

Parental Stress Influences How Bees Enter Winter

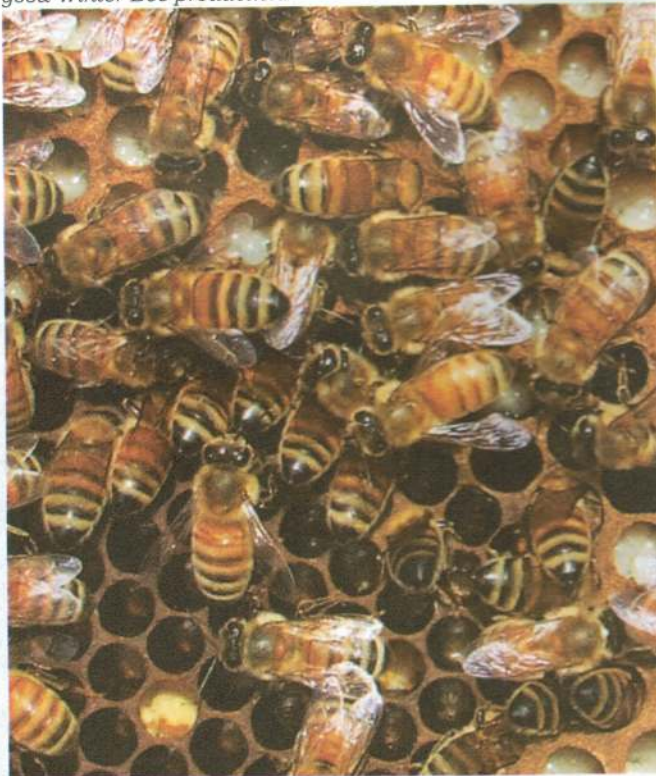
Larry Connor

Grandma B, who helped Grandpa B run a coal-heated greenhouse and raised four children during the Great Depression and World War II, when asked how she did it, shrugged her shoulders and replied, "We didn't know as much." Now human couples spend a great deal of time putting energy into their kids' futures. Grandma B would say too much effort. In the past few months I have heard or read about parents who want to go with their adult children to their first post-college job interviews, about a new book that encourages boys to be boys – roughhouse, run, jump and yell, and about chickens that get stress from their parents. Grandma B may not have understood, but there is a link here for bees and beekeepers.

"Parental" Nutrition

Most beekeepers learn about the differences between Summer Bees and Winter Bees. Summer bees live about six weeks after emerging from the pupal cell. They rapidly pass through their predictable hive assignments, working as nurse bees, house bees and foragers and then dying. But in the Northern Hemisphere, at about this time of year in the middle latitudes, the bees start to produce Winter Bees. These are the bees that will live six months

The tips of their abdomens out of the cell, these nurse bees are busy feeding larvae. The nutrition of the nurse bees is key to good Winter Bee production.



or longer, and are part of the cadre of bees that forms the Winter cluster. Winter Bees must have the ability to survive the Winter and build the colony in the late Winter and early Spring before the first of the Summer Bees are produced. They must be healthy and well fed. The honey bee's genetic strategy for colony survival rests in these bees, not the residual Summer bees that soon will die.

If you read my column last month, I suggested you read about the Australian work on *Fat Bees and Skinny Bees*. If you did you already know what Grandma B did: offspring that are well fed and well cared for will be more useful, indeed, more successful, than the ones that are poorly fed. The Fat bees are those that are fed the full component of all aspects of nutrition, especially ten essential amino acids, lipids, steroids, vitamins and minerals. These materials must come from hive resources and *the bees that raise these bees* – the nurse bees that produce the Winter Bees, along with the entire colony that supports the nurse bees. This "parental" effect is huge in beekeeping, and must be learned by every beekeeper to be successful over the long haul.

