APiS UK

September 2009

Editorial

And another season ends in the Northern hemisphere—and what a season it was. Hundreds if not thousands of new beekeepers are taking up the challenge of providing increased pollination for our crops—and that's really what it's all about— but on the other side of the coin, it was also a year when almost a fifth of Britain's honey bee colonies died last winter.

An average of 19 per cent perished across the country - and a third were lost in the North. Eastern England had the best levels with just 13 per cent dying. (In the USA it was 35%). Bees are worth around £200million to the economy a year as they pollinate crops - but they have been hit by disease and changes in farming. Can these losses be sustained? BBKA President Tom Lovett thinks not and said: "The losses cannot continue if we are to secure food supplies." And this is the point isn't it.

So what is to be done about all of this? Initiatives such as that taken by **British Waterways**; Take a look at www.waterscape.com/features-and-articles/news/2525/british-waterways-pilots-community-beekeeping for an example of how this situation can be turned around. Their assistance can be applied to many other areas—railway lines, motorway borders and so on and of course more beekeepers—especially urban and rooftop beekeepers.

Research and money for research are also a must in the fight to reverse the appalling situation. Take a look at some of the research in this issue for example. Genomic research is perhaps pointing a finger at the cause of CCD. Research at Leeds indicates that queen mating patterns and numbers may show us the answer to some of the questions relating to colony failure and an international team of researchers has found that increased pathogen levels are an indicative feature.

It's an interesting time for beekeepers. We are learning more about bees every week than we learned about them over many years in the 1990s. The pace of research has increased enormously and ultimately this will benefit all of us whether beekeeper or not and this brings me to the third way of helping the situation and that is education. Tell your mates about your beekeeping. Explain it to them—the newspapers are giving you a lead and beekeeping is no longer seen as the preserve of dotty old folk. And so with new initiatives, new research and education and encouragement, we can avert a disaster.

What else have we got in this issue? Always of course we try and keep you up to date with the latest research. Ever heard of Nanobees? Well they could be an answer to cancer! We take a look at the honey production stats for 2008 in the USA and see that despite their losses, not everything is doom and gloom and as an aside, we ask whether bees can tell us how to become young again. (For those of us who aren't). In our history section we take a look at a great Roman beekeeper, and we also bring you a poem from a wonderful bee poet and of course a delicious and unusual honey recipe.

All the best

David Cramp.

Editor. info@bassdrumbooks.com

Collapsed Honey Bee Colonies Show Higher Pathogen Levels

Honeybees in colonies affected by colony collapse disorder (CCD) have higher levels of pathogens and are co-infected with a greater number of pathogens than their non-CCD counterparts. Although no individual pathogen can be singled out as the cause of CCD, the results do help scientists narrow the direction of future CCD research by showing that some possible causes are less likely, according to a study by an international team of researchers.

Although pathogens seem likely to play a critical role in CCD, that role may be secondary, much like AIDS patients die from secondary diseases.

The researchers, collected samples of adult bees, wax comb, pollen and brood – developing larvae – from 91 colonies in 13 apiaries in Florida and California and quantified more than 200 variables, including the presence of parasites such as varroa and tracheal mites; infection by bacteria, viruses and fungi; pesticide levels; nutritional factors; and bee physiology. No single factor was found consistently only in those colonies suffering from CCD. The study's findings, which were published in the online journal PLoS ONE, illustrate the complexity of solving the CCD problem, The results suggest that this condition may be contagious or the result of exposure to a common risk factor that impairs the bees' immune systems, making them more susceptible to pathogens.

The scientists noted that higher pathogen loads are likely to have caused CCD symptoms, but what causes the bees to become infected with so many pathogens is still not known. Although pathogens seem likely to play a critical role in CCD, that role may be secondary, much like AIDS patients die from secondary diseases.

The researchers also found detectable levels of residues from 50 different pesticides in all of the sampled colonies, but there was no association between increased pesticide levels and CCD.

No one of the screened pathogens had a higher prevalence in colonies that had CCD. There also was no significant difference in the prevalence nor in the total load of varroa or tracheal mites and Nosema, a protozoan that causes disease in bees. But overall, CCD colonies were co-infected with a greater number of pathogens—viruses, bacteria and microparasites such as Nosema. For instance, 55 percent of CCD colonies were infected with three or more viruses compared to 28 percent of non-CCD colonies.

In fact, the pyrethroid insecticide 'Esfenvalerate'—used for a wide variety of pests such as moths, flies, beetles and other insects on vegetable, fruit and nut crops—was more prevalent in the wax in non-CCD colonies, being found in 32 percent of non-CCD colonies compared to 5 percent of the CCD colonies. Coumaphos, which is used to treat varroa mites in honeybees, also was found in higher levels in non-CCD colonies.

