

## **Why should beekeepers select their own queens for the trait of hygienic behaviour?**

Beekeeping now and in the future should require minimally invasive interventions in the bee colony in order to deal with parasites and diseases. Through targeted selection, we can restore the honeybee's ability to heal itself. This leads to healthier bee colonies, less losses, and higher yields.

The central defence mechanism of a bee colony against brood diseases is the detection, opening and removal of diseased or damaged brood. This process has been shown to be a basic component of queen selection and breeding. The removal behaviour is described as hygienic behaviour (HYG+) of the colonies.

The genetic predisposition to immunocompetence can be made visible with the help of the Weimar needle stamp. This is done by selectively killing individual pupae and assessing the reaction of the colony.

### **Healthy bees without unnecessary medication**

The selection protocol for HYG+ therefore provides us quickly and efficiently with information and can be used as a pre-selection to avoid having to carry out time-consuming further screenings with all existing colonies. Testing for the hygiene behaviour of bees is also helpful in the search for colonies worthy of breeding.

Heritability for brood hygiene behaviour as well as for VSH (Varroa Sensitive Hygiene) is based on recessive and additive/quantitative inheritance. By deciding which queens will build up a colony in our hives, we also decide which drones will be available for mating in the next generation.

This gives beekeepers the opportunity to build up a bee population that is characterized by pronounced self-healing powers and already allows a certain tolerance for the start of treatments in the first step. Continued selection for HYG+ opens up the possibility of reduced drone cuttings and treatment independent of the calendar. A longer retention time of the honey on the colonies, leads to a natural reduction in the water content, this increases both the quality and the quantity yield.

### **Varroa & its virus**

One of the biggest challenges in beekeeping is dealing with the Varroa mite and the Varroa virus complex. The current solution to combat the varroa mite is drug treatment, which is also used as a preventative measure. Due to the increased medication, a bee colony's own defences are no longer visible. In addition, medication affects the bee's intestinal flora, thereby weakening the immune system and its defences.

In Europe, each hive is treated on average 3 to 7 times in one season!  
However, discontinuing medication-based treatments without using an alternative can lead to a loss of 80% to 90% of bee colonies.

The idea of working with at least partially self-healing bees is quite obtainable and

these colonies are not only less aggressive - because they are not sick - but also do not show the same desire to swarm - due to less parasite pressure.



## **Weimar Needle Stamp – Made in Germany**

The Weimar needle stamp is manufactured in Germany and impresses with its precision and quality assurance. The test is made from alcohol-resistant material, which is crucial for the sterilisation process, to avoid cross-contaminating other hives. Also, every part can be replaced individually (in case a needle bends or breaks).

The Weimar Needle Stamp has won the bronze medal for “Innovation” at the Apimondia 2022 and is used by beekeepers all over the world.

The results of the needle test with the Weimar Needle Stamp can be easily entered into the breeding value estimation program ([www.beebreed.eu](http://www.beebreed.eu)) by specifying the test tool - Weimar Needle Stamp (WNst).

The test cannot be used for high-precision scientific recording, as it includes faulty cells.

### **Different cell sizes**

Needle stamps of different sizes are available for different cell sizes in the dimensions 4.9mm, 5.1mm and 5.4mm.

They can be used in any hive size and any cell size, e.g. Dadant, Zander, German Normal, Mini Plus, Apidea, Kieler or Langstroth.

The Weimar Needle Stamp can also be used in natural hives.

### **Applicable to all species**

Every subspecies of *Apis mellifera* has the genetic predisposition for brood hygiene. It does not matter whether it is a Carnica, Buckfast or Mellifera, Ligustica.

## Procedure

Principally you can test any time, as long as there is sufficient brood in the red-purple eye state. For practical reasons, test in spring, shortly before the start of foraging as the bees might prioritise foraging over hive hygiene. The pinTest should be done twice a year in each hive.

