NUVAN® Directed Spray™ Aerosol

Bed Bug Control
Program Overview

- Welcome
- NUVAN® Product Line Overview
- Evolution of Bed Bug Control
- NUVAN® Technical Overview
- NUVAN® Directed Spray™ Aerosol in Action
- What’s Next for NUVAN®
- Q&A
NUVAN® PRODUCT LINE OVERVIEW

Jeff Alvis, AMVAC
NUVAN® Family of Products

• NUVAN® Prostrips® and NUVAN® Prostrips®+
  – Provide control through vapor action that lasts up to four months
  – Two sizes
    • NUVAN Prostrips = 16g
    • NUVAN Prostrips + = 65g
  – Features DDVP
    • Powerful tool for controlling bed bugs and other structural pests
    • Controls bed bug nymphs and adults in 48 to 72 hours
    • Controls bed bug eggs in a minimum of one week
NUVAN® Family of Products

• NUVAN® Directed Spray™ Aerosol
  – Introduced in September.
  – New spray product that is highly effective against bedbugs, cockroaches and other structural pests.
  – Contains DDVP, one of the most effective active ingredients to use against bed bugs, including pyrethroid-resistant strains.
    • Provides immediate kill for bed bugs, with 100% kill within 20 minutes.
EVOLUTION OF BED BUG CONTROL

Paul Bello, Industrial Entomologist, PJB Pest Management Consulting
• As we all know, bed bugs have continued to increase in prevalence since the mid 1990s.
  – The exact cause of the resurgence of bed bugs is unclear.
• What is clear is that they are a problem that cannot be managed without a thorough and comprehensive approach best implemented by competent pest management professionals.
Bed Bug Health Risks

• Bed bugs can cause a number of health effects including
  – Skin rashes,
  – Psychological effects, and
  – Allergic symptoms.
• Bites may lead to a range of skin manifestations.
• Additional research is needed to determine the potential for bed bugs to transmit disease and their impact on public health.
Bed Bug Identification

• The first step to controlling bed bugs is knowing that the client truly has a bed bug infestation.
• Many people may think they have bed bugs but may not.
• Telltale signs of bed bugs include:
  – Fecal stains,
  – Shed skins,
  – Eggs,
  – Carcasses, and
  – Live bed bugs.
• We cannot confirm bed bug infestation based upon bite evidence alone!
Bed Bug Hiding Spots

**BED BUG HIDING SPOTS**

- **Mattress**: 34.6%
- **Boxspring**: 22.4%
- **Frame / Headboard**: 13.4%
- **Baseboard Areas**: 11.4%
- **Couch / Chair**: 7.4%
- **Nightstand / Dresser**: 4.2%
- **Walls / Ceiling**: 2.3%
- **Other**: 0.2%

Source: University of Kentucky
Controlling Bed Bugs

• Bed bug control is most effective when an Integrated Pest Management (IPM) approach is taken.

• IPM takes advantage of all appropriate bed bug management options including
  – Thorough inspection,
Controlling Bed Bugs

• Bed bug control is most effective when an Integrated Pest Management (IPM) approach is taken.

• IPM takes advantage of all appropriate bed bug management options including
  – Thorough inspection,
  – Vacuuming,
Controlling Bed Bugs

• Bed bug control is most effective when an Integrated Pest Management (IPM) approach is taken.

• IPM takes advantage of all appropriate bed bug management options
  – Thorough inspection,
  – Vacuuming,
  – Steam application,
Controlling Bed Bugs

• Bed bug control is most effective when an Integrated Pest Management (IPM) approach is taken.

• IPM takes advantage of all appropriate bed bug management options including
  – Thorough inspection,
  – Vacuuming,
  – Steam application,
  – Heat Treatments,
  – Pesticides,
  – Installation of encasements & blocker devices, and
  – Suitable follow up.
Bed Bug Pesticides

• Judicious use of pesticides has been critical in the success of bed bug control and will continue to play an important role in successful management programs.

