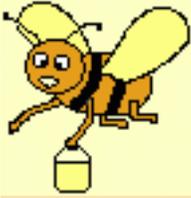


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## BEES AND BEEKEEPING

Bees can be pollinators, honey makers, income making little creatures. With proper equipment working with them can be great joy, too. The best way to learn beekeeping is of course with some of the more experienced beekeepers, but a lot can be learned through books and reading yourself. In order to find some beekeepers in your area it is best to go to local beekeepers association. Beekeeping needs calmness, gentleness and understanding. When talking about honeybees we have picture of the bee flying from flower to flower but there is much more than that. The ones that gather honey are called workers which most of them are. There are also drones, which are males, and only one mother bee of them all, called queen.

### QUEEN BEE

Honeybees live together in colonies. Both queen and workers are females whereas drones are males. What makes one or the other is the kind of food they get when they are larvae. Queen are simply better fed and so their reproductive organs are much better developed. They are fed royal jelly, which is actually a secretion of workers glands, or bees milk, rich in minerals, vitamins and such. On the other hand workers and drones are fed a mixture of honey, royal jelly and pollen. They are there to lay eggs and rebuild colony population with new members. Queen can live even a few years whereas worker bees live only about 40 days during summer or about 100 during winter. For commercial beekeeping it is recommended to replace her within two years because capability of eggs laying will drop with time. 16 days is needed for queen to develop fully from the egg. Few days later queen goes to a mating flight. She goes once and mates with dozens of drones so that she has as diverse genetic material as possible. Then she lays eggs depending on the cell size, so that fertilized eggs are laid into worker cells and those that are not fertilized are laid into bigger, drone cells.

## WORKER BEES

Workers are actually females just like queen. The only difference is the food they get. It takes 21 day for workers to develop from the egg to the fully grown bee. They are smaller in size than queens and don't have sexually developed organs, although in some circumstances they can lay eggs. In the case queen is injured or dead, one worker can take role of the queen but it cannot be done nearly as good as queen can. It can lay only drone eggs. First few days worker does cleaning and feeding older larvae. Then from fifth to tenth day it feeds younger larvae and places nectar taken from foragers. When another few days older it builds combs and does some hive cleaning. From day fifteen to twenty it does some entrance guarding and makes examination flights. Since day twenty it becomes forager, gathering nectar, pollen and eventually water and is doing it till she dies at day forty approximately. Bees fly as far as 2 or 3 miles (5-6 km) when foraging for food but for effective beekeeping there should be food source as close as possible to them so that they can do it more efficiently, and then in turn colony would grow stronger. Also if there is no water close to them you should bring them some, so that they can spend more time foraging.

## DRONE

There is not much to say about drones, because there is almost nothing they do. The only reason of their existence is to eventually mate with queen. And if they do succeed, they lose part of their intestines and then die. They may move freely from hive to hive and they have no stinger, only females do.

## Resources

[Beekeeping course](#) - beekeeping tutorial, lots of pictures and very informative.

[Beekeeping](#) - beekeeper's homepage, one of the best.

Also the biggest [beekeeping links collection](#) on the web.

[Beekeeping](#) - here you can find a lot of info about

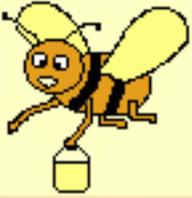
beekeeping in four languages.

Bees and beekeeping - <http://beekeeping.atspace.com/index.html>

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## VARROA

There are two main types of mites:

-**Varroa**, which attacks bee when she is a larvae.

-**Tracheal mite** which place itself inside bee's breathing system.

These two are main causes feral bees are almost extinct. In Southern America this is even worse because of the presence of so called killer bees which are spread through South America and are now in North America as well. Organic acids ,essential oils as wintergreen, and pesticides are used for varroa treatment. Varroa is a bug which sucks bee's fluids. In such circumstances, bees are less able to do their daily jobs, not to mention mites as potential virus carriers. Also, varroa is found to affect drone's ability to mate with queen and therefore affects hive population. All of it points to a necessity of varroa treatment.

