35 YEARS

Fumigants & Pheromones

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It's a Bird! It's a Plane! It's... a Pesticide!

by Pat Kelley, BCE

Like Clark Kent changing into Superman, some insecticides begin as mild-mannered chemicals that literally couldn't hurt a flea. Where Superman would use a phone booth (What's a phone booth?!?) to make his change, one particular group of insecticides changes into more powerful and deadly compounds within the cells of an insect's body. This chemical alteration is called biotransformation and the pesticides that exhibit this change are called "pro-insecticides."

Pro-insecticides become stronger after they enter an insect's body.

Due in part to exploration into nerve gasses during WWII, approximately 90% of the insecticides on the market today attack and kill insects through their nervous system. To defend against these types of poisons, insects and people alike have protein-based defense mechanisms built into their cells that are designed to remove foreign substances. As an example, after a heavy night of drinking, human bodies detoxify from excessive amounts of alcohol with the help of an enzyme named Cytochrome P450. This enzyme binds up with alcohol and chemically changes it into water and other byproducts that are more easily passed through and out of our system. Hangovers and extreme thirst after binge drinking are due to this enzyme flushing out the alcohol as well as a majority of the water that is stored in our body tissue. We basically become dehydrated during this process and we feel bad or sick the next morning.

In the same way, when an insect comes in contact with foreign chemicals, cellular-level warriors such as Cytochrome P450 enzymes quickly get to work to convert the toxic chemicals into water molecules that can be flushed out of the insect's system. While typical insecticides are designed to trick or overpower Cytochrome P450 enzymes in order to reach the nervous system of the insect, pro-insecticides embrace these enzymes. In the case of pro-insecticides, instead of detoxifying these chemicals, the enzymes actually activate the chemicals. This converts them from relatively non-toxic compounds into deadly pesticides. A few examples of pro-insecticides are thiocarbamate insecticides as well as the pesticides indoxacarb, sulfuramid, and chlorfenapyr. One big advantage of pro-insecticides is that their mode of action to kill insects is very different than most standard insecticides. Because of this, they make a great choice when one is looking to rotate pesticide products in order to reduce the likelihood that insect pests will develop resistance to any one type of insecticide. Although it's not quite bug "kryptonite", pro-insecticides can really be a pest's biggest weakness.

Fumigant Research

by Ellen M. Thoms, Ph.D.

Global Technical Leader,
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Dr. Ellen Thoms, a Global Research Leader for Douglas Products, provided an overview of results for extensive state-of-the-art toxicology research on sulfuryl fluoride (Vikane® and ProFume® gas fumigants, trademarks of Douglas Products) conducted by Dow Chemical for the current EPA registration review of non-soil fumigants. This research verified that inhalation is the primary route of exposure to Vikane and ProFume. Inhaled sulfuryl fluoride is rapidly absorbed, metabolized, and eliminated in mammals. No sulfuryl fluoride is found in blood, tissues, or urine of tested animals. Instead, sulfate, fluorosulfate, and fluoride, are the metabolites found in blood, tissues, and urine. Sulfate, a normal constituent of the body, is generally regarded as safe. Fluorosulfate and fluoride are rapidly eliminated from the blood plasma and tissues. Fluoride is also cleared through uptake into bone. Ingestion of food commodities fumigated with ProFume does not result in chronic exposure to this fumigant or its metabolites. Residues of ProFume (sulfuryl fluoride) in fumigated commodities are transient and continue to rapidly decrease through desorption to levels of no concern. Only trace concentrations of the metabolite, fluoride, may remain in fumigated food commodities, depending upon commodity and dosage of ProFume.

