Fumigants & Pheromones

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Routing:

A Newsletter for the Insect Control & Pest Management Industry

Stored Product Protection

***Dr. Rudy Plarre**, Federal German Institute for Materials Research and Testing*

***Dr. Wendell Burkholder**, University of Wisconsin*

The protection of stored food against attack by insects and molds has been a necessity since the dawn of agriculture, or perhaps since humans began to manufacture primitive clothing and tools for daily use from plants or animal material. Protection of stored products, thus, has a tradition of tens of thousands of years and is documented in the earliest records of history.

Stored food and other products of plant or animal origin provide a habitat with shelter, food, and breeding sites for insects. Worldwide losses from these post harvest insects and other food pests are estimated to be from a few percent in developed countries to 20% in an average year in some developing countries. Under certain storage conditions, 50-100% of food is lost.

Several hundred insect species are associated with stored products. Most are beetles or moths. These can be divided into two main categories: species infesting dry botanicals (mainly grain seeds), and scavenger species infesting animal products (meat, fur, wool, feathers, etc.). Very few pest insects can feed and breed successfully on both plant and animal material.

The struggle between man and insects started long before the dawn of civilization.

Behavior of Stored Product Insects

The behavior of stored product insects is greatly influenced by semiochemicals. Living organisms, grain, microflora, insects, and mites, as well as decaying matter, produce an array of volatiles that combine with the oxygen, nitrogen, and carbon dioxide of the system. For example, enzymatic reactions in stored seeds produce unsaturated fatty acids that are highly attractive to a number of pests. Catabolism of decaying plant and animal matter enables pest insects to locate suitable feeding and breeding sites. Fungi have a distinct odor that is attractive to fungivorous species but repellent to others at high concentrations.

Communication is directed by a number of pheromones. Sex pheromones, nearly always produced by the female, attract mates. These pheromones comprise specific compounds or a highly specific combination of compounds. Aggregation

(continued on page 2)

IN THIS ISSUE:

Stored Product Protection

(continued from page 1)

pheromones, typically found in species with long-lived adults, are products by males and attract both sexes. Certain compounds of some aggregation pheromones are not species specific, and there is cross-attraction, especially among closely related species. In most cases, foods synergize the effect of aggregation pheromones.

insects. Sulphur was one of the first fumigants for stored product protection. The insecticide property of burning sulfur was known in the New Kingdom around 1,000 B.C. Toxic fumigants have the great advantage over contact insecticides of fully penetrating the commodity and therefore also killing internal infestations. However, the application of fumigants and pesticides is not risk free.

Today's pest control programs must therefore address health-related, ecological, and economic concerns. Modern pest control strategies in stored product protection focus on integrated pest management (IPM). The concept of IPM is based on using threshold levels to make control decisions and on the combination of physical, biological, and chemical pest control measures.

Although aggregation pheromones increase the likelihood that an individual will find a mate, the role of these substances as mating pheromones is not necessarily obvious. Several parasitoids and predators make use of volatiles to locate hosts and/or prey.

Protecting Stored Products Against Pest Insects

The ancient Egyptians intermixed ash with grain, which acted as abrasives on insects' cuticle causing desiccation. Today inert dusts on a base of diatoms are applied to grain. The Egyptians added specific herbs and spices to the commodities to repel pest

Environmental concerns and the potential danger to human health have led to a steady reduction of registered fumigants and contact insecticides. Incorrect handling of pesticides can lead to control failure and resistance.

In the past, eradiation of pests was the primary objective, and increasingly high food quality standards allow no, or only little, contamination of stored commodities. On the other hand, consumers demand foodstuff that is free of chemical residues. A zero pest tolerance can rarely be achieved without the application of insecticides.

Source: Encyclopedia of Insects, 2003, Academic Press, www.academicpressbooks.com, printed in part

Quotable Quote

"And Christie Todd Whitman, who's head of the E.P.A. has announced she's resigning next month. She's stepping down. President Bush was shocked. He didn't know he had an Environmental Protection Agency."