Entomologists say that the study suggests that future research should focus on monitoring parasite, pathogen and pesticide loads, as well as potential interactions among pesticide and pathogen loads.

Journal reference:

Van Engelsdorp et al. Colony Collapse Disorder: A Descriptive Study. PLoS ONE, 2009; 4 (8): e6481 DOI: 10.1371/journal.pone.0006481

A Plausible Cause of Colony Collapse Disorder

Colony Collapse Disorder (CCD) is rightly the subject of much research by bee labs all over the world. It has caused such losses that beekeepers everywhere should keep up with the latest research on this subject—even if some of it is of a complex nature. This study is important as researchers report that they have found a surprising but reliable marker of Colony Collapse Disorder, a baffling malady that in 2007-2008 killed off more than a third of commercial honey bees in the U.S.

The study, documented in the Proceedings of the National Academy of Sciences, is the first to identify a single, objective molecular marker of the disorder, and to propose a data-driven hypothesis to explain the mysterious disappearance of American honey bees. The researchers spearheaded the honey bee genome project, which was completed in October 2006, less than a month before the first reports of colony collapse disorder (CCD) began to circulate. The new study made use of the genome and a genome-based tool, the microarray, to look for differences in gene expression in the guts of healthy honey bees and in those from hives afflicted by CCD.

Such micro-array analyses normally identify only active genes – those that have been transcribed into messenger RNA in the first stage of building proteins. But Reed Johnson, a University of Illinois doctoral student in entomology and first author on the study, noticed that the micro-arrays were turning up large quantities of fragmented ribosomal RNA (rRNA) in the bees affected by CCD. Ribosomes are the factories in which proteins are made, but Johnson observed that this rRNA contained adenosine-rich sequences not seen in normal ribosomes.

This “polyadenylation” is believed to be a sign of ribosome degradation. Microarrays for other organisms also contain these mysterious pieces of ribosomal RNA, for reasons that are not yet altogether clear, say the scientists. But comparisons of healthy bees and bees from hives afflicted with CCD showed that the fragments were present at a much higher frequency in the CCD bees, he said. It was found that they are significantly overrepresented in the CCD bees. The one consistent indicator of CCD across samples collected at multiple times and in multiple places was the overabundance of ribosomal fragments.”

When the team looked at the pathogens of healthy bees and bees from hives affected by CCD, they saw that the CCD bees suffered “more than their share” of infections with viruses that attack the ribosome, Berenbaum said. These so-called picorna-like viruses “hijack the ribosome,” she said, taking over the cellular machinery to manufacture only viral proteins. The list of picorna-like viruses that afflict honey bees is long and includes Israeli acute paralysis virus, which was once suspected of being the primary cause of CCD. Numerous suspects have been identified in the hunt for a cause of CCD, from nutritional deficiencies to exposure to genetically modified plants or pesticides. Researchers in Spain recently pointed to a parasitic fungus, Nosema ceranae, which afflicts many CCD bees in Spain. The loss of ribosomal function would explain many of the phenomena associated with CCD.

The varroa mite, which is believed to have killed off a significant number of honey bees after it was accidentally introduced to the U.S. in 1986, is a carrier of picorna-like viruses, and is likely a significant contributor to the high viral pathogen load that afflicts U.S. bees. The mite may act as a tipping factor leading to ribosome breakdown, the researchers said. All of these influences, along with the practice of carting bees around the country for pollination services, are significant stressors on the bees, a heavy burden that would be amplified by a loss of ribosomal function, Robinson said.

Scientists know that If your ribosome is compromised, then you can’t respond to pesticides, you can’t respond to fungal infections or bacteria or inadequate nutrition because the ribosome is central to the survival of any organism. You need proteins to survive.

Sex, the Queen Bee and CCD

The importance of drones

Modern science has at last shown beekeepers the folly of messing with colony dynamics and especially population ratios between workers and drones. 'Lazy,' 'useless', 'expendable' drones are as essential to the life and future of a colony as any other caste – otherwise they wouldn't be there. My view has always been that beekeepers should keep up drone numbers. Ed.

A Queen Bee normally contends with a dozen or more suitors at a time, and has been known to mate with up to 20 or more. We have reported previously in Apis UK that the more matings the better as far as queen acceptance by workers goes and it is the drones - or lack of them that scientists are now looking at as a team at Leeds University believes that the decline in the world's honeybee population may be caused by a lack of variety in potential mates for the mothers of the hives and are beginning a three-year project that will examine whether a lack of mates is making colonies less genetically diverse.