### You'll need:

- The Weimar Needle Stamp
- rubbing alcohol (min. 75%) to disinfect the tools after each use
- Sponges & rubber bands for cleaning and safe storage (including a box for transportation)
- a water-based lacquer pen to mark the area and the frame
- a pen and small paper notes 3 for each hive with

a.) the hive name/or number &

b.) the time: 0 hours; 6 hours; 24 hours

### How to:

1. A frame with a dense brood pattern that has capped cells with pupae has to be chosen. If possible, without missing cells. Look for cells with a middle-aged brood stage: Larvae with compound eyes, pink to purple are ideal.

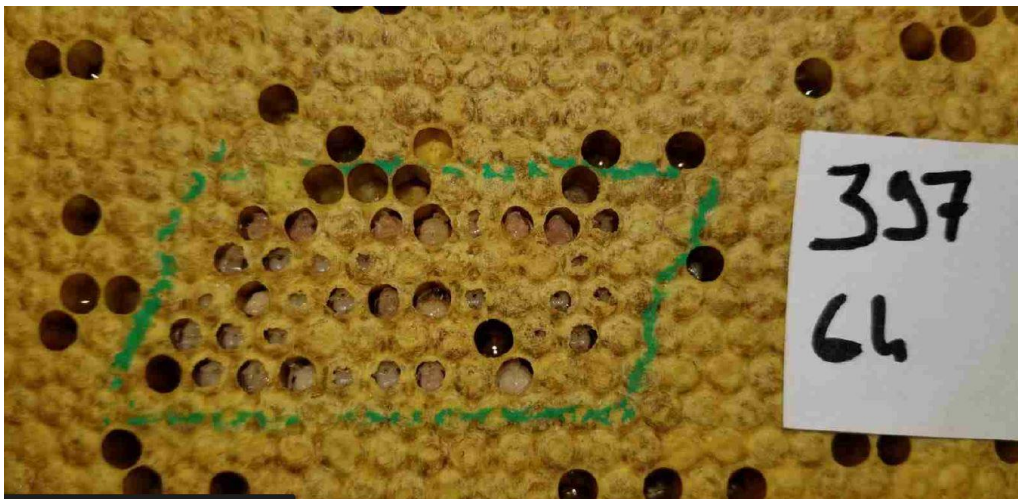


2. Position the stamp in such a way that the needles point at the middle of the cell cover.

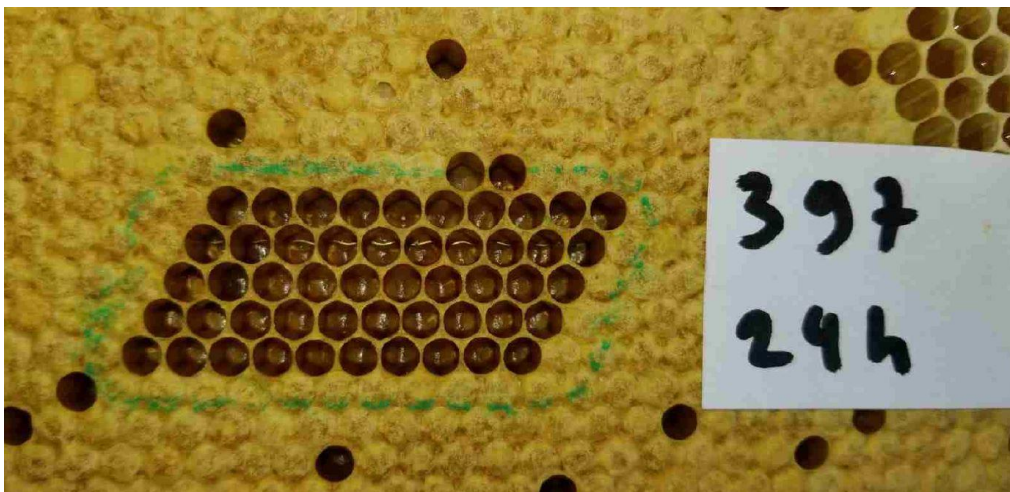


4. Gently push the stamp as far as possible and mark the test field & frame with a pen.

5. Place the note with hive name or number and the time next to the area & take a picture before hanging the frame back.



6. Take another picture of the area after 6 to 8 hours: Ideally many cells have been opened and a few have been cleared already.



