



Please note that this is a draft protocol we are developing and testing.

Materials:

- Oxalic Acid crystals, stored in airtight container, clearly labeled
- Oxalic Acid vaporizer
- Timer. If you use your cell phone, remember timing is critical.
- Dedicated measuring spoon for crystals
- Respirator approved for oxalic acid fumes, one type from 3M is OV/N95. The respirator must be approved for acid gas.
- Acid resistant gloves, disposable
- Eye protection if respirator is only half-face.
- Wet rag, duct tape, painter's tape, foam etc. to block entrances
- Smoker, lit – used to monitor wind direction and to direct bees at entrance to move into the hive if necessary

Safety:

- Always wear your mask, eye protection and gloves. Breathing the fumes can cause severe irritation and burns to the throat.
- Avoid skin contact with the crystals as OA can cause a burning sensation. After hive treatment, rinse skin for several minutes with running tap water and eyes for much longer. Itching on skin means “rinse some more.”
- Keep a smoker lit to indicate wind direction and to notify you when wind shifts. As much as possible, work your hive upwind.
- Not for use with plastic/polystyrene hives, only wood hives.

Steps

1. Clean off sticky board and re-place because you are using it to measure mite fall.
2. Clear away excess burr comb from bottom edges of frames in first box. You can see it with a flashlight and remove it with an extra-long hive tool.
3. Light smoker.
4. Slide sticky board completely in. Seal all openings and entrances with materials you've chosen from materials list above, including sticky board slot and upper entrance.
5. Put on disposable gloves.
6. Add 1 gram per brood box, no matter the brood box size, of Oxalic Acid crystals to the head (pan) of your Oxalic Acid Vaporizer. You can use a $\frac{1}{4}$ of a teaspoon (which is the equivalent of one gram) as a measuring tool. For example, a colony with two brood boxes requires 2 grams for treatment or $\frac{1}{2}$ a teaspoon. For a nuc box, you would use $\frac{1}{2}$ a gram. Use “dedicated” labeled measuring utensils.



Steps (cont.)

7. Put the rest of your PPE on: OV/N95 respirator, eye protection, etc.
8. Calibration: If you have not used this vaporizer and this battery before, do Step 9 the first time, away from the hives without inserting the wand into the hive. Time how long it takes for the OA to completely vaporize, usually 2 to 2 ½ minutes and use that time to treat each hive.
9. Insert the vaporizer about ½ to ¾ of the way into hive from the front entrance, level and not tilted up against the frames. Resting on hive floor is better. A wet rag forms a good seal at the front entrance around the vaporizer wand.
10. Adjust your respirator to fit tightly.
11. Connect your vaporizer to the power source (12 volts) for the time measured in your trial outside the hive, probably close to two and a half minutes (possibly as long as three minutes, depending on battery).
12. If you see fumes leaking out, you can try to seal them.
13. Disconnect power source.
14. Wait 2 minutes and remove the vaporizer to prepare for the next hive.
15. Set the timer and keep the hive sealed an additional ten minutes. Or you can leave the vaporizer (still disconnected from the battery) inside the hive for the full ten minutes. Then remove all sealing cloths and materials.
16. You can seal the next hive while waiting.
17. Ensure the vaporizer is cooled down before reusing or storing. Wipe with a wet cloth unless the manufacturer suggests otherwise.
18. If you have brood repeat these steps every five (5) days for four (4) weeks. A total of 4 treatments are required, as the vapor doesn't kill mites in the capped brood cells and you need to vaporize those mites as they emerge with the brood during this time frame.
19. If you vape during a broodless period, then one treatment may be sufficient.

The vaporization is temporary and the acid form almost immediately a visible cloud of fine acid dust particles that are deposited all over the bees and the interior hive surface and anything else they land on, including your exposed skin and lungs if you don't wear the respirator.

Note: Start out by planning on doing a single hive from start to finish. As you get more experience, you will see that you can speed up the process by having two hives cycling through the process simultaneously: one hive started and carried through to the sealed-in stage after the wand has been withdrawn. Then, during the sealed-in stage on the first hive, another one is started with the freshly-filled wand, and so on. Treating a second hive concurrently requires an additional timer to keep the different cycles straight. However, since safety for both you and your bees should be your primary goal, start off slow and work your way up to doing more than one hive at a time.