The team at Leeds University hopes that providing queens with sufficient numbers of males could protect hives from being wiped out by disease. The possible explanation for the fall in honeybee numbers is markedly different to previous hypotheses, which have included a lack of suitable food in the countryside, the impact of pesticides and climate change.

The researchers are confident that their project will solve the problem. "By making sure queens mate with enough genetically variable males, we may be able to boost resistance levels and so protect our honeybee populations from disease attacks like the ones we have seen hitting the US," said Dr Bill Hughes from the university's Faculty of Biological Sciences.

As we know – but it is worth repeating - statistics point to an alarming drop in honeybee numbers across the world. Last year, average losses of colonies in the United States stood at 35 per cent, with some beekeepers losing 90 per cent of their colonies. In the UK, nearly a fifth of all colonies perished last winter, according to the British Beekeepers Association.

With the rise in importance of the general awareness of global warming, Amazon and other tropical deforestation the making of hard hitting reality nature films are becoming the vogue nowadays. The issue of CCD will next month (October 2009) receive wide attention with the release of a documentary voiced by actress Emilia Fox. 'Vanishing of the Bees' points out that, thanks to their pollination of crops, bees are worth about £200m to the British economy each year. Vanishing of the Bees, directed by George Langworthy and Maryam Henein. takes a piercing look at a subject that has already hit the news this year – the disappearance of the honeybee due to the mysterious phenomenon known as "colony collapse disorder".

The Leeds initiative has received nearly £500,000 from the Natural Environment Research Council. Collaborators include the UK government's National Bee Unit and the University of Copenhagen.

Emilia Fox will read 'The Vanishing of the Bees'

Becoming Young Again. Can the Bees Tell Us How?

Truly Remarkable research. Ed

Many of us know that cognitive function declines as we get older and in fact recent studies have shown that the specific kind of daily activities we engage in during the course of our lives appears to influence the extent of this decline. (I wonder what I'm doing wrong! Ed). Well perhaps our knowledge of bees can give us a clue to becoming young again. Findings from a remarkable piece of research carried out by a team of researchers from Technische Universität Berlin, it appears that bees may have this secret. The scientists are looking at are how division of labour among honey bees affects their learning performance as they age.

We all know that bees progress in life through various work stages beginning with being house hold bees, then nurse bees and guard bees and finally becoming foragers. It has also been well established that if for example, all of the foragers are wiped out by spray poisoning

Will these foragers revert and become young again.

or some other calamity then young nurse bees will accelerate their development and become foragers earlier than usual in their lives. This can work in reverse as well and is shown by the fact that if nurse bees are removed, then older foragers will revert to being nurse bees – quite a feat considering that their food glands will have atrophied and have to be re-activated.

Now however the scientists have found something more in all this.

Surprisingly, they have found that, by switching their social role, aging honey bees can keep their learning ability intact or even improve it. The scientists are planning to use them as a model to study general aging processes in the brain, and they even hope that they may provide some clues on how to prevent them. Dr. Ricarda Scheiner, leader of the research team, presented these findings at the Society of Experimental Biology Annual Meeting in Glasgow in July.

The oldest bees in a colony are the foragers - a task that demands a high amount of energy. With increasing foraging duration, their capacity for associative learning was found to decrease. On the other hand, no decline was observed in nurse bees that remain inside the hive taking care of the brood and the queen, even though their age was the same as that of their foraging sisters. When the scientists artificially forced a subset of these foragers to revert to nursing tasks, they discovered that they learning performance improved again, demonstrating a remarkable plasticity in their brain circuits.

"The honey bee is a great model because we can learn a lot about social organisation from it and because it allows us to revert individuals into a 'younger' stage. If we remove all of the nurse bees of a colony, some of the foragers will revert to nursing behaviour and their brains become 'young' again. We thus hope to study the mechanisms responsible for age-dependent effects, like oxidative damage, and also to discover new ways to act against these aging processes.

(Perhaps it is as well that bees don't realise that by eradicating younger bees, they could have a new life! Ed).

Reference: Society for Experimental Biology (2009, July 5). A Young Brain For An Old Bee.

New Varroa Trap - Industrial Partner Wanted

Varroa is without doubt associated with CCD and any safe method of destroying this little pest is welcome. Now, thanks to a new attractant developed by Agricultural Research Service (ARS) scientists in the USA, we may be a step nearer.

At the ARS Chemistry Research Unit in Gainesville, scientists are testing a bait-and-kill approach using sticky boards and natural chemical attractants called.