• Pesticide resistance by bed bugs has continued to increase with time.
  – U.S. bed bug populations show a tolerance for pyrethroids many times that of susceptible lab strains.
  – Bed bugs collected from NYC have been found to be many times more resistant to pyrethroids than those collected in Florida.
Pesticide Evolution

• NUVAN® Prostrips® have been used successfully for bed bug control by pest pros across the country.
• NUVAN® Directed Spray™ Aerosol will provide even more opportunities for success for today’s bed bug professional.
NUVAN® TECHNICAL OVERVIEW

Charles Silcox, Ph.D., Product Development Manager, AMVAC
Technical Overview

• Active Ingredient Information
  – Basic information on dichlorvios
  – Unique attributes of dichlorvios
  – Applicator and occupant exposure study

• NUVAN® Products
  – NUVAN® Prostrips®
  – NUVAN® Prostrips® +
  – NUVAN® Directed Spray™ Aerosol

• NUVAN® Directed Spray™ Aerosol
  – Brief label review
  – Bed bug efficacy data
Active Ingredient Information

- **Common Name**: dichlorvos
- **Chemical Name**: 2,2-Dichlorovinyl dimethyl phosphate
- **ISO* Name**: Dimethyl-2,2-dichlorovinyl phosphate
- **Chemical Class**: Organophosphate
- **Target System**: Nervous System - Synapse
- **Mode of Action**: Acetylcholinesterase Inhibitor
- **IRAC Code**: Group 1-B Insecticide

*International Standardisation Organisation*
Unique Dichlorvos Attributes

• Contact and vapor action
  – Insects directly contacted with spray are quickly killed.
  • Bed bugs appear to be particularly susceptible to dichlorvos
  – Moves in the vapor phase to deep harborages and other hidden areas.

• Selective toxicity via enzymatic degradation
  – Dichlorvos-ACHE complex rapidly hydrolyzed by mammals
  – Dichlorvos-ACHE complex is stable in target insects

Dichlorvos (DDVP)
Unique Dichlorvos Attributes

• Rapid degradation
  – When applied, it quickly kills insects and then rapidly dissipates.
  – Its greatest strength may be its molecular weakness.
  – Non-residual – should be used with a complementary residual product.

• Mode of Action
  – The only Group 1 insecticide registered for indoor residential use.
  – Important component of a resistance management program.

Dichlorvos (DDVP)
Recent cancellation of most indoor organophosphate and carbamate insecticide usage has depleted the arsenal of effective bed bug products; and of those remaining products (principally pyrethroids), the prospect of resistance is worrisome.”

Dr. Michael F. Potter
University of Kentucky
American Entomologist – Summer 2006
Applicator and Occupant Study

• Researcher Affiliations
  – University of Nebraska
    • Department of Entomology; Department of Agronomy; Department of Environmental Programs
  – University of Nebraska Medical Center
    • Department of Pharmacodynamics and Toxicology

• Evaluated occupational and residential exposure during liquid applications of 0.5% dichlorvos.
Applicator and Occupant Study (continued)

- Twenty single-family houses were treated in Macy, NE.
- Treated with an average of 19.5 g (AI) of dichlorvos per residence.
- Concluded:
  - “that the application of 0.5% (AI) DDVP caused no undue risk to either the applicators who mixed and applied the insecticide or to residents of the treated structures.”
  - “It was demonstrated that normal work apparel provides an effective barrier to DDVP; however hand protection is strongly recommended.”
Applicator and Occupant Study

- Provides a frame of reference for NUVAN® Directed Spray™ Aerosol
  - NUVAN® Directed Spray™ Aerosol is marketed in a 17 ounce unit.
  - Each unit contains approximately 2.4 g of dichlorvos.
  - This is about 1/8 of the amount of dichlorvos that was applied per residence in the study conducted by Gold et.al.
  - In most cases, one unit of NUVAN® Directed Spray™ Aerosol will be used to treat more than one residence.
  - Thus, in practice, the amount of dichlorvos applied using NUVAN® Directed Spray™ Aerosol will be at least an order of magnitude less than that shown by Gold et.al. to have no undue risk.
NUVAN® Family of Products