Jay Leno, May 21, 2003

Indianmeal Moth Biology

Minimum for population increase:
65° F (18° C)

Optimum for development:
84° F (30° C)

Maximum fordevelopment:
95° F (35° C)

Relative Humidity:

minimum	optimum
20%	75%

IMM life cycle is 25 days from egg to larvae to pupae to adult. Each female adult lays 200-500 eggs in her short life span of 7-10 days. The Indianmeal moth remains the number one stored product insect pest in the United States.

Future Fumigants & Pheromones Conference:

First Announcemnt
7th Fumigants & Pheromones Conference - March 2005
Monterrey, Mexico

September 17-19, 2003*
Nestle Purina Food Safety Symposium, Sedona, AZ

October 1-3, 2003*
Int'l Association of Operative Millers, Nashville, TN

October 7-9, 2003*
Kentucky Pest Control Short Course, Lexington, KY

October 15, 2003*
Minnesota Food Processing Conference, Minneapolis, MN

November 3-6, 2003*
10th Annual Research Conference on Methyl Bromide Alternatives and Emissions Reduction, San Diego, CA

November 5, 2003*
Association of Midwest Museums, Milwaukee, WI

August 8-13, 2004*
International Conference on Controlled Atmosphere and Fumigation in Stored Products, CAF 2004, Gold Coast, Australia

** Invited presenters include: Dave Mueller, Pat Kelley, or John Mueller*

Dave's Soapbox

...for what it's worth

When is enough...enough?

For most of my life I believed that the purpose in life was to collect wealth. The saying **"THE ONE THAT DIES WITH THE MOST TOYS WINS"** is the way many of us observe life as a competition. Most men especially live by this rule. Think about these: Who has the newest and fastest and most powerful car(s), largest house(s), biggest and fastest boat(s), newest and smallest cell phone, newest and smallest computer, biggest office, best big office with the best view, largest stock portfolio, biggest and most expensive watch, (you fill in the blank). The list for women can be even bigger and more detailed.

Now that I approach the age of 50, I have a new priority in life: *Knowing when enough is enough.*

If you are looking for the message in this article about fumigants, pesticides, stored product protection or even cell phone usage you can stop looking now. This is about something much different.

If we stop each day and hum the phrase: *The goal in life is to determine when enough is enough*, we will get a glow or calm on our face. We will slow down and start letting cars go first at the intersection, let the mother with the small children go first in the grocery line. Maybe we will leave the office by 5:00 p.m. and go home and start the barb-b-que grill and enjoy a favorite beverage without walking around pulling weeds or straightening the garage.

Now I understand this will be hard for Americans. I grew up in the Midwest in a house with five children and a father and mother that lived through the Great Depression. My dad awoke to shine his shoes on the back step before he left for work at the flour mill at 6:30 every morning. This was our definition of work. We had to listen for the only bathroom in order to get to school on time—that was our alarm clock. The only car in the family left at 6:30 am. If you wanted a car in this family the line was long. I received my first car when I was 22 years old when I got my first job after college.

We as Americans are great collectors because many of our parents had to make great sacrifices just to survive. As children of the children of the Depression we collect and store more things than our children. If you don't believe me, go to your closets and look at the 30-year accumulation of T-shirts that you have collected. Most of the concert T-shirts that you have collected have members that have died of natural causes by now. T-shirts can be thought of as an historical calendar of sporting event championships or near championships (except if you are a Chicago Cubs fan).

Well, what's your message, Dave? My point is simple. Everyday we work hard to accumulate one more "thing," or addition to our "Big Toy" collection. Maybe there are things more important in life…how about starting with our health, and a cleaner environment than we inherited, how about living in a world where we don't have to lock our bicycles, cars or homes. That's a good start for now…*enough is enough.*

D. K. Mueller

UNDP Project in Mexico

Team of experts on methyl bromide alternatives in commodities and structures David Mueller, Insects Limited, Inc, César Altamirano Lemma, Fumitec, Mexico, Dr. Josue Leos-Martinez, U.A.N.L., Mexico, Dr. Enrique, ITESM, Mexico, Dr. Luis Tejada Molina, ITESM, Mexico.