So, if your colonies' nurse bees start making their Winter Bees in early August this year, how well were the nurse bees reared? What were the conditions in the hive at the time? They were probably produced in July, so their care and feeding is now important to us. How many beekeepers worry about the bees produced mid Summer, when the nectar flow is on or about to end? So, how was your beekeeping environment *last month*? Did the nectar flow arrive? Or did things dry up and were the *Varroa* mites sucking on the blood of your bees at a heavy rate? Maybe you bought or raised a bunch of bad queens and your nucleus increase colonies had a stressful start with late egg laying and slow colony buildup?

Obviously it is easy to ask these kinds of questions, and you can become completely neurotic worrying about what is going on in the hive. And in most years, and in most locations, the bees will do just fine. But if you are in an area of single crop (monoculture) production, or if you have been experiencing high *Varroa* levels, or if you have had a poor year for nectar and pollen production, you should be concerned about your Winter Bee production and the nurse bees that produced them!

Let me say this another way – the success of your bees NEXT Winter and NEXT Spring depends on the proper nutrition and a high quality hive environment these past few weeks. If the bees in your hive have had a diverse supply of pollens – dozens or more pollen sources producing pollen the bees collected – and the nectar flow provided plenty of surplus honey, then the bees may be off to a good start for 2008.

But if your bees have been sitting on the edge of a corn field, and the bees have "mostly" collected pollen from

just one plant, then things may not be so fantastic. The average protein content of corn pollen is 14-15% (most grass pollens have a low protein level; pine pollen runs 7-8% protein), but in many areas corn is the primary pollen the bees are able to find in late July, and it goes against the natural instinct of bees to have one primary pollen source for nutrition. Given a choice, studies have shown that most colonies will collect pollen from 20 or more plants at the same time. This is probably an effort to get a balance of essential and non-essential amino acids for proper brood growth. Like Grandma B said, eat a little bit of everything, and don't fill up on just one thing.

Where do we have areas of monoculture? Quite frankly, most agricultural land is focused on one or two primary crops. The focus on alcohol production from corn and diesel fuel substitutes from soybeans is rapidly changing agriculture in the United States. So watch out! If you rent bees for cucumber or pumpkin pollination (26% protein in the pollen but not much of it), my guess is that the bees come back to you in very poor shape. The exception, and it is quite a big exception, is when there is a clover, buckwheat, or "weed" field nearby that the bees are able to visit. I've driven through large sections of the country these past few years, and there are few places I can name where there is a huge diversity of Summer flowers. One of the best was downtown Detroit, where houses have been torn down and fantastic wildflowers grow in their place.

What can you do if your bees are not healthy? Bees that live under the constant feeding demands of a parasite like *Varroa* are giving up part of their nutritional and probably biochemical nature to feed the beasties. If you had a parasite the size of a flattened orange feeding on your child, you would freak out. And if you walked around all week and tried to work normally with a Frisbee-sized beastie feeding on your back, one you could not pull out because it had mouthparts that went deep into your body, I bet you are not having one of your best days.

"Parental" Stress

Recently I stumbled over an article in *The Economist* (Epigenetics, "Serenity and the Farm," April 21, 2007) that explained how chickens get stress from their parents. When both junglefowl (wild chickens) and domesticated leghorn chickens were raised in either a stress-free or stressful environments (the stress was created by putting birds into a night/day pattern that changed constantly), the stressed domestic chickens acted quite differently when they were expected to follow a maze to food. What is significant for beekeepers is the fact that the *offspring of the stressed chickens* acted the same way, even when the offspring were raised in a calm environment. "Those (chickens) raised in an unpredictable environment had a worse spatial memory than their calmer counterparts, and, weirdly, that effect was repeated in their offspring, even though those chicks had grown up contented." The researchers looked at the level of corticosterone, a stress hormone in the yolk and whites of the stressed hen's eggs, but there was no difference than the unstressed hens. The authors suggest that maybe changes in patterns in the genes of the stressed hens were passed on their chicks.