A thing of the past? Probably not but every little helps

semiochemicals. In nature, Varroa mites rely in these semiochemicals to locate—and then feed on—the bloodlike hemolymph of both adult honey bees and their brood. We all know the result. Severe infestations can decimate an affected hive within several months—and rob the beekeeper of profits from honey or pollinating services.

But in this case, the mites encounter a more heady bouquet of honey bee odours that lure the parasites away from their intended hosts and onto the sticky boards, where they starve. In preliminary tests, 35 to 50 percent of mites dropped off the bees when exposed to the attractants. Free-roving mites found the semiochemicals even more attractive, according to Teal.

Moreover, the extra dose of semiochemicals wafting through hives didn't appear to significantly interfere with the honey bees' normal behaviour or activity. The scientists reported the results this past January at the 2009 North American Beekeeping Conference in Reno, Nevada

The team hopes ARS' patenting of the Varroa mite attractants will encourage an industrial partner to develop the technology further.

The semiochemicals attractant is used in conjunction with a sticky board—available from all beekeeping supply companies.

New News About HMF

Don’t Poison your bees

HMF is dangerous to bees and I know beekeepers who have used acid hydrolysis to invert sugar syrup but instead find that their colonies are not benefiting from this but in fact being poisoned. The reason is the rise in breakdown products particularly HMF which are often uncontrolled using this method of inversion.

Some beekeepers mainly in the USA and Canada feed High Fructose Corn Syrup to their bees and now researchers have established the conditions that foster formation of potentially dangerous levels of a toxic substance in the high-fructose corn syrup (HFCS) that is often fed to honey bees. Their study, may also have implications for soft drinks and dozens of other human foods that contain HFCS.

The substance, hydroxymethylfurfuraldehyde (HMF), forms mainly from heating fructose and its presence can be a factor in many problems in the colony especially in feed regimes.

In the new study, Blaise LeBlanc and Gillian Eggleston and colleagues note HFCS's ubiquitous usage as a sweetener in beverages and processed foods. Some commercial beekeepers also feed it to bees to increase reproduction and honey production. When exposed to warm temperatures, HFCS can form HMF and kill honeybees.

Some researchers believe that HMF may be a factor in Colony Collapse Disorder, a mysterious disease has killed at least one-third of the honeybee population in the United States. The scientists measured levels of HMF in HFCS products from different manufacturers over a period of 35 days at different temperatures. As temperatures rose, levels of HMF increased steadily. Levels jumped dramatically at about 120 degrees Fahrenheit. The data are important for commercial beekeepers, for manufacturers of HFCS, and for purposes of food storage.

Because HFCS is incorporated as a sweetener in many processed foods, the data from this study are important for human health as well, the report states. It adds that studies have linked HMF to DNA damage in humans. In addition, HMF breaks down in the body to other substances potentially more harmful than HMF.

Reference:

LeBlanc et al. Formation of Hydroxymethylfurfural in Domestic High-Fructose Corn Syrup and Its Toxicity to the Honey Bee (Apis mellifera). Journal of Agricultural and Food Chemistry, 2009; 57 (16): 7369 DOI: 10.1021/jf9014526

Help for Athletes.

Can Propolis help protect against heat Stress?

We have all been told that propolis is full of antioxidants and now research has discovered just how useful propolis can be for athletes. The antioxidant in propolis may be able to protect athletes from overheating according to an article in the Journal of Food Science, published by the Institute of Food Technologists in the USA.

Honeybee propolis, or bee glue, has been widely used as a folk medicine. An active ingredient in propolis known as caffeic acid phenethyl ester, or CAPE, has a broad spectrum of biological activities including antioxidant, anti-inflammatory and antiviral. Hyperthermia, or heat stress, is considered to be the main factor underlying the early fatigue and dehydration seen during prolonged exercise in the heat. “Since hyperthermia and free radical generation are related to exercise-induced physical damage, it is reasonable to test whether an antioxidant can prevent or reduce hyperthermia-induced free radical generation and damage,” says lead researcher Yu-Jen Chen of Chinese Culture University in Taiwan.

More uses for propolis seem to be discovered every day

Researchers examined blood from 30 competitive cyclists who engaged in endurance training for two to four years prior to the investigation. None participated in any competitions or intensive training or had any clinical illness or medical or surgical treatments four months prior to the study.

“CAPE rescued mononuclear cells from hyperthermia-induced cell death,” writes Yu-Jen Chen. “This implies that CAPE might not only promote athletic performance but also prevent injury secondary to endurance-exercise-induced hyperthermia.”

In addition, researchers indicated that further human studies need to be conducted to solidify their findings.