The United Nations Development Programme of New York is an implementing organization for the Montreal Protocol. It contracts with fumigation experts from around the world to help accumulate information and write projects for phasing out methyl bromide. In Mexico, David Mueller of Insects Limited, Inc, was contracted by UNDP to gather a team of experts to survey the changes and trends of use for methyl bromide and help write a project document for grain, milling, dried fruit and nuts, and other stored products. This information then goes into a larger soil fumigation project written by UNIDO of Vienna.

A survey was sent to post-harvest fumigators throughout Mexico. This survey then provides information for the UNDP phase out project.

The second part of the project is doing five demonstration projects in Mexico on flour mills, recirculating phosphine in silos, IPM in food factories, diatomaceous earth/Neem for organic milling, protectants on grain.

The third part of this proposed $10+ million dollar methyl bromide phase out project is to implement alternatives and training to reach sustainable methyl bromide reduction to acceptable levels under the Montreal Protocol.

COPENHAGEN 2003

Elin Miller, Michael Allan, Jeff Welker

Dr. Thomas Stotenberg

Cindy and Eric Eichler

On June 3 the International Fumigants & Pheromones Conference and Workshop, with over 175 people from 30 countries, converged on the European capitol city of Copenhagen to listen to 31 experts present their ideas on stored product protection.

Copenhagen graced the meeting with its renowned Scandinavian Summer—that period of June when the weather is perfect. Besides the varied lectures, poster displays, formal discussions, and museum workshop, the conference offered time to enjoy the city and its surroundings. One of the highlights of the conference was the Harbor Cruise after the last night of the conference. The boat offered a perfect place for attendees to 'take off their ties' and enjoy a fine Danish seafood dinner along with live music and refreshments. Copenhagen's harbor has a long history and this excursion stopped at a harbor fort before heading home. Several members of the conference took the stage to perform their favorite songs during the Harbor Cruise, which turned out to be some of the best entertainment.

Luis V. De Moura and Luis G. De Moura

Pat Kelley

Dr. Horn with his spider.

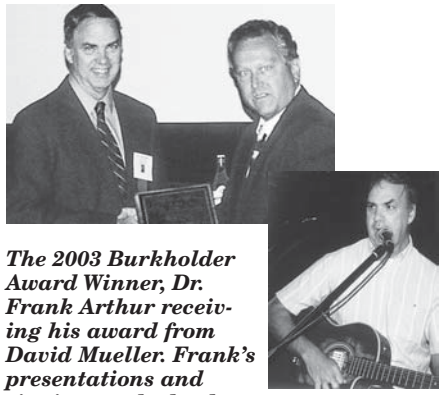
The final day of the conference found 120 people attending the Museum Workshop at the famous National Museum of Denmark. The speakers from this day offered many non-toxic alternatives to conventional pest management. This concluded the conference and workshop but many of the people took the weeks end to explore Denmark and nearby Sweden. This part of the world offers much civility and beauty.

Insects Limited's International Distributors

In all, the Conference in Copenhagen was a big success. Articles from guest speakers will be found in future articles of *Fumigants & Pheromones*. To see over 100 pictures from this international meeting, explore our web site at **www.insectslimited.com**.

Dr. Moto Hirao, Nancy Lee, Roger Chen, Frank Lin, Dr. Lee-Shin Tsai

Organizers Henrik Lange, Lona Lange, and David Mueller.



The 2003 Burkholder Award Winner, Dr. Frank Arthur receiving his award from David Mueller. Frank's presentations and singing on the harbor cruise were well received.

Methyl Bromide: *Myths & Facts*

MYTH: Methyl Bromide does not have a significant impact on ozone.

FACT: Atom for atom, bromine from MB is 45-60 times more damaging to ozone molecules than chlorine from CFCs (Freon®, aerosols). Over half of the ozone depleting substances on this planet are from Methyl Bromide. Methyl Bromide's relatively short lifetime means that it exerts its effect rapidly on ozone, having an impact during the next few years when the ozone layer is most vulnerable. The existence of natural sources of MB does not justify continued release of current human emissions. Natural sources, like the oceans, form a natural background level. Ozone depletion is caused by *additional* sources—these arise from human activities, primarily use of MB fumigants. *(NASA's Scientific Assessment 2002, p.1.29)*

MYTH: There are no alternatives to Methyl Bromide.

