

Western IPM Center

PROJECT NARRATIVE: Baseline Data Regarding Regional Bed Bug Management Practices, Challenges, and Research Needs

Type of Project: IPM Work Group

Problem and Justification

Bed bugs, *Cimex lectularius* and *Cimex hemipterus* (Hemiptera: Cimicidae), have re-established themselves as key household pests throughout the world after decades of relative obscurity. This resurgence has been attributed to increases in global travel and commerce, widespread pesticide resistance, changes in indoor pest management tactics, and a lack of general awareness¹. Due to this meteoric rise of the bed bug from rare nuisance to key household pest in the United States, there exists no universally-recognized or ‘conventional’ pest management strategy², but regular applications of pesticides, especially pyrethroid insecticides, have often been recommended by pest managers’ associations³ and used within eradication strategies⁴. This approach has proven problematic since widespread resistance to pyrethroid insecticides within urban bed bugs has arisen rapidly, with some populations entirely unaffected by label rate applications⁵. Furthermore, the residential public has sometimes decided to take bed bug management into their own hands, opting for do-it-yourself pesticide applications which have been identified as contributing to numerous poisonings and at least one death in recent years⁶. Usually associated with these poisonings, the total-release foggers or ‘bug bombs’ often used in excess as a last resort by desperate residents have been demonstrated to be quite ineffective against bed bugs within harborage sites⁷.

Current liquid formulation pesticides registered for use against bed bugs include pyrethroids, neonicotinoids, combinations of pyrethroids and neonicotinoids, the botanical insecticide pyrethrin, the pyrrole insecticide chlorfenapyr, and the insect growth regulator hydroprene. Dust, or solid, formulation pesticides for use against bed bugs include pyrethroids and neonicotinoid insecticides as well as desiccants such as silica and diatomaceous earth. Most pest management professionals (PMPs) rely on one or more of these aforementioned pesticides. Often times, liquids will be applied, usually two to three applications at an interval of two to three weeks, followed by dust applications to harborage sites. However, it is worth noting that insecticide applications rarely bring about complete control when used alone due to potential inefficacy, resistance, and coverage issues. Additionally, repellent insecticides, such as most pyrethroid formulations, can drive bed bugs into adjacent housing units, exacerbating the building’s infestation⁸. For these reasons, insecticide applications cannot be the sole tactics used. Nonchemical tactics, including harborage removal, steam, heat, vacuums, and mattress encasements, are often necessary to achieve thorough and lasting control⁹.

Integrated pest management (IPM) represents an alternative to strategies reliant upon regular pesticide applications, and may help mitigate the associated problems while providing adequate management. Several PMP companies are currently providing IPM services for bed bugs, but the movement towards widespread adoption has been slowed by perceptions of inefficacy and higher cost and by a lack of awareness and understanding. An IPM service usually includes an educational component in order to gain cooperation from the client and to explain prevention measures. Clutter management may be carried out to reduce harborage sites, and existing infestations in mattresses or box springs can be sealed within encasements. Nonchemical treatments to harborage sites, including steam, heat and cold temperature delivery, are becoming increasingly available. These services generally require a greater time commitment on the part of the PMP team as compared to a conventional pesticide application, and so IPM services may initially cost more. Additionally, clientele may be unaware of the benefits and efficacy of IPM and may request that an 'exterminator' make pesticide applications in order to feel as if management actions are being carried out. Regional outreach and education programs, focused on PMPs and the general public, are needed in order to provide consistent messages regarding the effectiveness of bed bug IPM in urban areas, both to professional clientele and to the general public.

Management of bed bugs has been particularly challenging in low-income, multiple-occupancy residential buildings, where resident turnover, lack of resources, ease of dispersal, communication barriers, and sanitation issues have contributed to chronic infestations. Dispersal of bed bugs within and between adjacent rooms or apartments spanning multiple floors in multiple-occupancy housings is common¹⁰. Chronic bed bug infestations in multi-occupancy structures not only affect the well-being of the tenants, but also have impacts on housing management entities. Failure to take preventive approaches to bed bug management has increased the exposure of property owners, agents and managers to potential litigation. On the other hand, even though bed bugs are legally considered vermin and are therefore required by most states to be managed by landlords under habitability laws, tenants are sometimes held financially responsible for infestations. In some cases, such as within a recently-enacted San Francisco ordinance, responsibilities of tenants are required that seem to contradict state mandates¹¹. Unfortunately, such requirements sometimes create a financial disincentive for tenants to report infestations, potentially allowing the bed bug population to expand and making management more difficult. Clear legal precedents for landlord / tenant roles and responsibilities with regards to bed bug infestations are nonexistent; questions and uncertainties abound.