Reference: Institute of Food Technologists (2009, July 29). Antioxidant In Substance

PAST TIMES Beekeeping History

We now leave modern research and look at one of the first true beekeeping researchers whose amazing writings have been preserved remarkably well. I think you will see that he was quite advanced for his time.

Lucius Lunius Moderatus Columella AD 4 - ca. AD 70) was a Romanwriter born in the Roman province of Baetica, part of modern Spain, in Gades – present day Cadiz. After a career in the army he took up farming. His *De Re Rustica* in twelve volumes has been completely preserved and forms our most important source on Roman Agriculture. His references to other past beekeepers and their writings are illuminating. For example he wrote that some of the beliefs of the times are:

Hyginus --- a woman of surpassing beauty called Melissa, was changed into a bee by Jupiter.

Euhemerus -- bees were bred from hornets and the sun -- that the daughters of Phryxon, reared them.

Virgil -- bees are created in the carcass of a young bull.
he was one of the first known 'scientific' agriculturalists and his thoughts on bees were surprisingly up to date. Certainly he was quoted by bee masters for many centuries. Some of his own thoughts are as follows:

The Worker: "for the larger and rounder a bees, the worse it is, and if it is unusually fierce, it is by far the worst kind of all."

The Queen: "Now the king bees are slightly larger and more oblong in shape than to other bees, with straighter legs but less ample wings, of a beautiful shining color and smooth, without any hair, and stingless, .."
The drone: "They are insects of a larger growth, very like bees.... for the do not collect food but consume that which is brought in by others. Never the less these drones seem to contribute something to the procreation of the younger generation by sitting on the seeds from which the bees are formed, and so they are admitted on terms of some intimacy in order to sit upon the eggs which produce the new offspring; then, when the young bees are

The Drone: "They are insects of a larger growth, very like bees.... for the do not collect food but consume that which is brought in by others. Never the less these drones seem to contribute something to the procreation of the younger generation by sitting on the seeds from which the bees are formed, and so they are admitted on terms of some intimacy in order to sit upon the eggs which produce the new offspring; then, when the young bees are hatched, they are hustled out of the hives and, as the same old poet says, "they are kept away from the fold.""

On the Beekeeper he has the following to say:
"very great care must be taken by the man in charge, who feeds the bees, when he must handle the hives, that the day before he has abstained from sexual relations and does not approach them when drunk and only after washing himself, and the he abstains from all edibles which have a strong flavor....from acrimonious stench of garlic and onions and all other similar things."
On Management:
"Usually in the tenth year all the population of the whole hive is destroyed and exterminated"
Making Increase: "Fresh stock must be continually propagated and care must be taken in the spring, when the fresh swarms issue forth, that they are intercepted and the number of dwelling places increased"
Equipment: "The store-house should be chiefly occupied by hives ready for the use of new swarms..."
Clipping a queens wings: "he must be despoiled of his wings, when he oft times attempts to break out with his swarm and fly away; for we strip him of his wings, we shall keep the vagrant chieftain as though in fetters chained..."
Replacing poor queen: "Sometimes the king bee has to be put to death when an old hive falls short of its proper complement of bees and its want of numbers must be made up from another swarm."
Combining weak hives: "In the early spring a young brood is born in the hive, the new king bee is squeezed to death, so that the multitude of bees may live with their parents without discord.
Overcrowding: "for when the disaster to the crowded hive is recognized, you must examine any combs which it contains. You must then next cut away, from the wax which holds the seed, that part in which the offspring of

the kingly race comes to life. It is easy to see this, since almost at the very end of the wax there appears as if were the nipple of a breast projecting somewhat and with a wider cavity than the rest of the holes, in which the young bees of the common kind are enclosed."

Equipment: "The store-house should be chiefly occupied by hives ready for the use of new swarms..."

Clipping a queens wings: "he must be despoiled of his wings, when he oft times attempts to break out with his swarm and fly away; for we strip him of his wings, we shall keep the vagrant chieftain as though in fetters chained..."

Replacing poor queen: "Sometimes the king bee has to be put to death when an old hive falls short of its proper complement of bees and its want of numbers must be made up from another swarm."

Combining weak hives: "In the early spring a young brood is born in the hive, the new king bee is squeezed to death, so that the multitude of bees may live with their parents without discord. But if the combs have produced no offspring, it will be open to you to bring together the population of two or three hives into one, but only after they have been sprinkled with sweet liquid...."

Overcrowding: "for when the disaster to the crowded hive is recognized, you must examine any combs which it contains. You must then next cut away, from the wax which holds the seed, that part in which the offspring of the kingly race comes to life. It is easy to see this, since almost at the very end of the wax there appears as if were the nipple of a breast projecting somewhat and with a wider cavity than the rest of the holes, in which the young bees of the common kind are enclosed."

