stage of development. Pre-Pupa stage
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The Pupa Stage

Time period (days 12 - 16) approximately 120 hours

Day 12	Day 13 - 15	Day 14	Day 16
The queen can now be clearly identified as bee like. Color is white Nymph but no wings developed.	The queen pupa begins to darken with the eyes developing color. The wings are the last to develop.	It is at this time that cells can be moved into nuc's. Nuc's must be ready.	Adult Virgin Queen emerges.

Once a virgin queen emerges from her cell, she will destroy other cells from which queens have not yet emerged. If there are other queens in the cell builder, they will find each other and fight until there is only one left.

The virgin queen will mate usually within 5 days of emerging and begin to lay eggs usually within 10 days after emerging. However, it may vary a bit due to weather conditions. Researchers point out that virgin queens mate more than once and usually between 12 to 20 mating occur. Thus you will need a very large drone population for your young virgin queens. A good strong healthy hive may have between 300 and 500 drones at peak periods.

Grafting-Transferring of larvae



- Fertilized egg uncommitted for 36 hours after hatching
- Best time to graft within the first 12-24 hours as a larvae

Young larvae

- Just before larvae hatch, cells are provisioned with brood food.
- Larvae rests on its side, on top of food.

Larval Stage:

- there are no legs, wings, eyes, antennae, stinger
- only very basic mouth parts for spinning a silky web (cocoon) before pupation (spinneret)

Larval Stage

Larvae- two layers

1) cuticle-colorless

2) white fat body

body divided into 1 head 13 segments

first three segments are (T1,T2,T3) thorax

A1-A10)= abdomen

there are no constrictions found between the head, thorax and abdomen

Respiratory System

- 10 pairs of spiracles (T2-A8)
each spiracle is permanently open to the central lateral tubes that run the entire length of the body.

Avoid Drowning Larvae

- Ensure that the “upside” of the larvae remains “up”
- Bottom spiracles remain plugged
- Do not submerge larva in royal jelly

Pre-Pupa

- Larvae continues to eat within sealed cell.
- Stretches out and enters pre-pupal stage.

Pupa

- Massive internal and external changes taking place.
- Molts a sixth and final time.
- Becomes an imago (adult) bee.



Drone Layer

- If a queen lays drone eggs in a worker cell when she becomes infertile, she is called a drone layer
- Producing a small brood nest with a scattered brood and drone brood in worker cells



Laying Worker

- If a worker bee lays eggs she is called a laying worker.
- The classic symptom of a laying worker is multiple eggs in the brood cell
- The nurse bees will tolerate multiple larvae in a cell for about three days, then the nurse bees consume the extra eggs or larvae

Pheromones

- The inhibition of worker ovarian development is from pheromones produced in the brood
- Whereas queen pheromones inhibit the rearing of other queens (i.e. in swarming due to congestion in the hive)