FACT: There are alternatives for the vast majority of MB uses: *The Methyl Bromide Technical Options Committee (MBTOC) assessments of 1994, 1998, and 2002* have identified a wide range of alternatives. The MBTOC assessment concluded: 'there are existing alternatives for more than 93% of current consumption of MB, excluding Quarantine and Pre-shipment (QPS)'.

MYTH: Methyl Bromide provides complete control of pests.

FACT: Although MB is very convenient; it is not the perfect structural fumigant. MB treatments sometimes fail, leading to diseased plants and structural fumigation failures. Studies conducted in US food facilities show that MB often does not kill 100% of the pests as claimed. The studies found that, in commercial practice, MB killed only about 85-95% of the pests in food facilities. Yet MB-proponents are demanding that alternatives should kill 100% of pests.

MYTH: Methyl Bromide does not pose risks to human health

FACT: Methyl Bromide is a highly toxic chemical, listed in the US as a Category 1 acute toxin. The World Health Organization states that MB is neurotoxic (i.e. damages the nervous system) and that 'MB gas can be fatal if inhaled' *(WHO 1994)*.

A new US study by the National Cancer Institute studied 55,300 male pesticide applicators found that MB had a statistically greater risk of developing prostate cancer, particularly those who had longer exposure to MB. The study noted that the US National Institute for Occupational Safety and Health had listed MB as a potential occupational carcinogen *(Alavanja et.al. 2003)*.

A number of countries (e.g. Austria, Germany, Saudi Arabia, Netherlands, Switzerland, Denmark, Sweden, Russia) restricted or prevented many MB uses long ago, for health, safety and environmental reasons.

"Critical Use Exemptions will not be eligible if alternatives, like Profume® fumigant, become registered by the EPA for flour mills and food processing structures before January 1, 2005."

METHYL BROMIDE ALTERNATIVES COMPARISON for COMMERCIAL STRUCTURE FUMIGATIONS

	Duration *(hours including labor & sealing)*	**Estimated Costs/ 1000 ft.³ Materials**
Methyl Bromide	24-48 hours	$20.00/ 1000 ft³
Heat+CO_2+PH_3	24-48 hours	$18.00/ 1000 ft³
Year round IPM	replacing the need to fumigate	varies
Fogging + IGRs	2-24 hours	$3.00/ 1000 ft³
ECO_2FUME	48-96 hours	$12.00/ 1000 ft³
ProFume™ (sulfuryl fluoride)	24-48 hours	not available
Pheromone Mating Disruption	on going	$7.50/ 1000 ft³
Heat treatment	24-48 hours	$20.00-40.00/ 1000 ft³

What's Hot this Summer?

Every year brings a new twist. This summer there are two hot issues—fogging and empty bin treatments.

Fogging

Many warehouse managers, sanitation managers and others are going back to fogging. The high cost of methyl bromide fumigations have forced these managers to find ways to stay within their budgets, and with this economy, even reducing their budgets. This is being done with a heavy increase in **strategic foggings**. Some of the foggers we have had success with are the Cyclone [treats up to 256,000 cubic feet] the Tornado [treats up to 384,000 cubic feet] and the Micro-Gen E-44 [300, 000 cubic feet] electric foggers. These units are very durable and compact. You can use a wide variety of fogging compounds and the droplet size meets the 20 micro target range. A key to foggers is the ability to have the units repaired and both the Cyclone and Tornado can be sent in for quick repairs. If you have more questions regarding foggers, please call 800-992-1991 or log on to www.FumigationZone.com.

Cyclone

E-44

Empty Bin Treatment

The grain industry is going through a "clean-out". Corn storages are very low and many grain facilities are empty. This cycle lends a great opportunity for grain storage managers to treat these empty structures and eliminate the "live stock" [insects] which have developed in the aeration ducts and flooring. If these insects go untreated they can readily infest new crops placed in these storages.