- **NUVAN® Prostrips®**
  - Resin strip containing 18.6% dichlorvos
  - "Small Strip" – 16 grams
  - Each strip treats 100 to 200 cubic feet

- **NUVAN® Prostrips® +**
  - Resin strip containing 18.6% dichlorvos
  - "Large Strip" – 65 grams
  - Each strip treats 900 to 1,200 cubic feet

- **NUVAN® Directed Spray™ Aerosol**
  - Aerosol containing 0.5% dichlorvos
  - Marketed in a 17 ounce aerosol
<table>
<thead>
<tr>
<th>Nuvan® Prostrips®</th>
<th>Nuvan® Prostrips® +</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Buildings</td>
<td>Animal Buildings</td>
</tr>
<tr>
<td>Attics</td>
<td>Attics</td>
</tr>
<tr>
<td>Barns</td>
<td>Barns</td>
</tr>
<tr>
<td>Boats</td>
<td></td>
</tr>
<tr>
<td>Cabins</td>
<td></td>
</tr>
<tr>
<td>Closets</td>
<td></td>
</tr>
<tr>
<td>Crawl Spaces</td>
<td>Crawl Spaces</td>
</tr>
<tr>
<td>Cupboards</td>
<td></td>
</tr>
<tr>
<td>Farm Houses</td>
<td>Garages</td>
</tr>
<tr>
<td>Garages</td>
<td>Grain Bins</td>
</tr>
<tr>
<td>Grain Bins</td>
<td></td>
</tr>
<tr>
<td>Mobile Homes</td>
<td>Museum Collections</td>
</tr>
<tr>
<td>Museum Collections</td>
<td>Museums</td>
</tr>
<tr>
<td>Museums</td>
<td>Outhouses</td>
</tr>
<tr>
<td>Outhouses</td>
<td></td>
</tr>
<tr>
<td>Pantries</td>
<td>Pest Traps</td>
</tr>
<tr>
<td>Pest Traps</td>
<td></td>
</tr>
<tr>
<td>Ranch Houses</td>
<td>Sheds</td>
</tr>
<tr>
<td>Recreational Vehicles</td>
<td>Storage Units</td>
</tr>
<tr>
<td>Sheds</td>
<td>Trash Bins</td>
</tr>
<tr>
<td>Storage Units</td>
<td>Utility Boxes</td>
</tr>
<tr>
<td>Trash Bins</td>
<td></td>
</tr>
<tr>
<td>Utility Boxes</td>
<td>Vacation Homes</td>
</tr>
<tr>
<td>Vacation Homes</td>
<td></td>
</tr>
</tbody>
</table>
• For Control of Bed Bugs and Bed Bug Eggs
  
  – NUVAN PROSTRIPS may be used to control crawling bed bug nymphs and adults exposed to product vapors for **48 hours**. In difficult to treat areas, a minimum treatment time of **72 hours** will provide better results. **Strip may be used to control bed bugs that have entered various items in an infested structure including, but not limited to: electronics, appliances, footwear, artwork, collectibles, plush toys, clocks, radios, wall hangings, telephones, computers, printers, mattresses, box springs, books, lamps, furniture and other such items.**
• For Control of Bed Bugs and Bed Bug Eggs
  
  – Place infested items in a suitable plastic bag, poly sheeting, container or room that is closed to contains strip treatment. Plastic bags or poly sheeting should be at least 2 mils thick. The closed volume for treatment should not exceed the volume to be treated for the size of the strip used. Take care to avoid direct contact of the strip with the surface of items being treated. Seal items in the containment for a minimum of 48 hours to kill bed bug nymphs and adults. To kill any bed bug eggs, if suspected to be present, seal items in the treated space for seven days. Seal plastic bags and poly sheeting with as much air space around the treated article as is practical as this will enhance the exposure to the product vapors. Proper seal can be attained by any appropriate manner such as the use of tape, twist ties or other means. Professionals should test for adequate seal by testing for the escape of air from the sealed bag.