Regional approaches to research, education, and extension with regards to urban / community IPM have been rare. The one notable exception has been stoppests.org, a collaborative team initiated by the Northeastern IPM Center at Cornell University whose charge is to improve pest control in affordable housing situations nationwide through IPM education and outreach activities. Stoppests.org has been very successful in developing educational resources for multifamily housing and in serving as technical advisers to clientele going through the process of IPM adoption, but efforts have been concentrated in the Eastern Seaboard of the northeastern United States, a region affected early on by bed bug infestation resurgences. A recent study undertaken at the University of Hawaii developed educational workshops for the general public to increase awareness

and teach preventive methods and early detection. These workshops were highly successful at increasing understanding and confidence in dealing with bed bugs (Gerardo and Spafford, unpublished data). We propose formation of a similar group in the Western Region that will adapt resources such as those produced by stoppests.org to meet our regional needs, produce new resources for specific situations such as public housing, dormitories, homeless shelters, hotels, and single-family homes, and share information and resources throughout the region. The first step to such a group will be to establish baseline data with regards to current management practices, landlord / tenant roles and responsibilities, and prevalence of insecticide resistance in regional bed bug infestation situations. These data can then be utilized to identify specific applied research needs regarding bed bug IPM in the region and to measure outcomes and impacts of education and outreach programs.

Stakeholder interest and need for these baseline data are clearly evident from online mission statements and trade magazine articles published by PMP industry groups such as the National Pest Management Association and the Pest Control Operators of California. Housing management associations, such as the National Apartment Association and the California Apartment Association, have identified clarification of bed bug policies and recommended practices as key needs for their industry moving forward. Additionally, 'Preventing and controlling bed bug infestations in multifamily and other public housing and other built environments' was identified as a 'high priority' by the USDA National IPM Program in its 2013 *National Roadmap for IPM*.

Objectives

1. Establish baseline data for the Western Region with regards to:
 - prevalent bed bug management strategies and tactics
 - stakeholder (tenants, landlords / managers, PMPs) roles and responsibilities related to bed bug management within multiple-occupancy housing and other low-income situations
 - observed / perceived resistance to insecticides within regional bed bug populations
2. Extend baseline assessment data to stakeholders within the Western Region.
3. Define clear goals for future endeavors into applied bed bug management research within the Western Region.
4. Establish a collaborative framework for regional bed bug IPM work for the future

Procedures

Numbers correspond to objectives above, letters separate distinct procedures related to common objectives.

- 1a: Review all pertinent bed bug IPM literature
- 1b: Develop survey for regional PMPs, to be delivered electronically or via mail

- 1c: Disseminate PMP survey to 100 regional members of the National Pest Management Association
- 1d: Develop phone interview questions for PMPs involved in bed bug management
- 1e: Conduct at least ten PMP interviews via telephone
- 1f: Review regional laws regarding bed bug management in landlord / tenant situations
- 1g: Develop incentivized survey for tenants in multiple-occupancy housing situations who have had experiences with bed bug infestations
- 1h: Disseminate tenant survey via websites, social media outlets, and regional tenants' rights groups
- 1i: Develop landlord / housing manager survey regarding bed bug experiences, practices, and policies
- 1j: Disseminate landlord survey to 100 regional members of the National Apartment Association, public housing associations, and other housing management professional groups
- 1k: Develop phone interview questions for regional landlords / housing managers
- 1l: Conduct at least ten landlord / housing manager phone interviews
- 1m: Design straightforward insecticide resistance bioassay that can be conducted by PMPs during or as part of professional service. This procedure will be conducted in the field through cooperation with regional PMPs, serving to efficiently collect observational data regarding insecticide resistance in field populations.
- 1n: Extend insecticide resistance information, including aforementioned bioassay explanation, to regional PMPs via in-person presentations and individual consultations
- 2a: Collect and compile all survey and interview data
- 2b: Summarize survey and interview data within print and online publications in at least one professional / trade venue, at least one peer-reviewed venue, at least one public media venue, and in technical reports / white papers submitted to collaborating stakeholder groups
- 2c: Present summarized survey and interview data as part of ongoing education and outreach programs delivered to stakeholder groups
- 2d: Submit baseline data summary to the Western IPM Center for later projects to use for project justification and comparison
- 3a: Identify knowledge gaps and problems, based on survey and interview data, in order to define applied research goals for regional bed bug management
- 3b: Produce and disseminate a document outlining future bed bug management research goals within the Western Region. Disseminate information using existing University and eXtension websites.
- 4a: Discuss research needs, other project objectives via teleconference / videoconference
- 4b: Organize and hold two meetings where Work Group members can discuss project objectives, present data and other findings, and design potential products and / or proposals