Approximately one week after queen lays an egg, varroa female enters ( just before capping ). Preferably they choose drone brood, but worker cells are affected also, especially if there is strong infestation going on. Varroa female lays 5 eggs more or less. Varroa female is bigger and red colour. Male Varroa is smaller. Menthol is used for tracheal mite and apistan® for varroa.

#### **How to examine for varroa?**

One method is to examine drone pupae. Open the cappings of drone cells and remove drone pupae from it, then examine it for varroa. It is easy to see varroa mites against white pupae. Another technique is Apistan® strips in conjunction with detection boards. They can be used as detection method and as a antivarroa treatment also. You can make detection boards simply by cutting paper so that it fits bottom of the hive. Then spill some vegetable oil over it so that any varroa which falls onto it does not go up again but to stay there. You must protect bees from falling to the plate. You make them

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net above the plate with the holes large enough for varroa to fall through and small enough for bees not to fall through. It is important to say that late fall and early spring is the best time when you should use apistan strips, because there is less brood then, meaning less varroa will be protected under cappings. Apistan® strips must come in direct contact with the bees, meaning they must be walking over it in order for it to work. If there is infestation, then strips are already in place as an antivarroa measure, and they should stay there for about 6 weeks. If only for detection purposes then one week is enough. It is important to say that as with any medicine, you shouldn't apply it while having honey suppers in place, but you can put them back right after you remove strips. Most common appliance is two strips per ten frames of bees. There's treatment with [oxalic acid](#) for example, used in Europe.

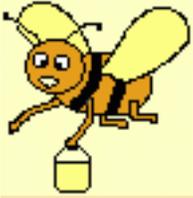
Bees and beekeeping - <http://beekeeping.atspace.com/varroa-mite.html>



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## OXALIC ACID

Oxalic acid can kill varroa and tracheal mite, but is primarily used for varroa treatment where it gives the best results. Oxalic acid dihydrate /  $C_2H_2O_2 \times 2H_2O$  / Oxalic-2-hidrate is what we talk about here, from now on referred to as oxalic acid. It can be found in nature in small quantities, so it is not something mixed up in a lab somewhere. You can find it in chocolate, coffee, spinach, strawberries, mango, potato, tomato and in honey also. You can use it on bees even through the winter if you can catch few days with temperatures above freezing. You should mix 7.5 parts of oxalic acid with 100 parts water and 100 parts sugar, and that is a recommended dose. Amounts range from 20 ml of solution for small up to 50 ml for strong colonies. So 5 ml is the dosage applied to one frame full of bees. You can use ordinary medical syringe cause then you can see the exact amount applied. Treatment should be undertaken at almost any time when there is no brood in the hive to get greater efficiency, so late autumn and early winter is the best.

Apply in late autumn / early winter to:

- get maximum efficiency ( up to 95% ) because there is no brood and no varroa mites protected inside capped brood cells,
- any acid there will be dissolved till next season comes, so it will not show up in honey.

Also it should not be used more than once in three months. It is possible to obtain very high varroa mortality rate using oxalic acid. Outer temperature should be well above freezing when applying. Solution should be warmed to room temperature. Breathing mask, gloves and eye protection must be worn while working with oxalic acid. Any solution made must be used within few weeks cause it cannot last longer.

There are actually three methods of applying oxalic acid:

- spraying,
- trickling,

- vaporizing.

Trickling does not require to dismantle hive as spraying does, it is cheaper, faster and very good results are obtained. Also it does not require any other special equipment as vaporizing does, so it is preferred method of applying. Extreme precaution is needed when working with oxalic acid.

You need to protect against :

- coming in contact with your skin,
- coming in contact with your eyes,
- against inhaling it,
- against swallowing it.

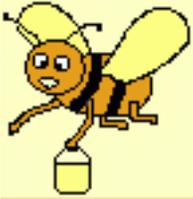
It is very irritating to eyes and skin. In case of it coming in contact with skin or eyes, wash with large amounts of water and in all cases seek immediate medical help. It is important to know that it can be lethal if swallowed.