Read the entire label before using NUVAN® Prostrips®
• For Control of Bed Bugs and Bed Bug Eggs

  – Identify sealed treatment by a label indicating a pesticide treatment is in process that should not be disturbed by unauthorized persons. The label should include the date, pest professional person or company responsible and contact telephone number. When treatment is completed, remove treated items from the treatment in a well ventilated area and air out for a period of not less than two hours.

Read the entire label before using NUVAN® Prostrips®
NUVAN® Prostrips® +

• For Control of Bed Bugs and Bed Bug Eggs
  - NUVAN PROSTRIPS + may be used to control crawling bed bug nymphs and adults exposed to product vapors for 48 hours. In difficult to treat areas, a minimum treatment time of 72 hours will provide better results. The strip may be used to control bed bugs that have entered various items in an infested structure including, but not limited to: electronics, appliances, footwear, artwork, collectibles, plush toys, clocks, radios, wall hangings, telephones, computers, printers, mattresses, box springs, books, lamps, furniture and other such items.

Read the entire label before using NUVAN® Prostrips® +
NUVAN® Prostrips® +

- For Control of Bed Bugs and Bed Bug Eggs
  - Place infested items in a container or room that is closed to contains strip treatment. The sealed volume for treatment should not exceed the volume to be treated for the size of the strip used. Multiple strips can be used in a large space and should be distributed uniformly over the space being treated. Take care to avoid direct contact of the strip with the surface of items being treated. Seal items in the treatment for a minimum of 48 hours to kill bed bug nymphs and adults. To kill any bed bug eggs, seal items in the treated space for seven days if bed bug eggs are suspected to be present. The presence of air space or volume within the sealed treatment space is desirable to enhance the exposure to the product vapors.

Read the entire label before using NUVAN® Prostrips® +
NUVAN® Prostrips® +

• For Control of Bed Bugs and Bed Bug Eggs
  – Identify sealed treatment areas by label indicating a pesticide treatment is in process that should not be disturbed by unauthorized persons and the label should include the date, pest professional person or company responsible and contact telephone number. When treatment is completed, remove treated items from the treatment in a well ventilated area and air out for a period of not less than two hours.

Read the entire label before using NUVAN® Prostrips® +
NUVAN® Directed Spray™ Aerosol

- Read the entire label before using NUVAN® Directed Spray™ Aerosol.
NUVAN® Directed Spray™ Aerosol – Label Review

• KILLS INSECTS WITH VAPOR ACTION
  – Effective against: Ants, Bed Bugs, Bed Bug Eggs, Bees, Beetles, Carpet Beetles, Clothes Moth Larvae, Cockroaches, Crickets, Fleas, Flies, Flour Beetles, Gnats, Hornets, Millipedes, Mosquitoes, Moths, Silverfish, Sowbugs, Spiders, Ticks, Wasps, Waterbugs, and Weevils

• INTENDED FOR SALE TO, USE AND STORAGE BY LICENSED PEST CONTROL OPERATORS, OR PERSONS UNDER THEIR DIRECT SUPERVISION, ONLY
NUVAN® Directed Spray™ Aerosol – Label Review

• PRECAUTIONARY STATEMENTS
  – Hazards to Humans and Domestic Animals
  – CAUTION: Harmful if swallowed. Causes moderate eye irritation. Avoid contact with eyes or clothing. Wear long sleeved shirt, long pants, shoes and socks. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum or using tobacco. Remove and wash contaminated clothing before reuse. KEEP OUT OF REACH OF CHILDREN. **Do not apply to surfaces contacted frequently by children or allow them in areas where surfaces are not yet dry.** Avoid contamination of food/feed and foodstuffs. Do not treat areas where food or food/feed crops are growing. **Do not use on pets or animals.** **Do not smoke while using.** Do not spray directly on the skin or on animals. **Do not apply in patient rooms or rooms occupied by the elderly or infirm.** Do not allow children or pets to contact treated surfaces until dry.
NUVAN® Directed Spray™ Aerosol – Label Review