Grandma B would have commented that some families she knew were just like that. The parents were always stressed-out over something, and the kids were always



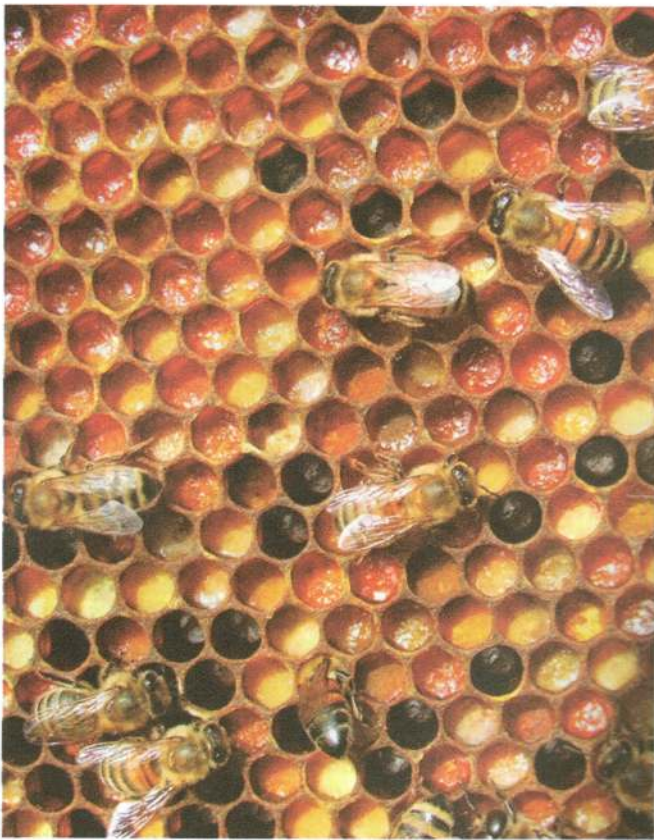
Cucumber flowers are very attractive to bees because of the relatively high sugar level in the nectar, and crops like pumpkins have a relatively high protein level in the pollen. The problem, for large acreages of vine crops like this is simple. There are simply not enough plants and thus flowers per acre to support the number of bees needed to pollinate the crop. Many beekeepers rent bees on cucumbers and pumpkins only to learn that they will be weak and die over Winter.

getting into trouble, and were "just not right." Now, it is a big leap to go from chickens to children, but what if stressed bee colonies passed on stress-related behaviors to *their* offspring? I like to think of the genetic nature of any animal is like having thousands of switches that control everything. Each gene's switch may be on, or off or partway on. So nurse bees, when they feed the larvae royal jelly secreted in their glands, may contribute chemical signals that turn on, or off, certain genes when they feed the Winter Bees, Well, it's something to think about Grandma B would say.

Last year I focused on this, and came up with a possible method to use to increase nutrition, decrease mite feeding, and maybe even produce a low-stress colony. The answer is to make up summer increase colonies – two- to five-frame nucleus colonies – that are allowed to build up into full sized colonies over the Summer, or are overwintered as nucs. A lot of this ended in up in the book, *Increase Essentials**. Here are some reasons you should consider Summer nucleus production in your apiary, even if you only have one or just a few colonies:

1. *Young, locally produced queen* – In the summertime you can raise your own queen, or get one from a local producer. She may be in several forms:

A. Swarm cell – As you work your colonies and find a swarm cell, remove the entire frame with the cell (if there is more than one cell, leave them all on the frame). Make sure the frame does not have the Mother queen on it. Move this frame to a nucleus colony or a 10-frame box with a follower board (a dummy frame to reduce the volume of nest the bees must guard). Add a frame of pollen



Bees on pollen: The diversity of colors reflect a wonderful array of essential amino acids bees need to produce new bees. By August, these include the Winter Bees. If a single color of pollen is found, it may be from just one plant source, and may lack enough of a particular amino acid bees need to thrive.

and honey, plus the bees that are on it. Add extra drawn combs (if you have them).