Bees and beekeeping - <http://beekeeping.atspace.com/oxalic-acid.html>

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## TRACHEAL MITE

Tracheal mites are much smaller than varroa. If present, they live inside of the adult bee breathing system, in her trachea and sucks her blood. There is also danger of the mite as a potential disease carrier. When too many mites exist inside trachea the bee will simply suffocate. Tracheal mite spreads easily from one bee to another and with robbing of weak colonies. It is much easier for them to spread during winter cause the bees are quiet and gather in cluster. That's when it's usually seen that something's wrong.

During spring and summer, when foraging is on, infestation usually declines. What happens is that young mated female mite, when grown enough goes out of trachea and is looking for another host. When she finds one it moves into her trachea and lays eggs and so on. If she doesn't find a new host within one day she dies. It is much harder to detect them because you can't recognize them with a naked eye, you need a microscope. Without it you can suspect for tracheal mite if there is a large number of dead bees in the winter and there is enough food. Then you can try to chop bee's head off and look at where trachea is, and you should see white trachea. In case you see it is dark or brownish you can be pretty much sure it is tracheal mite. But it doesn't work all the time cause not all species can be seen there, only mite called *acarapis woodi*. So it may be good for examining this type of mite only. Menthol is the best solution for this pest at the moment.

## MENTHOL

50 grams of menthol should be placed on the frames, inside of the hive. It works so that it evaporates in the air and bees inhale it. They should be kept there for about a month. When outside temperatures are lower than 60 F

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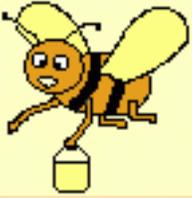
menthol should be placed on the frames. If outside temperature become too hot, over 80 F, menthol should be on the bottom of the hive. Results as good as 90 - 95 % can be obtained.

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## AMERICAN FOULBROOD

American and European foulbrood are two most common honeybee diseases, and American foulbrood may be the worst and most dangerous. Mostly because it is very contagious, and it can spread to other hives and other apiaries easily. It can contaminate equipment and hives. It is caused by bacteria called *Bacillus larvae*.

Usually, when in non friendly environment it can be found in a form of spores, which can last for decades, and when in this form it is very difficult to destroy it. Then when moved to a friendly environment it can wake up and start spreading. Only in this form it can be treated, meaning antibiotics can do nothing to spores.

Prevention is done when there are occurrences of this disease in any neighbouring apiary or particular area. But this may be the way to make resistant bacteria also. You take action depending on the degree of infection.

If disease is advanced, you should burn combs, frames and bees. If not, you can move the bees into another clean hive and treat them with antibiotic. It may be better not to risk it, but to get rid of the combs and bees completely. You can reuse hive body and equipment but they must be thoroughly burned and cleaned.

American foulbrood is the disease manifested on capped brood whereas European foulbrood is the disease of the open, uncapped brood. Larvae are infested with food given to them by the bees. Cappings are often sunken, reddish brown in colour and there may be small hole in the middle made by house bees. Under the cap, dead brood becomes dark brown, sticky and elastic. Opened cells smell like glue. Also irregular pattern of capped and uncapped cells can be noticed.

Bees cannot clean the cells themselves because remains inside are in dense liquid

form. One of the reasons the disease won't stop by itself is that the bacteria which caused it remains present.

One of the most important things to do is to check bees regularly so that you can make an early recognition. If found anywhere close to you, you should check even more often. American foulbrood can be treated with [oxytetracycline](#) or similar antibiotic.

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## EUROPEAN FOULBROOD

European foulbrood is considered to be the second most common honeybee disease. It happens mostly in spring and is caused by bacterium called melissococcus pluton. European foulbrood is the disease of the open, uncapped brood, whereas American foulbrood is the disease of the closed, capped brood. So the biggest difference is that European foulbrood attacks younger larvae. Remains of the dead brood can be removed easier than that of the American foulbrood, so the bees are able to clean cells. That could be the reason why it is considered less dangerous than American foulbrood.

Larvae infected change its white colour into gray and can usually be found in twisted position at the bottom of their cells. There may be dead larvae under the cappings. In such situation it may resemble to American foulbrood and may be difficult to tell is it one or the other.

