

# Fumigants & Pheromones

Insects Limited, Inc.



Pat Kelley

## How Effective Was My Pest Treatment? – The Insects Can Tell Us

A worst-case scenario for many companies or organizations is finding materials under your care that have insect damage. Finding live insects or damaged materials with signs of insect activity can cause considerable anxiety about whether the insects are actively munching away on your products or if they have spread into other surrounding materials. A reasonable reaction to an infestation is to perform a treatment that will kill the insects that are doing the damage.



Photo by Eugenie Milroy, A. M. Art Conservation

*Example of a large scale anoxic envelope used in the treatment of museum objects*

Treatments aim to kill each and every insect in any phase of its life cycle by the time that the treatment has come to a conclusion. Recording and adjusting variables such as oxygen levels, gas concentration or temperature can be advantageous to let you know if you are in the correct range to kill pests, but how do you know if all of the insects were indeed killed at the conclusion of a treatment? Questions about the

efficacy of a treatment can be answered simply with the use of insect bioassays.



*Bioassays containing live insects provide a sure means of determining the efficacy of a treatment*

A bioassay is a “living test” of the effectiveness of your treatment. For pest eradication treatments, living insects can be incorporated into test vials or meshed bags and placed within the treatment enclosure and then inspected for mortality at the conclusion of the treatment. Insect bioassays are not new to the food and grain industries. They have been utilized in gas fumigation and chemical fogging treatments for several decades.

They have become a valuable tool for food suppliers and pest managers to judge the effectiveness of pest treatments. Bioassay samples can be incorporated deep inside pallets of finished food, placed inside dense wooden furniture, set inside storage boxes or simply set beside materials in the treatment enclosure to ensure that the effects of the treatment are reaching the locations that are the most concerning.

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*Examples of the meshed bags used for chemical fogging bioassays (top) and vial bioassays used for most other forms of treatment such as; fumigation, anoxia, heat and freezing (bottom).*

The bioassay can comprise any (or every) stage of the pest insect, E.g. Adults, eggs, larvae or pupae. The species of pest insects available include flour beetles, rice weevil, saw-toothed grain beetles, dermestid beetles, clothes moths, cigarette beetles, drugstore beetles and several other species. Different developmental stages of insect life cycles are used in the tests because the egg, larval or pupal stages of some insect species can be much more difficult to kill than the adult stage. By including samples of these difficult stages into the test vial, you can verify that the treatment killed (or did not kill) the most challenging stages of your pest.

Bioassays can be custom made as per institutional request. The exact species available for testing is based on which insect colonies are currently being reared in Insects Limited's lab. The insects are

counted out and placed into a plastic vial with a small amount of food to keep them alive for several weeks or more. A tiny hole is punched through the top of the insect vial that allows the passage of air, argon, nitrogen, CO<sub>2</sub>, and fumigant gasses into the vial, but small enough that the insects inside cannot escape. The vial is attached to a plastic card so that it can be easily retrieved following the treatment. The back of the card designates the species of insect in the vial and also allows you to write down the date of the treatment. To see a video of the process, click here:

<https://www.youtube.com/watch?v=hNGaoCIDDTk>

At the completion of the treatment, the inspection of adults is possible with the naked eye but checking on the mortality of other stages of insect development (such as eggs or pupae) may require the use of a hand lens or microscope. In some circumstances, the test insects may be completely immobile or sluggish at the conclusion of a treatment. Slight movement by the insects may indicate delayed mortality, a condition where all insects will be dead within a day. Unfortunately, small movements may also indicate that the insect's exposure to the treatment was not enough to kill them and they may completely recover after a period in fresh air. For this reason, it is important to re-check the bioassays 24 hours after being removed from the treatment enclosure to assess for survival.

If the egg stage of the insect is being used, it may be necessary to wait up to 2 months after the treatment to see if any larvae hatched out from the eggs. In the case of some of the insects, the eggs can hatch into

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larvae within one week from being laid or that time period can be as long as an entire month. The difference in hatch time is dependent on environmental factors. The waiting time prior to inspection is also based on the fact that when the larvae hatch, they are initially so small that they could be easily missed when performing the visual inspection. To put the size into perspective, more than five of the 1<sup>st</sup> instar larvae of Indian meal moths could sit side by side on the head of a pin while barely touching each other. Since they are so small, it is easier to see survivors if the larvae are given an extra month after hatching to grow into a more visible size.

As you find yourself in that moment of anxiety with an infestation, don't panic. Choose a treatment option that best fits your staff, your materials and your company/institution. Insect bioassays should answer important questions about whether a treatment has been successful or not. This information will help in the decision-making process of how to proceed best to protect materials under your care.

Insects Limited, Inc. [www.insectslimited.com](http://www.insectslimited.com)

Phone: 1 (317)896-9300

Patrick Kelley, Insects Limited, Inc.,  
[p.kelley@insectslimited.com](mailto:p.kelley@insectslimited.com)



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## Fumigation Service & Supply



Tom Sutton

## LEAN As It Applies to the Pest Control Industry

Utilizing “good manufacturing” practices is not a new concept. In fact, historians can date rigorous manufacturing processes back to the Venice Arsenal in the 1450’s. Today, Toyota’s LEAN principles seem to be the most widely accepted for many different industries, and pest management is no exception.

The fundamentals of LEAN are to improve processes and eliminate waste. This is done by the actual company employees creating more efficient ways of doing their jobs, while improving quality for the customer. These ideas are then presented to management, and at this time it is essential for management to determine the feasibility of the ideas and support these proven methods for sustained growth.

LEAN is simple to implement and even easier to sustain. The picture in this article is one idea; The problem for one customer was that the multi-catch mice traps were being moved from their designated area during cleaning. When the traps were placed back in their designated location they were facing the wrong direction. I can say I am thankful they tried putting them back. In some cases, the traps are moved to a completely different area.

People within the industry and outside of the industry ask the question, “Why does it matter which side of the trap is facing the wall?” Pest management is science, there are many published papers explaining why a pest that has evolved for several years as prey to much larger predators would want to utilize a wall when moving in an open, unprotected space. Because of the biology of this pest, the traps in use are designed to have the mouse entrance point against the wall.

In this industry many food facilities are audited for proper pest management and prevention techniques. Placing the traps back incorrectly after cleaning caused an issue when the customer had an internal audit. The auditors noticed the traps were not set up in the proper “best practice” orientation, which could affect the outcome of the audit.



*Example of properly labeled mouse trap in a facility*

The solution was simple and effective; place black tape in the designated area and “shadow” the trap. The other simple solution was to write which side of the trap should face the wall with an arrow indicating which direction is correct. This was only done on one floor of the multi-story facility and took about 20 minutes. Now, all new employees are sent to this floor to learn how to clean, and by using this technique of “Visual Management”, the employees know the correct orientation of the traps. This saves the customer having to explain to every new person how the traps should be put back after cleaning. It also ensures that as a pest control company, our IPM program remains successful and effective as intended. This is an example of how simple and beneficial to the company, and the client, LEAN can be.

This is one example, I challenge you to find your own opportunity for LEAN, and I promise, you will not have to look very far!