In addition, Dr. Thoms reviewed efficacy results of two field studies conducted with ProFume to fumigate stored sorghum in commercial tarpaulin-covered bunkers in Queensland, Australia and stored wheat in metal silos at Oklahoma State University (OSU), USA.[1] Four storages in each state, including earthen, metal or concrete-sided grain bunkers in Queensland, were fumigated. Concentrations of ProFume within each storage were measured throughout the exposure period, ten days for grain bunkers and one day for grain silos, to confirm dosages prescribed by the label-required Fumiguide™ were obtained. Prior to fumigation, bioassays containing stored product insects were placed in ten locations within each bunker and two locations within each silo. Bioassays in both studies included the red [rust] flour beetle (RFB) and lesser grain borer (LGB). In bunkers, the flat grain borer and rice weevil were also evaluated in bioassays. Results of both studies showed complete control of all adults immediately post-fumigation, and nearly complete control of all eggs (as indicated by reassessing any new adult emergence in bioassays about two months post-fumigation). Both studies show that label prescribed dosage of ProFume can effectively control all life stages of stored product insects, including phosphine-resistant insects, infesting stored grain.

Adelaide 2016: Dr. Paul Fields, Janet Rowley, Wes Otani, Matthew Stein and Dr. Ellen Thoms.

1 The OSU study has been published in the Journal of Economic Entomology, in collaboration with Dr. George Opit (OSU) and Dr. Tom Phillips (Kansas State University).

Dave's Soapbox

...for what it's worth

by David Mueller

We are very proud of our accomplishments at FSS and we work diligently so we can help our customers lower customer complaints. We celebrate that we are a professional organization comprised of individuals who are challenged each day in many ways and we strive to offer customer service beyond expectations.

35 YEARS

It is not just the quality of the service or the detailed documentation. It's not the accolades or the educational sessions. It's not just the robust safety program and the research and technology that drives our success. What makes FSS great is the people that work with you. It's the kind of people who give up weekends and holidays with their families because that's when you need them to help solve your problems. It's the people who answer their phones early in the morning or late at night to help deal with emergencies. Clients have come to expect excellence when hiring FSS for their products and services. People have to care in order to provide that level of service for 35 years. FSS exists because of adapting to new rules, insect resistance, and prolific rodents, but we have succeeded for 35 years because of you the customer.

Ways to Better Serve You...

1 Technical Support: Our team of entomologists believes you should start with the insect first. A fumigation for rice weevils is different than that for flour beetles which is different than that for fungus feeders. FSS provides premium custom fumigations and IPM to protect stored products. Insects Limited specializes in various non-toxic applications of pest management and is a leader in pheromone technology and technical support. As sister companies, we share our talents and experiences. We study the science to practice the art. Our free 'Dirty Dozen' stored product insect posters are a great training tool.

2 Newsletters: Since 1981, FSS has offered updates and industry news for protecting stored products. Over 1.5 million Fumigants & Pheromones newsletters have reached over 60 countries over the past 35 years. We hope the free information will help you in your business and you in kind will help support ours.

3 Education: Since 1981, we have organized, planned, presented, and participated in educational programs locally, nationally, and internationally. We believe that if you want to be professional, you must stay current and relevant. Here at home, we also offer college scholarships and summer employment to our employees' children.

4 Trade Associations & Organizations: FSS continues to support many trade associations that support you: National Feed & Grain Association, Grain Elevator & Processing Society (GEAPS), International Association of Operative Millers (IAOM), Ohio Seed Trade, Popcorn Institute, Kentucky-Agri Business, Illinois Pest Control, Ohio Pest Control, Ohio Agri-Business, Michigan Agri-Business, Michigan Pest Control, Wisconsin Pest Control, American Association of Museums, Pi Chi Omega – Pest Control Fraternity, Purdue University, Illinois Crop Improvement, and Entomology Society of America.

5 Customer Service: Most orders received by FSS and IL are shipped out the same day. Our box truck can pick up and deliver fumigants directly to your site. We stand ready to do emergency fumigations caused by untimely shutdowns. We continue to be ready by stocking essential fumigant products year round.

6 Communication: When you call our office a person answers the phone. Clients have direct access to our trained and experienced technical staff. Our website is full of useful documents and training material. We keep our Safety Data Sheets (SDS) and pesticide labels online and current.