Bait traps: "But you should also have empty hives placed in the apiary; for there are some swarms which, as soon as they have come forth, immediately seek a home for themselves nearby and occupy on which they find empty."

Chilled brood: "For if we transfer the honey combs when the brood has not come to maturity, the young bees will die when they cease to be kept warm..."

Hive inspections: "From the first equinox (spring), ... during these days the bees ought to receive attention for the first time by opening the hives, so that all filth, which has collected during the winter season may be removed, and after the spiders have been got rid of, the hives may be fumigated with smoke produced by burning ox dung."
"during the winter time it is not expedient to move or open the hives."

On disease and pest: "bees are often over taken by disease."
"The little worms also which are called moth-caterpillars and also the developed moths must be killed.
"But great care will have to be exercised between the rising of the Dog star and that of Arcturus that the bees are not surprised by violent attacks from hornets, which generally lie in wait in front of the hives for them to come out."

Columella. Ahead Of his time

On hive location: "feeding grounds ought to be assigned to the bees of which you approve."
"feeding grounds void of cattle and with a sunny aspect"
"located where they are little as possible exposed to storms."
"A position must be chosen for the bees facing the sun at midday in winter, far from noise and the assemblage of men and beast."
"It should be situated in the bottom of a valley, that the empty bees, when they go forth to feed, may be able more easily to fly up to the higher ground, and when they have collected what they require, they may fly with their burden on a down-hill course without any difficulty."
"If the apiary join a building, it must be on the side of the house which is free from the foul odours which come from latrines, the dunghill and the bathroom."
"Where ever the hives are placed, they should not be enclosed within very high walls."

On honey taking: "Honey of the finest quality is at its best at the autumn equinox which falls before the first of October."

Columella wrote very much more but space in this issue is limited. I think you will agree that he was a remarkable beekeeper with often very modern ideas.

The Deadly Nanobees

We all know what happens when a bee stings us. A complex venom is pumped into our system and it is one of the main reasons why everyone isn't a bee-keeper. Many claims are also made that the venom can be used medicinally and there is a steady market for bee venom but now a research team from the Washington University School of Medicine in St. Louis in the USA has harnessed bee venom for use as a carrier. The toxin in bee venom has been harnessed to kill tumour cells by attaching the major component of bee venom to nano-sized spheres that they call nanobees. In mice, nanobees delivered the bee toxin melittin to tumours while protecting other tissues from the toxin's destructive power. The mice's tumours stopped growing or shrank. The nano-bees' effectiveness against cancer in the mice is reported in advance online publication Aug. 10 in the Journal of Clinical investigation.

The nanobees fly in, land on the surface of cells and deposit their cargo of melittin which rapidly merges with the target cells. The researchers have shown that the bee toxin gets taken into the cells where it pokes holes in their internal structures. Melittin is a small protein, or peptide, that is strongly attracted to cell membranes, where it can form pores that break up cells and kill them. Melittin has been of interest to researchers because in high enough concentration it can destroy any cell it comes into contact with, making it an effective antibacterial and antifungal agent

Could Nanobees be the answer to cancer?

and potentially an anticancer agent. Cancer cells can adapt and develop resistance to many anticancer agents that alter gene function or target a cell's DNA, but it's hard for cells to find a way around the mechanism that melittin uses to kill. The scientists tested nanobees in two kinds of mice with cancerous tumours. One mouse breed was implanted with human breast cancer cells and the other with melanoma tumours. After four to five injections of the melittin-carrying nanoparticles over several days, growth of the mice's breast cancer tumours slowed by nearly 25 percent, and the size of the mice's melanoma tumours decreased by 88 percent compared to untreated tumours. The researchers indicate that the nanobees gathered in these solid tumours because tumours often have leaky blood vessels and tend to retain material.

Scientists call this the enhanced permeability and retention effect of tumours, and it explains how certain drugs concentrate in tumour tissue much more than they do in normal tissues. But the researchers also developed a more specific method for making sure nanobees go to tumours and not healthy tissue by loading the nanobees with additional components. When they added a targeting agent that was attracted to growing blood vessels around tumours, the nanobees were guided to precancerous skin lesions that were rapidly increasing their blood supply. Injections of targeted nanobees reduced the extent of proliferation of precancerous skin cells in the mice by 80 percent.