Project Evaluation Plan

The overarching purpose of this proposed Work Group is to provide the baseline data regarding regional bed bug management practices, stakeholder roles and responsibilities, and insecticide resistance so that clear collaborative research goals can be defined and so that future projects can more easily measure outcomes and impacts within stakeholder groups. These data do not presently exist, perhaps due to the relatively recent increases in the incidence of bed bugs as key household and community pests. To date, no Pest Management Strategic Plan (PMSP) exists within any of the regional IPM Centers that addresses bed bugs as key urban and community pests. It is our hope that the baseline data and research goals developed through this project may serve as the starting point for the development of a national PMSP aimed at this increasingly important pest, especially within low-income, multi-occupancy, multi-ethnic, multicultural, and otherwise underserved communities.

Given the exploratory and baseline-driven approach of this project, coupled with the short duration, all expected outcomes are short-term in nature, resulting from datasets and published summaries. Outcomes may include increased networks among Western Region collaborators and increased understanding of regional laws and practices regarding the management of bed bugs. In the long term, anticipated impacts include a targeted applied research program, a PMSP for bed bugs as urban and community pests and changes in knowledge regarding bed bug biology and ecology within key stakeholders. However, our intended outputs are not designed to evaluate these outcomes.

To some extent, survey we develop will build on previous work done in Arizona and Hawaii with low income members of the public and public housing tenants. In these cases, survey questions will be designed in such a way as to measure potential changes in attitudes, increases in knowledge, and changes in self-reported behaviors, using previous surveys as baseline data.

Project outputs are outlined under the ‘Procedures’ section above. We intend to design and disseminate surveys to regional PMPs, landlords / housing managers, and tenants, using both electronic and physical means. These surveys will be designed in such a way as to record experiences related to bed bug infestation and management as well as to capture regionally-prevalent bed bug management practices and policies. In order to increase participation by tenants in these surveys, we intend to offer a small monetary incentive (i.e. \$5 retail gift card). We also intend to develop interview questions, to be administered via telephone, for a subset of regional PMPs and landlords / housing managers currently participating in bed bug management endeavors. Surveyees and interview participants will be asked about IPM strategies (eradication vs. ongoing management), tactics (insecticides, steam, heat, etc.), business practices (management in response to client requests vs. constant monitoring and prevention), and legal policies (landlord always responsible for management vs. tenant sometimes responsible, etc.). The anonymity of all surveyees and interview participants will be protected at all times. We plan to seek out and obtain review and approval of our project’s scope of work and of individual questions / items from the Institutional Review Board at each of our institutions. Upon completion of these surveys and interviews, we intend to compile all data, analyze data using descriptive statistics, and disseminate summarized results to stakeholders, professional colleagues, and the Western IPM Center. These summarized results will be presented within peer-reviewed publications, trade / professional

publications, public media, social media, public websites, technical reports, and oral / visual outreach presentations.

Probable Duration

One year: March 1, 2014 – February 28, 2015

Cooperation of Key Personnel and Institutional Units Involved

Dr. Andrew M. Sutherland (Project Director)
Urban IPM Advisor (San Francisco Bay Area)
University of California Cooperative Extension – Alameda County *and*
University of California Statewide IPM Program

The following individuals have been contacted by the PD and have agreed to serve within this proposed Work Group. All are established experts in the fields of bed bug management, community IPM, and urban IPM.

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Dr. Alvaro Romero (co-PD)
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New Mexico State University, College of Agricultural, Consumer, and
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Dr. Helen Spafford (co-PD)
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Dr. Deborah Young (co-PD)
Professor and Extension Specialist; co-Director of the Center for Sustainable IPM
Colorado State University, Bioagricultural Sciences and Pest Management