7 Website and Social Media: FSS has recently updated its modern and informative website. Our social media committee meets monthly to

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Insects Limited Fights Cancer

by Lisa Orbaugh, Team Captain

The American Cancer Society Relay for Life movement is the world's largest and most impactful fundraising event to end cancer. It unites communities across the globe to celebrate people who have battled cancer, remember loved ones lost, and take action to finish the fight once and for all. Everyone who participated on our team has been affected by cancer in some way. By walking around a track for up to 24 hours, teams raise money and awareness to help the American Cancer society save lives. The money raised enables the American Cancer Society to help people facing the disease, educate people about how to reduce their risk for cancer, and fund cancer research.

Insects Limited participated this year on May 20–21, 2016. Our team consisted of ten participants competing under the name "Westfield Bug Thugs." The relay was held at the local high school in Westfield, Indiana. Our members walked many miles around the track. The relay has several events to participate in or watch. The Luminary and Survivor ceremony are the most touching events. The relay had bounce houses and fun things for children to enjoy. It offered something for all ages. Our relay held in Westfield, Indiana raised $74,787.42. Our team from Insects Limited enjoyed participating and spending time together. We're already discussing fundraising ideas for next year's relay. We want to do our part to help the fight against cancer.

Dave's Soapbox

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upgrade the various sites. Our new YouTube videos offer training on fumigation techniques and insect identification. www.fumigationzone.com

8 Pheromones: Our chemists and entomologists research, synthesize, and field-test new pheromones for stored product insects. I know of no other private company that does this in-house. If you consider that these pheromones were first developed and used in the early 1980s, that was exactly when Insects Limited began.

9 USDA Certified Export Fumigation Sites: Three USDA licensed export fumigation sites are maintained year round in Westfield, IN; Heyworth, IL; Joliet, IL.

10 Safety & Compliance: This includes Fumigation Management Plans (FMP) and state licensing. We comply with multiple certifying bodies and prequalifying programs, onsite and in house safety supervision and compliance. Our drivers are CDL Hazmat certified. Our campus complies with DHS storage requirements. We comply with your safety standards. All FSS employees have background checks, physical exams, and submit to random drug testing.

Happy 35th Anniversary, FSS, and thank you to our customers for allowing us to serve you. We look forward to continuing the relationship.

D. K. Mueller

The Pheromone Kitchen

by Alain VanRyckeghem, BCE

We are lucky at Insects Limited to produce most of our important insect pheromones in the lab and thus have control of inventory and quality of product going to the customer. Did you ever wonder what goes on in the pheromone synthesis lab?

It can be a lot like cooking in a kitchen. You can create a finished product like soup, but along the way there are several steps of preparation, cleaning, boiling, filtering, and of course tasting. Pheromones begin with raw (chemical) ingredients. The recipe to get from step one to step two may vary from one chemist (cook) to another, so it is the chemist's choice of ingredients and how to combine them that can determine the quality, quantity, and chemical structure (flavor) at the end of each step. Chemists 'taste' the product along the way with a gas chromatograph. If that batch of product is substandard, it is thrown out (properly disposed of) and the process has to start over.

Sometimes the ingredients are boiled in order to combine them; other ingredients are frozen to -110°F before they can be combined because they will catch fire (now that is spicy!) Often we have to combine them under nitrogen (no air) again because they can catch fire. After completion of an initial product, it may be filtered to remove solids, or it could be distilled like whiskey to get the pure ingredient (alcohol, for example). The purity of the product is our most important factor before we move on to the next step.

Alain VanRyckeghem "cooks up" a batch of pheromone in the synthesis lab at Insects Limited headquarters

Some of the pheromones require only a 'one pot' assembly and the product is made in a day or two of mixing. Purification can take several more days afterwards. A few of our pheromones have several steps (from 6 to 15). The more steps there are the more costly the pheromone becomes because you get less and less after each of the purification processes. The glass pots we use range in size from as small as a shot glass to as big as a keg of beer.