Two empty bin residual insecticides we currently suggest are Tempo™ [cyfluthrin] and Reldan® [chlorpyrifos-methyl]. Both products work well for empty bin treatments. It has been long suspected that Reldan® could be eliminated, but things are looking up for Reldan® these days. EPA is expected to lower the permissible levels for Reldan® from 6 PPM to 3 PPM and retain this useful tool for the grain industry.

Get into the Zone

By John Mueller

Fumigation Service & Supply, Inc. has opened its own website—**www.FumigationZone.com.**

FumigationZone.com is an exciting site designed to keep our customers up-to-date with our rapidly changing industry. We have a direct link to our new catalog, fumigation study materials, a fumigation quiz, and a "Hard-to-Find Fumigation Tools" catalog. This website's total focus is to be functional, useful, and fresh. We will be focusing on making this website a resource to our customers, a resource they can check from month to month to stay current and professional.

FumigationZone.com's homepage is full of exciting fumigation pictures. This site allows you to choose with ease where you would like to go, there are subsections for the grain industry, commercial pest control division and our Food Safety Specialists.

If you have a special need of request just log on, find your industry group, find out what is new, and direct questions to the appropriate division manager.

Stay current and visit our new website

www.FumigationZone.com

Pest Treatment of Museum Collections

Preserving Our History

By Patrick Kelley
Copenhagen 2003 Presenter

Conservators, collections managers, curators, and pest management professionals alike face a difficult task when invaluable museum collection pieces have potential or active insect infestation. Historically, fumigants or extreme poisons have been the norm for any museum pest problem. Even to this day, museum staffs have to be careful of contact with old taxidermy mounts due to a covering of arsenic!

For the past several years, there has been a definite trend to stay away from conventional fumigants in these situations. Options such as extreme temperatures and oxygen deprivation (anoxia) offer great means of insect control without the toxic aspect. Inert gasses (Carbon dioxide and nitrogen) can also offer control with less restrictions. These less toxic applications are great tools to protect collections, but damage to artifacts and unsuccessful fumigations with inert gasses still occur quite frequently.

Although conventional fumigants have gone by the wayside for many museums, there are still quite a few situations that clearly point to their use. The three mainstream fumigants that are available to licensed applicators are methyl bromide, phosphine and sulfuryl fluoride. All three, if applied correctly, will do an excellent job of killing all stages of insects deep within objects (even dense wood). A fresh look at each one will show caretakers that conventional fumigants can be a viable option for some museum pieces. Of course, with any treatment, it must be remembered that museum pest management is the ultimate in **"situational" pest control**. Every component of every piece of every group of collections must be studied to look for interaction with particular fumigants. Here are some basic facts about fumigants and other control measures and how they react with materials:

Some Treatments used in Museums and Their Effects on Materials

TREATMENT	EFFECTS
Dichlorvos (Vapona)[1]	Dissolves waxes, lacquers and rubber. Corrodes metals at high humidity
Methyl Bromide	Can cause a disagreeable odor with sulfur containing materials. Do not use with items containing hair, hide, feathers, fur, wool, latex or foam rubber, carbonless copy paper or cinder blocks.
Phosphine	Corrosive to copper and copper alloys. Also reacts with silver, nickel, gold and aquamarine
Sulfuryl Flouride (Vikane)	Purest form of gas is un-reactive to most museum pieces. Trace by-products of the gas synthesis can cause tarnish to unprotected metals. Condensation from misapplication of the fumigant can also cause damage
Freezing	Can damage ivory, teeth, wax, film, stretched skins, oil or acrylic painting on canvas, antique glass, wood with dry or failing glue, inlays and veneers with damage, wood with cracks, composites made with these materials and water saturated materials
Heating	Not conducive with objects containing wax or resins, untanned or deteriorated leather or collagenus material and paintings
Carbon Dioxide	Gas straight from a cylinder without humidification can cause desiccation and warping of moisture sensitive materials. Very difficult to contain the gas long enough to achieve an insect kill unless done in a specifically designed chamber
Nitrogen	Gas straight from a cylinder without humidification can cause desiccation and warping of moisture sensitive materials. Very difficult to contain the gas long enough to achieve an insect kill unless done in a specifically designed chamber

(1 Baker, M.T., H. D. Burgess, N.E. Binnie, M.R. Derrick and J. R. Druzik, "Investigation of the Fumigant Vikane(", Preprints ICOM 9th Triennial Meeting Desden, German Democratic Republic 26-31 August 1990, Volume II, Working Group 25 - Control of Biodeterioration)

These one-day skill building workshops share the experience and practical knowledge of field-tested experts that will help train you and your staff.