Overall, the results suggest that nanobees could not only lessen the growth and size of established cancerous tumours but also act at early stages to prevent cancer from developing. Nanobees are an effective way to package the useful, but potentially deadly, melittin, sequestering it so that it neither harms normal cells nor gets degraded before it reaches its target. If a significant amount of melittin were injected directly into the bloodstream, widespread destruction of red blood cells would result. The researchers showed that nanoparticles protected the mice's red cells and other tissues from the toxic effects of melittin. Nanobees injected into the bloodstream did not harm the mice. They had normal blood counts, and tests for the presence of blood-borne enzymes indicative of organ damage were negative. When secured to the nanobees, melittin is safe from protein-destroying enzymes that the body produces.

Although unattached melittin was cleared from the mice's circulation within minutes, half of the melittin on nanobees was still circulating 200 minutes later. This indicates that it is long enough for the nanobees to circulate through the mice's bloodstream 200 times, giving them ample time to locate tumours. Melittin is very stable on the nanoparticles, and it's easily and cheaply produced. Researchers are now using a nontoxic part of the melittin molecule to hook other drugs, targeting agents or imaging compounds onto nanoparticles. The core of the nanobees is composed of perfluorocarbon, an inert compound used in artificial blood. The research group developed perfluoro-

carbon nanoparticles several years ago and have been studying their use in various medical applications, including diagnosis and treatment of atherosclerosis and cancer. About six millionths of an inch in diameter, the nanoparticles are large enough to carry thousands of active compounds, yet small enough to pass readily through the bloodstream and to attach to cell membranes. The scientists can add melittin to nanoparticles after they are built. If they have already developed nanoparticles as carriers and given them a targeting agent, they can then add a variety of components using native melittin or melittin-like proteins without needing to rebuild the carrier. Melittin fortunately goes onto the nanoparticles very quickly and completely and remains on the nanobee until cell contact is made.

The ultimate health jab?

The flexibility of nanobees and other nanoparticles made by the group suggests they could be readily adapted to fit medical situations as needed. The ability to attach imaging agents to nanoparticles means that the nanoparticles can give a visible indication of how much medication gets to tumours and how tumours respond. Potentially, these could be formulated for a particular patient, The researchers say that they are learning more and more about tumour biology, and that knowledge could soon allow them to create nanoparticles targeted for specific tumours using the nanobee approach.

Journal reference:
Soman NR, Baldwin SL, Hu G, Marsh JN, Lanza GM, Heuser JE, Arbeit JM, Wickline SA, Schlesinger PH. Molecularly targeted nanocarriers deliver the cytolytic peptide melittin specifically to tumour cells in mice, reducing tumour growth. Journal of Clinical Investigation, August 10, 2009.

Sex, Love and Plant Defence

Flowering plants are what bees are all about and their continuing existence depends to a certain extent on them being able to protect themselves from predators. They have developed some interesting and subtle ways of doing this but evidently, just like us, they need a bit of love to really do it well.

In research published in Proceedings of the National Academy of Sciences, scientists from North Carolina State University and Duke University discovered that sexually produced evening primrose plants withstand attacks from plant-eaters like caterpillars better than plant relatives that reproduce by themselves.

The findings are important steps to learning more about how plants have evolved defences against insect herbivores. The variation in sexual reproduction has a large impact on the ability of plants to evolve defences against herbivores. In the study, the researchers performed both lab and field experiments on evening primrose (Onagraceae) plants, a plant family that has 259 different species – 85 percent of which reproduce sexually with the remainder reproducing asexually – to gauge the effects of plant sex on defence mechanisms. The researchers found that so-called generalist herbivores – those that eat a variety of plants – preferred to feed on the asexual species and lived longer while doing so. The results were a bit different for so-called "specialist" plant-eaters, however. Those insects that prefer just one kind of food were more apt to munch on sexually reproduced species of plant. This most likely occurs because specialized plant-eaters evolve alongside their hosts and have found ways to co-opt plant defences. Instead of being deterred by certain chemical compounds produced as defences by the plant, the specialized plant-eaters are attracted to them.

Sex shuffles up genes and allows individual plants to get rid of bad genes and keep good ones. That helps them evolve defences against generalist herbivores. Though there are short-term benefits to asexual reproduction – populations can grow more rapidly and propagate even when pollination is not possible – losing sex puts plants at a long-term disadvantage.

Evening Primrose. Subtle defences keep it alive

Journal reference:
Plant Sex and the Evolution of Plant Defences Against Herbivores. Proceedings of the National Academy of Sciences, July 13, 2009.

Poem of the Month

This month we look at another poem by that incredibly talented poet Sylvia Plath. It's appropriate for the time of year as most beekeepers are in the throes of wintering down their bees and it captures the essence of the time of the year for beekeepers through a poet's eye.