• PERSONAL PROTECTIVE EQUIPMENT (PPE)
  – Some materials that are chemical-resistant to this product are barrier laminates, butyl rubber, nitrile rubber, neoprene rubber, polyvinyl chloride or viton. If you want more options, follow the instructions for category C on An EPA chemical-resistance category selection chart.
  – Applicators and other handlers must wear:
    • Long-sleeved shirt
    • Long pants
    • Shoes and socks
    • Chemical-resistant gloves
NUVAN® Directed Spray™ Aerosol – Label Review

• DIRECTIONS FOR USE
  – It is a violation of Federal law to use this product in a manner inconsistent with its labeling. Use in residential sites as a crack and crevice or space spray is prohibited. Use on lawns, turf or ornamentals is prohibited. NUVAN Directed Spray Aerosol is intended for sale to and use by pest management professionals only. **This product is NOT intended for sale to or use by homeowners.**

• RESTRICTIONS
  – This product may be injurious to health; read entire label and use only as directed. Hold container upright to spray. Point valve opening away from face when spraying.
  – **Keep people and pets out of the area during applications. Only handlers wearing specified PPE may be in the area during application.** Do not apply this product in a way that will contact any person or pet either directly or through drift. **Do not allow people or pets to enter the treated area until sprays have dried. Do not reoccupy treated areas for at least two (2) hours.**
NUVAN® Directed Spray™ Aerosol – Label Review

• RESTRICTIONS
  – Do NOT use in hospitals or clinical rooms, such as patient rooms, wards, nurseries, operating or emergency areas.
  – Do NOT use in any rooms where infants or the sick or aged occupy or will be present for any extended periods of confinement.
  – Do NOT use to treat non-perishable packaged or bagged and/or bulk, stored raw or processed agricultural commodities.
  – Do NOT use in food/feed areas of food/feed handling establishments, restaurants or other areas where food/feed is commercially prepared or processed, in serving areas while food/feed is exposed or facility is in operation.
  – Do NOT use in federally inspected meat and poultry plants.
  – FOR COMMERCIAL APPLICATIONS, DO NOT TREAT MORE FREQUENTLY THAN ONCE A MONTH
NUVAN® Directed Spray™ Aerosol – Label Review

- **DIRECTIONS FOR USE (Continued)**
  - In the home, cover all food contact surfaces during treatment and thoroughly clean before using for food preparation or service.
  - **Applicators:** Do NOT treat more than five (5) application sites per day and do NOT make DDVP applications more than once per week.
  - **Application Sites:** For localized surface application in homes, cabins, garages and basements. Also for use in and around apartments, commercial buildings, factories, hotels, motels, warehouses, and other commercial and industrial buildings.
  - **Application Rate:** Apply a 2 second application of product per 4-5 linear feet as a localized application with the spray being applied 12-15 inches from the surface being treated.
  - Follow instructions for specific pests as listed below, repeating treatments as necessary, but **not more frequently than once a month**.
NUVAN® Directed Spray™ Aerosol – Label Review

• BED BUGS & BED BUG EGGS
  
  – Nuvan Directed Spray Aerosol kills bed bugs at the time of application and controls bed bug eggs for up to 14 days by direct application and through vapor action. **For best results bed bug eggs must be directly contacted.** Thoroughly inspect and treat areas where bed bugs may hide, travel, harbor or lay eggs. Treat surfaces of baseboards, floors, molding, and other infested areas where bed bugs may hide, lay eggs or travel not more than once a month.