Insects Limited, Inc. has announced the dates of continued education training for 2003 and 2004. Mark your calendar, get details on the Internet, and register early.

December 10, 2003

Fumigation Update

This continued education course is designed to offer certified applicators a review of changes in fumigant labeling, new products, fumigant stewardship training, and case studies from the real world. Much has changed since the word that methyl bromide is to be phased out in January 1, 2005. New ideas and technologies have emerged at a rapid pace. This continued education program will educate you on these new ideas, new products, and technologies. CCH's applied for in IN, IL, OH, TN, GA, SC, AR, VA, and WI. Cost: $295.

January 20, 2004

Basic Insect Identification Workshop— Start with the Insect First

Upon completion of this workshop the student is expected to be able to identify most of the common stored product insects associated with grain, food processing and museums. Emphasis will be on the identification features but will include basic biology, conditions conducive to infestions, damage, detection, and collection of field insects. Quizzes will be used to reinforce ID features. Instructor: Alain Van Ryckeghem. Continued education credits have been applied in IN, IL, OH, TN, GA, SC, AR, VA, and WI. Cost: $295.

January 21, 2004

Initial Fumigation Training—

Basic Fumigation

This one day training program is designed to train fumigators that need to take their fumigation exam. The Indiana State Chemist's Office will offer their fumigation exam at the end of the training program (Category 7D). People wanting to obtain training for other state fumigation licenses can attend. For more information contact: www.insectslimited.com. Cost: $195 per person.

January 22, 2003

Alternatives to Methyl Bromide

Advances Fumigation

This one day workshop will be held at the new Westfield training facility. Nowhere else can you receive tailored training to your particular needs and experience level. This course will start in the classroom and finish in the field to see for yourself how these alternatives to methyl bromide are used. With the impending phase out of methyl bromide, this workshop is important to help you selection from the menu of choices that are available and the advantages and disadvantage of each. This staff of instructors is the leaders in ozone protection technologies. They have worked on projects for alternatives to MB throughout the world. These experiences will be discussed in a case study format. Continued education credits have been applied for. Continued education credit has been applied for in IN, IL, OH, TN, GA, SC, AR, VA, and WI. Cost: $344 per person.

February 24, 2004

Pest Management for the Bird Food and Popcorn Industries—

Targeted Skill Building

Bird food and popcorn are grains that are highly attractive to stored product insects. This one-day skill building course will discuss basic pest management and insect ID during the morning sessions and review control methods in the afternoon. Many large retail companies are asking for a higher standard from the bird food and popcorn industries these days. This course is designed to bring the standard of food quality to a higher level. Continued education credits have been applied for in IN, IL, OH, TN, GA, SC, AR, VA, and WI. Contact www./insectslimited.com for more information. Cost: $295. per person.

Classroom limitation: Registration is limited to 35 enrollees per workshop. Past workshops have filled up early. To receive more details and to register, log on our website www.insectslimited.com and select CONFERENCES or call 1-317-896-9300 and ask for our workshop brochure.

NEWSLETTER

Fumigants & Pheromones is published by Fumigation Service & Supply, Inc. and Insects Limited, Inc. We hope that the information that you receive from this newsletter will help you in your business, and you, in turn, will support our business efforts. If you have an associate who would be interested in receiving this newsletter, please contact the address below. We would welcome any comments or suggestions for topics. Address correspondence to: David K. Mueller, Fumigation Service & Supply, Inc., 16950 Westfield Park Rd., Westfield, IN 46074 USA.

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