It is recommended to burn highly infected frames and combs. Hive body should be scorched thoroughly. Larvae are infested with food given to them by the bees. The cleaning bees being the ones stopping the disease are the ones that also spread the disease.

Prevention should be done when there are occurrences of this disease in any neighbouring apiary or particular area just like with American foulbrood. And just like American foulbrood, one of the most important things to do is to check bees regularly so that you can make an early recognition. If found anywhere close to you, you should check even more often.

Keeping the colony strong and healthy and keeping hive clean is certainly the best preventive for any disease. It can be done by replacing the hive with the one you cleaned and scorched. The same goes for frames and combs which can be replaced at regular basis too. European foulbrood can be treated with

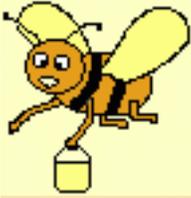
oxytetracycline or similar antibiotic.

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## OXYTETRACYCLINE

Oxytetracycline is used primarily for prevention of American foulbrood and European foulbrood. Also Oxytetracycline can be used for treatment of light American foulbrood infections. In that case, you can move the bees into another hive with clean frames and combs, and start with treatment there. In case that advanced stage of the disease has been found, you must burn combs, frames and any alive bees must be killed. Oxytetracycline kills only germ stage and not spores, which can stay in the hive for years, so hives should be thoroughly scorched if you should use it again. It is important to know that oxytetracycline loses its effectiveness if exposed to sunlight. There are two ways to give oxytetracycline to the bees and that is in the way of extender patties or powdered sugar. When treating bees with it the best way is always to follow instructions given with the medication. There may be different instructions given depending on the amount of the active ingredient. Extender patties should not be left for too long in the hive because antibiotic can make its way into honey, and secondly, bacterias can become resistant to it. Anyway, oxytetracycline needs about 2 months to dissolve, so this should be taken into account. You should stop any treatment at least one month before honey flow.

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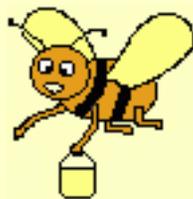
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## NOSEMA

Nosema is caused by one cell parasite called nosema apis. Once it gets into the bee it starts multiplying so that it splits in two. It is actually eating bee from the inside, and when had enough it splits. Then again each organism splits in two and so on. Eventually what happens is that bees defecate more and more often, trying to clean themselves because parasite is attacking their digestive system. If they have no time to do it outside of the hive they will do it anywhere, inside of the hive or at the entrance. They can have such symptoms caused by few other reasons also, for example when bees eat something indigestible, but is usually a sign of the nosema disease.

It happens mostly during winter and early spring, or better say, it becomes visible then. It may happen anytime of the year but it may go undetected, because bees can have cleansing flights. So nosema can be seen when bees are confined to hive, in areas where outside temperatures are usually below freezing for a long time. It spreads so that while some bees defecate inside the hive because of the cold weather outside, other bees are trying to clean up the mess and they pick up the disease in the process. Worker bees are unable to do their regular duties and everything becomes disrupted.

## FUMAGILIN

Fumagilin is what is used here. It is used for both, prevention and treatment of bees. It works so that it prevents parasite reproduction. Time of preventive application is usually in the autumn and the medication should be administered during one month time in order to free the bees from the disease. And being given preventively is the best way to go. As with any treatment it must be taken care of the medicine not to find its way into honey. Generally 1 gram of active fumagilin is enough for 5 - 6 colonies. It is recommended to mix

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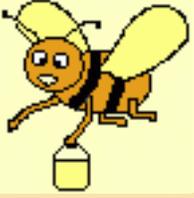
one teaspoon of fumagilin with 1 gallon of sugar syrup and give it to the bees so that 1 gallon is given to one chamber full of bees. If two chambers, give double the amount.

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## HONEY

Honey is gathered by bees so to make reserves for making it through the winter when there is no food in the nature. Any surplus they make is taken away by humans, but in return, humans provide them with shelter and care. Since varroa introduction, there is almost no feral bees population so beekeeping may be of great importance for their survival. Sometimes beekeepers feed them with sugar. As much honey as possible should be left for the bees to consume because of numerous healthy ingredients. With many vitamins, minerals and its anti bacterial quality it is irreplaceable food for bees. And that is why it is of great value to humans too.