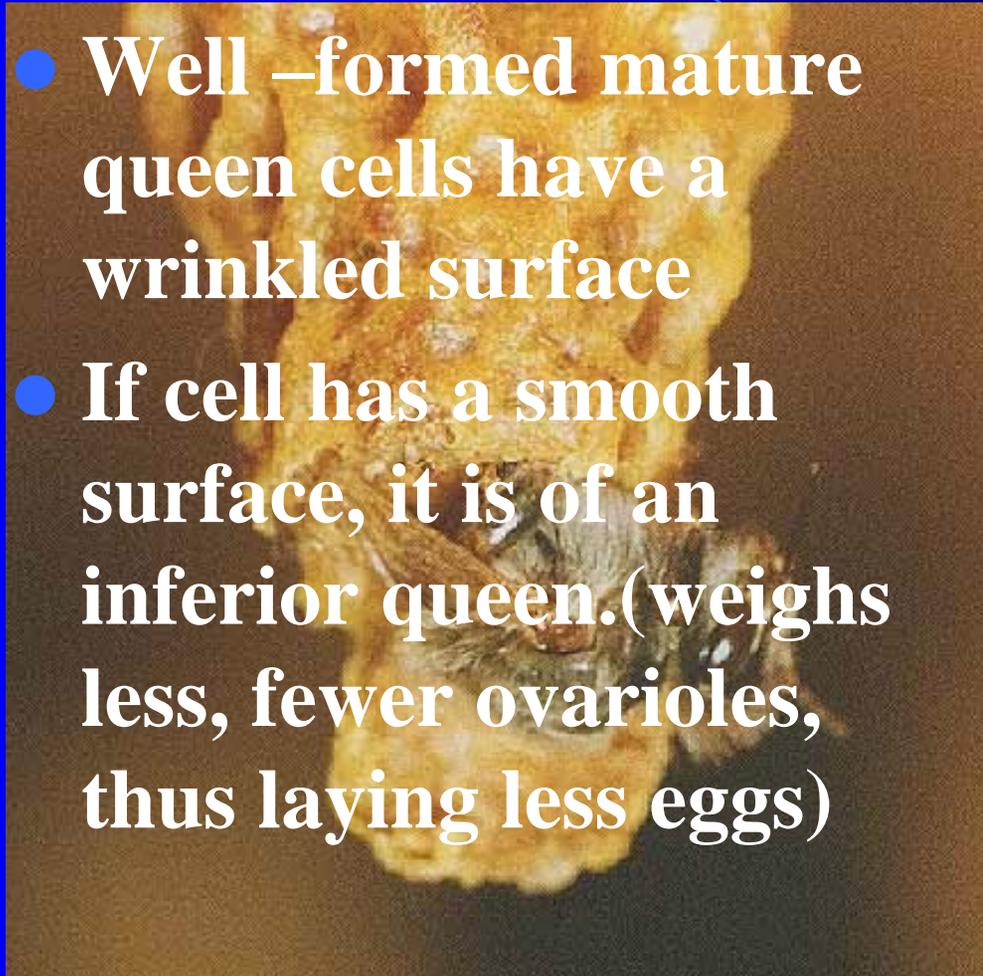
Queen cups



- The first stage in the construction of a queen cell.
- The first cups appear in colonies at the same time as spring pollen is available.
- Number of cups increases through the season actually indicating a strong, healthy colony

Queen cells

- Well –formed mature queen cells have a wrinkled surface
- If cell has a smooth surface, it is of an inferior queen.(weighs less, fewer ovarioles, thus laying less eggs)



Post-Emergent Queen

- Abdomen shrinks as queen discards waste.
- Feeds directly on honey or is fed by workers.

Queen piping

- Queen vibrates her wing muscles while pressing her thorax onto the comb.
- “tooting” sound lasts one second followed by quarter-second pulses followed by quarter-second intervals.
- “Quacking” sound heard by mature queens ready to emerge from their cells

Virgin queen

- First act is to kill other queens.
- Destroys other queen cells.
- Workers tear down unsealed cells.

Virgin Queens

- More active than mated queens.
- Often fly from comb.
- Runny
- Hide under masses of workers.

Flight of Virgin Queens

- 3 to 5 days after emergence, queen makes several orientation flights.
- Takes nuptial flight on the fifth to fourteenth day after emergence.

Queen lays eggs



- 2 to 5 days after mating the queen starts to lay eggs.
- Queen inspects the cell.
- Queen measures width of cell with forelegs) determining whether to fertilize the egg or not.
- Queen places small end of egg on the bottom of the cell.
- Laying pattern may be irregular for a few days.

Factors affecting Queen egg laying

- The number of adult bees in a colony
- Number of eggs must equal number of bees to keep them warm.
- Amount of pollen coming in from the field.
- # of eggs she can produce varies with the # of ovarioles she has in both ovaries.
- # of ovarioles predicated upon amount and quality of food she received in larval stage.

Unsuccessful Mating

- Virgin queens confined for 3 weeks will start to lay unfertilized eggs (drones).
- Virgin queens that do not mate within two weeks have limited capacity to store sperm (get a reduction in the queens life).

End Result – Good Laying Queen



Can You Find the Virgin Queen?