7. Take another picture of the area after 18 to 24 hours: Ideally all cells have been completely cleared. The percentual clearing behaviour will be evaluated in a temporal context.



## Evaluation

If a bee colony possesses the genetic trait of brood hygiene (recognizing, opening and cleaning out) to a high degree, the time after the use of the needle stamp proceeds as follows:

After the cell caps have been pierced, the bees close some cells again.

After about 2-3 hours the bees recognize the dead brood and open the cells. As soon as a cell is open, it will be cleared out.

After approx. 6-9 hours the cells are partially cleared and cleaned.

After 20-24 hours at the latest, 80 - 100% of the cells are empty.

When a pupa is punctured, a fluid consisting of haemolymph, body fat cells and other organic material emerges. However, the organic material, which may also reach the cell cap via the needle, has no falsifying influence on the result of the pin test. (See study by [Gramacho, Gonçalves, Rosenkranz & De Jong, 1999](#)).

## Interpretation

A rapid clearance shows a pronounced hygiene behaviour overall. Possible reasons for this are, on the one hand, the pronounced genetic disposition or, on the other hand, training in the event of increased disease influence.

If there is little evacuation (**30%-40%**) **after 6 hours**, there is a wait-and-see attitude, and no conclusions are drawn initially.

In the case of complete clearance (**80%-100%**) **after 6 hours**, the reason for the rapid clearance must be identified. Is it a pronounced genetic disposition or a trained colony suffering from increased disease pressure?

If there is little clearing (**30%-40%**) **after 12 to 24 hours**, it becomes apparent that the genetic disposition for brood hygiene is present but must be maintained and also added to in the next inheritance.

With a complete clearing (**80%-100%**) **after 24 hours** at the latest, it can be assumed that there is a pronounced genetic disposition for brood hygiene.

The following possibilities of brood hygiene behaviour become visible:

### **Nothing was cleared:**

It is not advisable to rebreed with this colony (F1), even if it is also possible in a lengthy process to add characteristics of brood hygiene via the drone side in the population.

### **Little was cleared:**

The hereditary trait for hygienic behaviour seems to be present in the population. Here it

is important to find out which traits (recognizing, opening or cleaning out) are not or only slightly developed in order to be able to add the missing traits via drones.

### **A lot has been cleared:**

The task here is to stabilize and maintain the properties.

The result of a pin test is a snapshot, which is why it is advisable to repeat it under different conditions.

### **Influencing factors**

In addition to the genetic factors influencing brood hygiene and the test result, there are other internal and external stress factors. The test result can be falsified by

- extreme outside temperature (many bees are outside the hive & are reducing brood care).
- Flowers in full bloom, e.g. oilseed rape (bees are foraging and reducing their care activities)
- In the event of increased disease pressure (panic VSH, panic HYG+), shortly before the colony collapses
- External disturbance of the bees, e.g. by humans or animals
- Testing at the wrong brood stage (it should be Red or Purple Eye)
- Wrong disinfectant

## **Cleaning**

To prevent mold, virus infestation and bacterial infections, it is essential to clean the needle stamp after each use.

Cleaning is carried out with a kitchen sponge and a disinfectant (at least 70% alcohol). Isopropanol should be diluted with 30% water to ensure solubility in the cells.

The needle punch is immersed twice in the soaked sponge and must then be allowed to evaporate for 3 - 5 minutes before it can be used again.

### Caution with methylated spirits & vinegar:

Denaturants are usually added to methylated spirits. These residues and fragrances could affect the result of the test. The same applies to acetic acid.



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Further information via email [info@pin-test.com](mailto:info@pin-test.com) or on the website [www.pin-test.com](http://www.pin-test.com)