

# Using paraffin wax and steam chests to sterilise hive parts that have been in contact with colonies with American Foulbrood Disease

Mark Goodwin and Heather Haine,  
Hort Research,  
Ruakura.

The Apiaries Act gives MAF inspectors the power to authorise beekeepers to salvage equipment that has been contaminated with *Bacillus larvae* spores (the causative agent of American foulbrood disease). This power to authorise methods of salvaging equipment will revert to the National Beekeepers Association as management agency for the American Foulbrood Pest Management Strategy in July. The only method currently authorised is the dipping of hive parts for 10 min in hot paraffin wax at 150-160°C. Only supers, floor, lids, innercovers, feeders and queen excluders are wax dipped. Frames and combs are usually burnt.

Even though the technique has been used extensively in New Zealand for more than 30 years, the actual temperatures and times required to sterilise American foulbrood are unknown. Both 160°C (E Roberts pers. comm.) and 150°C (Matheson and Reid 1992, M Reid pers. comm.) have been recommended and are used in different parts of New Zealand. Hot paraffin wax dipping is also often used to preserve wooden hive parts.

Even though the effectiveness of paraffin wax dipping has not been tested, the lack of reports of colonies being reinfected after receiving treated hive parts suggests that it is probably effective in killing *B. larvae* spores. It is also possible that shorter times and lower temperatures are equally effective while still leaving enough leeway to allow for operator error. Lower temperatures would also have the advantage of making the process safer to use.

Although it is not authorised, some beekeepers use steam chests, that they have designed to melt wax off combs, to sterilise hive parts. Although we use autoclaves (which use steam under pressure) in our laboratory to kill *B. larvae* spores it is questionable whether steam chests could generate sufficient temperature and pressure to be effective.

The aim of this investigation was to determine the effect of different temperatures and times used for paraffin wax dipping and the ability of steam chests to deactivate *B. larvae* spores.

## Paraffin Wax dipping

American foulbrood spores were heat fixed to microscope slides and dipped in paraffin wax at a range of temperatures and times. The spores were then scraped from the slides, suspended in water and spread on bacterial culture plates and incubated to determine their viability. The number of *B. larvae* colonies per plate was then counted and those with more than 100 colonies was recorded as having 100 colonies.

Only temperatures of 150°C and 160°C had significant effects on spore survival (Table 1). While temperatures of 150°C for 6 minutes or longer and 160°C for 2 minutes or longer significantly reduced spore survival, only 160°C/10 min appeared to eliminate all growth.

However, it is possible, judging from the eight minute results, that there may have been a few surviving spores at this time.

Table 1: Survival of *Bacillus larvae* spores at a range of temperature and time combinations.

The importance of the surviving spores at 160°C after 4, 6 and 8 min is unknown. However, *B. larvae* spores are not particularly infective so relatively large numbers of spores are

needed to infect a colony. The few spores remaining at 160°C after 4-8 minutes are therefore to be an important reinfection risk. If the purpose of wax dipping is to kill all *B. larvae* spores, hive parts should be immersed in wax at 160°C for 10 min.

Not all beekeepers use thermometers and timers when they are operating wax dippers. As the time and temperature appear critical, timers and thermometers should always be used.

We repeated the 160°C/10 min test with spores on wood instead of glass slides to approximate wooden hive parts. We also encased spores in multiple layers of bees wax to determine if this would protect the spores. Neither of these factors resulted in spore survival at 160°C for 10 min.

## Safety

Care needs to be taken in handling paraffin wax at high temperatures. There is the obvious risk of burns so protective clothing should be

worn. Paraffin wax has a flash point of 199°C and care should be taken to keep the temperature well below this level especially when heating the wax with open fires that may result in wide fluctuations in temperatures. The most common problem beekeepers encounter is contamination of the wax with water which can cause the wax to boil over the side of the container and ignite.

## Steam chests

Microscope slides coated with *B. larvae* spores were placed in microscope slide holders along with steam sterilisation strips which indicate the sterilisation conditions reached in the steam chests. The slide holders were sent to beekeepers who opened them and placed them in their steam chests when next in operation. The slides were then returned to us and we checked them for viable spores.

The steam sterilisation strips indicated that the slides had received either insufficient steam penetration or, at best, partial steam penetration, but insufficient for complete sterilisation. None of the steam cabinets reached full sterilisation conditions. Viable spores were recovered from all the steam cabinets except one. This indicates that steam chests cannot be relied upon to sterilise *B. larvae* contaminated equipment and it is our recommendation that they are not used for this purpose.

## Acknowledgments

We wish to thank those beekeepers who assisted with this trial. The study was funded by the Beekeeping Industry Trust Fund.

## References

Matheson, A, Reid, M 1992: Strategies for the prevention and control of American Foulbrood. *American Bee Journal*. 132: 471-475.

Temperature (°C)	80	100	130	150	160
Time (min)					
0	100	100	100	100	100
1	100	100	100	100	100
2	100	100	100	100	32.0
4	100	100	100	100	4.6
6	100	100	100	21.6	0.1
8	100	100	100	6.4	0.1
10	100	100	100	0.6	0

Please don't tidy my mess,  
you'll only confuse me and  
mess up my life!!