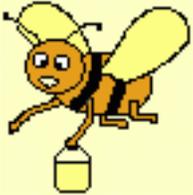
In its natural form, honey is consisted mostly of fructosis and glukosis which are sugars in its simpler form. It means it is absorbed directly without digestion. The bees need it in this form to eat it. They cannot digest ordinary sugar bought in groceries easily, they need to transform it into simpler form. So if there is need to feed sugar syrup to the bees during winter when they cannot process it themselves, you can make them this simpler, inverted sugar , which is sort of artificial honey. It may be life saving for the bees in the winter. There are twenty or so different sugars in honey. There are vitamins B, C, E also iron and minerals needed in humans nutrition. Stored in a jar it can last for long time if kept in a dry and cool place. Honey can be different depending on the flowers it was taken from.

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## SWARMING

Swarming is gathering of the bees from one colony in search of the new home. It is usually half of the bees leaving with the old queen and the other half stays with the new one.

Beekeepers usually try to prevent swarming with removing queen cells. Swarming happens mostly during spring and summer, and it is thought to happen because of overcrowding in the hive, meaning if there are too many bees. It will happen if there is no space for the bees to store any more honey or there is no more space for the queen to lay eggs. There may be another thing here beside overcrowding and that's frame placement. There must be certain order of how frames are placed, otherwise it would be like if there is no place for brood rearing even if that is not true. Just before swarming workers start building a lot of queen cells. Then, when the time comes for new queen to take over, foraging is stopped and the bees wait for old queen to take them away. Then, bees find suitable tree just a few yards away and gather in cluster. Few scout bees start looking for a suitable place to build new home. When appropriate place is found, all of them move to it. So swarming also represents a natural way for the bees to develop and multiply.

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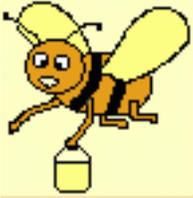
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## AFRICANIZED OR KILLER BEES

Killer bee is actually a unfortunate combination of african and european bee.

Somewhere in 1950., scientists in South America tried to find a wining combination and mixed these two kinds. What they have got was aggressive kind which had not many positive characteristics, and for the things to be even worse, they escaped their confinement and started spreading through the American continent so that nowadays you can find it in the south of the USA. Looking at first sight there is no much difference between african and european bee.

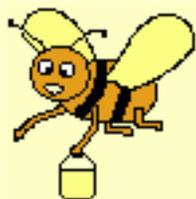
Only noticeable difference is their behaviour. European bees are gentle and kind whereas african bees are overprotective and easily disturbed and they can stay upset for days. It is sort of wild bee. There were cases of the people stung to death by them, but the truth is their reputation is slightly exaggerated. Real threat is for beekeepers because africanised bees tend to take over hives inhabited by european bees.

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#### VARROA MITE

Examination

Oxalic acid

Apistan®

#### TRACHEAL MITE

Menthol

### DISEASES

#### FOULBROOD

American

European

Oxytetracycline

#### NOSEMA

Fumagilin

### OTHER

Honey

Swarming

Killerbees

Inverted sugar

## MAKING INVERTED SUGAR

When feeding bees with honey it is best to give them honey they produced. If there is none then you can make artificial honey discussed here which is second best. It is in no way recommended to give them someone else's honey cause you can easily give them diseases. Ordinary sugar bought in groceries is called saharosis and bees can eat it only if transformed into simpler form of sugars called glucosis and fructosis. They can normally do it themselves but sometimes, especially during winter it is impossible. Then you can do it for them. Inverting sugar is simply done by heating water until it boils. Then add sugar and acids, for example lemon juice. Cook it for about next 30 minutes. Then move it away from fire and leave it to cool down. Water 2 cups, sugar 4 cups, 1 teaspoon lemon juice.

Bees and beekeeping - <http://beekeeping.atspace.com/inverted-sugar.html>

 Deutsch

Basic

## Beekeeping



### INTRODUCTION

#### BEES

Drone

Worker

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