Wintering

This is the easy time, there is nothing doing.
I have whirled the midwife's extractor,
I have my honey,
Six jars of it,
Six cat's eyes in the wine cellar,

Wintering in a dark without window
At the heart of the house
Next to the last tenant's rancid jam
and the bottles of empty glitters--
Sir So-and-so's gin.

This is the room I have never been in
This is the room I could never breathe in.
The black bunched in there like a bat,
No light
But the torch and its faint

Chinese yellow on appalling objects--
Black asininity. Decay.
Possession.
It is they who own me.
Neither cruel nor indifferent,

Only ignorant.
This is the time of hanging on for the bees--the bees
So slow I hardly know them,
Filing like soldiers
To the syrup tin

To make up for the honey I've taken.
Tate and Lyle keeps them going,
The refined snow.
It is Tate and Lyle they live on, instead of flowers.
They take it. The cold sets in.

Now they ball in a mass,
Black
Mind against all that white.
The smile of the snow is white.
It spreads itself out, a mile-long body of Meissen,

Into which, on warm days,
They can only carry their dead.
The bees are all women,
Maids and the long royal lady.
They have got rid of the men,

The blunt, clumsy stumblers, the boors.
Winter is for women--
The woman, still at her knitting,
At the cradle of Spanis walnut,
Her body a bulb in the cold and too dumb to think.

Will the hive survive, will the gladiolas
Succeed in banking their fires
To enter another year?
What will they taste of, the Christmas roses?
The bees are flying. They taste the spring.

Sylvia Plath 1932—1963

Recipe of the Month

The recipe this month has been in Apis before but a couple of weeks ago I met a beekeeper who actually hadn't tried it and so we cooked some up and it took me right back to my days in Spain. It's delicious and healthy and well worth a try.

Deep-fried Aubergine with honey

Ingredients

For this recipe you will need one large aubergine per two people.

- Aubergines cut widthways into 1cm (½") slices
- 3 to 4 units plain flour
- 1 unit cumin powder
- 1 unit baking powder
- Cold water
- Salt and pepper
- Olive oil for frying
- A good clear honey for pouring over

Heat the oil in a deep-fat fryer or large saucepan.

To make the batter, mix the sifted flour, cumin and baking powder in the ratio above to coat however many aubergines you have. Add the salt and pepper then add just enough water to make a very stiff batter. (A tip here is to leave out the baking powder and use carbonated water instead. This gives the same light and crunchy finish once cooked.)

Coat the slices of aubergine well and drop them straight into the very hot oil. Cook for a few minutes until they are golden brown and crisp then remove with a slotted spoon and drain on some kitchen roll. Serve on a plate straight away with a generous coating of the honey.

And Finally

If anyone can help Mahmoud in his quest for information on Mite Away 2 please send it in and I'll ensure that he gets it. Ed.

Hi,

I wonder if you have some good information on use of formic acid on BEEDATA.
Would it OK to put an article on formic acid against varroa please ?

Mite away 2 is a product but they cover their back on website and they mention **if** used properly ...and so on.

What will be interesting to know is that concentration in the hive (double and single brood box), air change and the concentration of the formic acid (using 50%, 65%) , bee mortality and how it could affect queens health and mortality.

It is difficult to close mesh floor. Mesh floor can be closed to some extent but not fully.

I wonder what Germans and Swiss do when they apply Formic acid in the hive.

I do appreciate your work.

Regards

Mahmoud Pourabadey

News from the States

Despite losses and other calamities in the USA the news from the US the USDA report the following for 2008.

United States Honey Production Up 8 Percent

Honey production in 2008 from producers with five or more colonies totaled 161 million pounds, up 8 percent from 2007. There were 2.30 million colonies producing honey in 2008, down 6 percent from 2007. Yield per colony averaged 69.9 pounds, up 15 percent from the 60.7 pounds in 2007. Colonies which produced honey in more than one State were counted in each State where the honey was produced. Therefore, yields per colony may be understated, but total production would not be impacted. Colonies were not included if honey was not harvested. Producer honey stocks were 50.4 million pounds on December 15, 2008, down 4 percent from a year earlier. Stocks held by producers exclude stocks held under the commodity loan program.

Honey Prices Record High

Honey prices increased to a record high during 2008 to 141.0 cents, up 31 percent from 107.7 cents in 2007. U.S. and State level prices reflect the portions of honey sold through retail, cooperatives, and private channels. Prices for each color class are derived by weighting the quantities sold for each marketing channel. Honey prices for 2008 were up from the previous year for all color classes and marketing channels. Prices for the 2007 crop reflect honey sold in 2007 and 2008. Some 2007 crop honey was sold in 2008, which caused some revisions to the 2007 crop prices.