Once the pheromone is made it is either used on its own or combined with other pheromones to make a blend that is specifically attractive to one or two insect species. Because of our on-site chemistry lab, we are able to manufacture pheromones for minor pests that most other chemical manufacturers will not do because of low volume. These include: Cigarette beetle, Hide beetle (8-pheromone blend), Varied Carpet beetle, Black carpet beetle, Furniture carpet beetle, Lesser and Larger grain borers, Rice weevils, Granary weevils, Angoumois grain moths, and, of course, our Clothes moth pheromones.

Life of the Spider

by JH Fabre

J.H. Fabre became one of the greatest entomologists in history; not because he was a faculty member of a prestigious University like Oxford, Cambridge, or Harvard, but because he, like Darwin, was a great observer. He would sit for days and observe the habits of one insect or spider in a small lot near his home in rural France. His ability to communicate his observations in over a dozen books became a must read in the early 1900's for children and adults. Napoleon III wanted to bring him to Paris to be the national scholar of France. Fabre refused the invitation and he returned home to continue observing and teaching.

PHOTO: Wikipedia

Fabre was one of the first scientists to recognize pheromones. He placed a small box with a female moth near a screened window in his lab. He observed several male moths, of the same species, actively flying on the outside of the screen. He was one of the first to observe and understand the effects of insect sex-attractant pheromones back in the 1880's; about 100 years before modern scientists were able to identify their molecular structure, synthesize, and use them commercially.

Here is an example of his poetic prose about spiders from his book called "The Life of a Spider" written in English in 1912:

"The Spider has a bad name: to most of us, she represents an odious, noxious animal, which everyone hastens to crush under foot. Against this summary verdict the observer sets the beast's industry, its talent as a weaver, its wiliness in the chase, its tragic nuptials and other characteristics of great interest. Yes, the Spider is well worth studying, apart from any scientific reasons; but she is said to be poisonous, and that is her crime and the primary cause of the repugnance wherewith she inspires us. Poisonous, I agree, if by that we understand that the animal is armed with two fangs which cause the immediate death of the little victims which it catches; but there is a wide difference between killing a Midge and harming a man. However immediate in its effects upon the insect entangled in the fatal web, the Spider's poison is not serious for us and causes less inconvenience than a Gnat-bite. That, at least, is what we can safely say as regards the great majority of the Spiders."

New Certified Entomologist (ACE)

Josh Wilhelm, Regional Manager for the FSS Ohio Office, is our newest associate certified entomologist. Josh has worked with FSS since 2008. He is married and has three children. He is active in his church and enjoys outdoor sports and hunting.

FSS has nine board certified entomologists and associated certified entomologists. The requirements for this certification include written testing, classroom training, and years of experience. This certification will allow Josh and others in FSS and Insects Limited the ability to offer a recognized professional status by meeting standards set by the Entomological Society of America. Congratulations, Josh Wilhelm. You can contact Josh at j.wilhelm@fumigationzone.com.

Two New Product Guides Available

Fumigation Service & Supply has its new product guide available as a 24-page, full-color, and easy-to-read booklet. The electronic edition can be found online at **www.fumigationzone.com**. Jeff Waggoner, general manager for FSS, said, "We have highlighted categories in Fumigation, Fogging, Monitoring, Insecticides, Pest Control, and Safety."

Insects Limited has completed its newest product guide also. This 16-page full-color and fully illustrated booklet comes both hard copy and online at **www.insectslimited.com**. It contains stored product pheromone kits and lures. Tom Mueller from Insects Limited said, "This new product guide includes several new pheromones and the new All Beetle Trap."

Contact us at 1.800.992.1991 or 1.317.896.9300 for your new catalog or click on the websites.

Cicadas Among Us

You would never know it, but lying in the ground beneath trees are billions of bugs just waiting to emerge into daylight. The wait can be really long though, as in 17 years long! The telltale red eyes of the 17-year locust give away how long they have been patiently waiting to visit the earth above ground. Here is their story.