B. Purchase a ripe queen cell – If you have a local beekeeper who produces queens and queen cells, arrange to pick up ready-to-emerge queen cells. Carry them in a padded container and use up the same day. If they are ready to emerge, one virgin – the first one to emerge – will destroy the rest. From a strong colony, remove one or two frames of brood and bees, a food frame, and install them into a nucleus box as described above. If you want to keep the new colony (-ies) in the same apiary try this, from G.M. Doolittle's book, *A Year's Work in an Out-Apiary**: Gently shake or brush all the bees off one or more frames of brood. Replace frames of drawn comb or foundation into the hive to prevent the bees from building burr comb. Put a queen excluder over the hive, and put an empty hive shell over the excluder. Close up the hive. In a few hours the nurse bees will have crawled through the queen excluder and covered the brood. Since they are young and have never flown, they may be located in the same apiary without fear of drifting. Keep the entrance of the hive small to reduce robbing from other colonies. Once in position, a queen cell or queen may be added.

Queen cells should be handled only at the base, and gently pushed into the top of one of the brood frames so the tip of the cell points downward. Or push two frames together with the queen cell in between. This works very well if the queen larva was grafted into a plastic cell cup, since this gives you a solid base and is less likely to be damaged. If the queen cell was produced in a clear cell

cup, look for surplus royal jelly in the base of the cup. If there is no surplus jelly, I strongly recommend you not purchase or use the queen cell, since it shows that the queen larva was not well fed.

C. Mated Queen – A queen from a nearby mating nucleus may be added to your increase colony using a push-in cage. Since she has been laying, her pheromone production should be normal, and a locally produced queen has huge advantages over a mated queen shipped to you from a queen bank from a producer miles, or states, away.

2. Find a diverse floral location – Move the nucleus colony to an out apiary location surrounded by a diverse supply of Summer and Fall flowers. You might find this along parks, rivers and streams, utility right-of-ways, etc. Many suburban locations are ideal places to produce queens and make increase colonies, since there are many gardens, parks, and floral plantings in the flight area of the colonies. During late July and August my suburban city location may have more floral diversity than Mom's farm just nine miles away.

3. A break in brood cycle – Many beekeepers have discovered that a break in the brood cycle has a significant impact on the development of huge *Varroa* mite populations. This happens when you make up a nucleus with a queen cell. There will be a period of several weeks where there is no new ready-to-seal brood for the *Varroa* mite to enter, and the worker bees will be better able to groom each other to remove the mites. When the mites are not able to enter brood cells, their reproduction rate stops. That's a good thing in mid Summer. (This is also an ideal time to treat this with any of the treatments that require no brood – powdered sugar is a good choice, too.)

Several beekeepers have looked at the smaller colonies and concluded that they do a better job of keeping mite levels low. Perhaps there are more resources for bee-to-bee grooming than in a larger colony. Perhaps some hygienic "switch" is on in small colonies and off or suppressed by something else in large ones. Who knows!

4. Local stocks – There are a growing number of us who want to produce queens locally. We want to produce queens from stock that has survived Winters and Summers and *Varroa* mites in the area where we keep our bees. We are less interested in getting queens from distant parts of the country, and we really don't want queens with genes from Australia or Africa. Yes, we know we cannot control mating very much, but if we use local stocks for several years, we should get our desirable local genes out into the mating environment.

5. Well-fed, low-stress nurse bees and Winter Bees – If we reduce *Varroa* mites, provide colonies with a diverse array of flowers to visit, and provide a break in the brood cycle, we may produce increase colonies that are better fed and less stressed than we might have had otherwise. This should put them in great shape as they enter Winter, and will then explode with rapid growth in the Spring of 2008. **BC**

*Wicwas Press, 1620 Miller Road, Kalamazoo, MI 49001, ebeebooks@aol.com