  – Remove furniture coverings including bed liners and blankets. Infested coverings, bedding and linens should be sealed in a plastic bag and then removed for laundering and run in a hot clothes dryer for a sufficient time and temperature to destroy all bed bugs that may be present. **To avoid staining or discoloration of furniture surfaces, make an application to a hidden area of items to be treated to test for potential staining or discoloration before making a complete application.**
NUVAN® Directed Spray™ Aerosol – Label Review

• BED BUGS & BED BUG EGGS (continued)
  
  – Inspect the mattress, box spring, bed frame and other furniture thoroughly for the presence of bed bugs and bed bug eggs. Dismantle beds and other furniture as needed to inspect and treat mattress, box springs, bed frame, and headboard.
  
  – Inspect and treat furniture and other items where bed bugs and bed bug eggs may be present such as night stands, chairs, couches, futons, tables, desks, artwork, wall hangings, luggage, books, shelving and other items where bed bugs may hide. Sensitive electronic items may be successfully treated using NUVAN® Prostrips® as needed, following directions on the product label.
NUVAN® Directed Spray™ Aerosol Bed Bug Efficacy Data
Product: NUVAN Directed Spray
Formulation: Aerosol
Applic. Rate: 1 sec/2.5 ft.
Applic. Distance: 15 inches

Study conducted by Virginia Tech
Study conducted by Snell Scientifics, LLC

Nuvan® Directed Spray™ Aerosol
Bed Bug Adults (Harlan Strain)

- **Product:** NUVAN Directed Spray™ Aerosol
- **Formulation:** Untreated
- **Applic. Rate:** 1 sec/2.5 ft.
- **Applic. Distance:** 15 inches

![Graph showing percent mortality for NUVAN Directed Spray™ Aerosol and Untreated samples after 1 hour and 24 hour periods. The graph indicates a higher mortality rate for the treated samples compared to the untreated controls.]
Nuvan® Directed Spray™ Aerosol
Bed Bug Adults (Cooper 2 Strain)

Product: NUVAN Directed Spray
Formulation: Aerosol
Applic. Rate: 1 sec/2.5 ft.
Applic. Distance: 15 inches

Study conducted by Snell Scientifics, LLC
Nuvan® Directed Spray™ Aerosol
Bed Bug Eggs (Cooper 2 - 1 to 3 days old)

Study conducted by Snell Scientifics, LLC
Nuvan® Directed Spray™ Aerosol
Bed Bug Eggs (Cooper 2 - 1 to 3 days old)

Study conducted by Snell Scientifics, LLC

Product: Nuvan® Directed Spray™ Aerosol
Formulation: Aerosol
Applic. Rate: 1 sec/2.5 ft.
Applic. Distance: 15 inches

Percent Mortality
NUVAN® DIRECTED SPRAY™ AEROSOL IN ACTION
NUVAN® Directed Spray™ Aerosol in Action

• In my view NUVAN® Directed Spray™ Aerosol is like duct tape for bed bugs.

• This is so because it gives the applicator a broader window of opportunity for success than they had before due to the vapor action.
NUVAN® Directed Spray™ Aerosol in Action

• Plus, if we’re looking to take full advantage of the vapor action, we can eliminate bed bugs on a sofa, lounge chair, box spring or other furniture item more easily than before.
• As with any pesticide product, we want to use NUVAN® Directed Spray™ Aerosol in its “sweet spot”.
• This is not a residual product so we shouldn’t expect it to be. And, it’s a good thing that it’s not a residual.
• NUVAN® Directed Spray™ Aerosol is able to kill bed bugs in areas that are tough to see due to the vapor action.
• I recommend that we use NUVAN® Directed Spray™ Aerosol in combination with other methodologies.
Beyond Bed Bugs

- NUVAN® Directed Spray™ Aerosol is registered, and effective against more than 20 other pests including:
WHAT’S NEW FOR NUVAN®

Jeff Alvis, AMVAC
What’s New

• Happy to announce the newest addition to the NUVAN® family of products
  – NUVAN® FOG5%™
    • Currently pending state registrations
    • Fogging product for use in commercial situations
What’s New

• AMVAC is committed to continuing to bring new solutions to pest management professionals
  – Highest level of control and safety for applicators and customers
QUESTIONS?