On warm spring nights they all begin to emerge together. Their numbers can be in the billions on a given year. As they finally pop their heads out above ground after the long wait, they look for a tree or vertical post to climb. Once they find a spot that they deem acceptable, they will literally pop out of their skin and transform into the final adult stage of their lives. After a few days of rest, their wings fill out and their shells harden. Now they are ready to start their important job of reproducing.

The males begin the mating process by calling the females to them. They do this by popping organs on their abdomen called "tymbals" in and out. The synchronized chorus of cicadas has been called one of the loudest sounds in nature. Mating takes place over the next several weeks. During this time many cicadas will be eaten by animals or insects and will not survive, but their numbers are so large that the population always succeeds.

As a final act of her brief life as an adult, a female cicada will bore a deep hole into a tree branch and lay her eggs. After only 6 weeks since the masses of cicadas emerged from beneath the ground, they are all gone. Eggs the size of a grain of rice soon hatch, and the young cicadas drop to the ground beneath the tree and instinctively dig downward. The nymphs will spend their time beneath the surface feeding on juices they suck from the roots of trees. And so the 17-year waiting period goes.

The reason we can hear cicadas each and every year is because of the 150 different species of cicadas in the U.S, some will emerge on any given year. Scientists have studied the different species and they know what years will be the "big" years for different areas of the U.S. You can find this information at cicadamania.com. So as you sit out at night this summer and you hear the distinct shrill noise of the male cicada calling for a mate, know that there are probably many more in the ground beneath you just waiting for the right time.

PHOTO: USDA.gov, via Wikimedia Commons

Most of the 17-year cicadas have telltale red eyes. Watch a video about them here: http://bit.ly/28R77JB

NEWSLETTER

Home Charter

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: Peggy Rutkowski, Fumigation Service & Supply, Inc., 16950 Westfield Park Rd., Westfield, IN 46074 USA.

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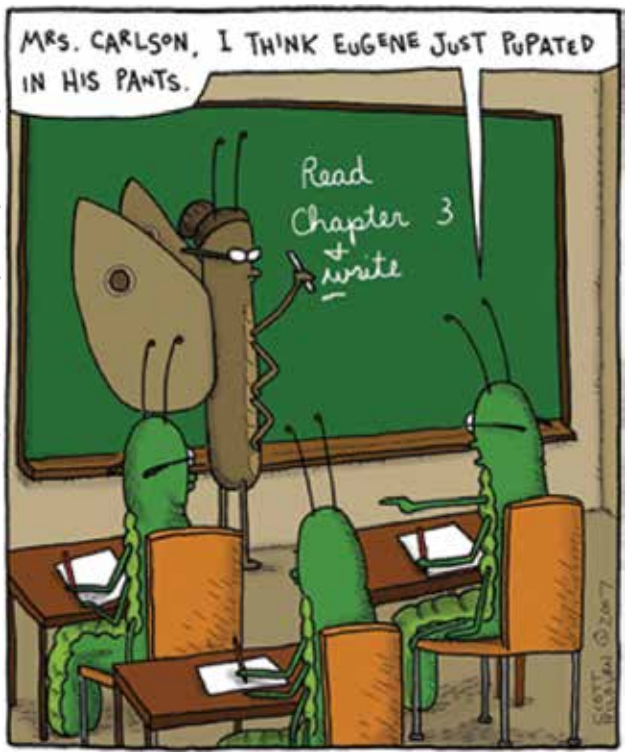

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2016 FUMIGATION TRAINING

November 29 Indianapolis

December 8 Bloomington, Illinois

December 13 Cincinnati

Continued education credits will be applied for in IN, IL, OH, MO, WI, MI, AR, TN, and KY. If you are from a different state and want to receive credit, we can inquire to states not listed. Exact locations and details can be found at www.fumigationzone.com or by calling 1.317.896.9300.