

Research Article

Bed Bugs (*Cimex lectularius* L.) in Mississippi: Survey of the Scope, Extent, and Control of the Problem

Goddard, J.

Department of Entomology and Plant Pathology, Mississippi State University, Mississippi State, MS 39762, (662) 325-2085, jgoddard@entomology.msstate.edu

Received: 5-V-2011 Accepted: 17-VIII-2011

Abstract: Bed bugs are blood-sucking insects which had nearly disappeared in developed countries until fairly recently, when a dramatic increase and spread of the insects began in the 1980s. Since then, bed bugs increasingly have been reported inside U.S. hotel rooms, dormitories, and apartments. In this study, entomologists at the Mississippi Department of Health, as well as licensed pest control personnel throughout the state, were queried for information about the scope and extent of bed bug infestations throughout Mississippi for the time period from 1 September 2010 through 28 February 2011. In addition, pest management personnel were asked to provide information about pesticides and other control methods used for bed bug control in Mississippi. A total of 179 bed bug infestations were reported by the respondents covering the six-month period. Health department personnel reported 40 infestations around the state, with an average of 5.0 infestations per responder, while pest management personnel reported 139 infestations with an average of 5.1 infestations per responder. About 30% (8/27 pest control; 3/11 health dept) of responders reported no infestations in their area, so bed bug problems appear to be focal in distribution. Pesticides remain the primary control tool for bed bugs in Mississippi, with most responders saying they use products in the pyrethroid class of pesticides. This particular finding is worrisome in light of widespread pyrethroid resistance. New and expanded educational efforts aimed at both homeowners or tenants and pest management professionals are needed in the fight against this emerging pest.

Keywords: Bed bugs, geographic distribution, incidence, control, Mississippi

Introduction

Bed bugs are small, flat, oval-shaped wingless insects that feed on the blood of warm-blooded animals such as humans, bats, birds, and pets (Figure 1) (Ryckman et al. 1981, Thomas et al. 2004, Reinhardt and Siva-Jothy 2007, Little and West 2008). They have traditionally been common in the developing world, and especially in areas of extreme poverty and crowding. These blood-sucking parasites had nearly disappeared in developed countries until fairly recently, when a dramatic increase and spread of the insects began in the 1980s (Potter 2006, Goddard and de Shazo 2008). Since then, bed bugs have been increasingly reported inside U.S. hotel rooms, dormitories, and apartments (Cleary and Buchanan 2004, Gangloff-Kauffmann et al. 2006, Anderson and Leffler 2008). Bed bugs feed at night, hiding in crevices during the day. Hiding places include seams in mattresses, crevices in box springs, and spaces under baseboards or loose wallpaper. There are five nymphal stages that must be passed before

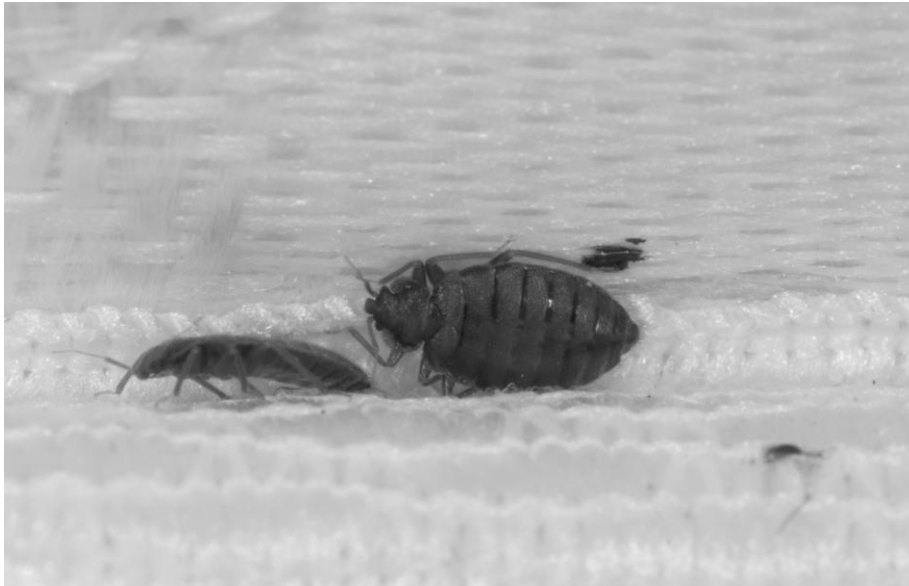


Figure 1. Adult bed bugs on mattress (Photo by Dr. Blake Layton, Mississippi State University).

development to adulthood. Once an adult, the bed bug has a life span of 6 to 12 months. At each nymphal stage, bed bugs must take a blood meal in order to complete development and molt to the next stage. The bugs take about 5 to 10 minutes to ingest a full blood meal. Bed bugs can survive long periods without feeding, and when their preferred human hosts are absent they may take a blood meal from any warm-blooded animal, including pets and poultry (Kahn et al. 2008, Steelman et al. 2009). Health effects from bed bug bites include pruritic bumps and rashes, bullae, and rarely systemic allergic reactions (Churchill 1930, Elston and Stockwell 2000, Bircher 2005, Hwang et al. 2005, Brasch and Schwarz 2006, Goddard and de Shazo 2008). As far as is known, bed bugs do not transmit human disease agents (Goddard and de Shazo 2009). Both urban and rural healthcare providers now encounter patients with mysterious bite reactions that might be a result of bed bug biting (Goddard and de Shazo 2008), so more information about bed bugs and the prevalence and types of infestations is needed. Little is known about the scope and extent of the bed bug problem in Mississippi other than anecdotal reports of increasing numbers of the pests. This study was initiated to examine the extent of the bed bug problem in Mississippi, and to ascertain common methods of bed bug control used by pest management personnel.

Methods

We sent a questionnaire to two medical entomologists at the Mississippi Department of Health (MDH), as well as the nine MDH District Public Health Inspectors, asking for information of the scope and extent of bed bug infestations throughout Mississippi from the time period 1 September 2010 through 28 February 2011. In addition, we sent a questionnaire to 427 licensed pest control personnel throughout the state asking them for information on numbers of infestations and type(s) of properties infested for the same time period. Pest management personnel were also asked to provide information about pesticides and other control methods used for bed bug control in Mississippi. Categories for answers included pyrethroids, non-pyrethroids, natural pyrethrins, organophosphates, inorganic dusts, insect growth regulators (IGRs), and various combinations of these materials. Answers about non-chemical control methods were analyzed and included as well.

Results and Discussion

Responses were received from 8/11 (73%) Mississippi Department of Health district inspectors and entomologists about bed bug infestations over the past 6 months and 27/427 (6.3%) responses from licensed pest control personnel around the state. A total of 179 bed bug infestations were reported by the respondents covering the six-month period of September 2010 through February 2011. This number is in stark contrast to those of the decade before wherein less than 10 bed bug infestations were known from the entire State of Mississippi (Goddard 2008). In the current study, health department personnel reported 40 infestations around the state, with an average of 5.0 infestations per responder, while pest management personnel reported 139 infestations with an average of 5.1 infestations per responder (Table 1). Interestingly, both groups reported about 5 infestations per six-month period, which can be extrapolated to 10 per year. About 30% (8/27 pest control; 3/11 health dept) of responders reported no infestations in their area, so bed bug problems appear to be focal in distribution. Reported infestations in Mississippi are currently mostly associated with urban areas such as the Jackson metropolitan area, the Gulf Coast, and the Golden Triangle (Figure 2).

Table 1. Number of bed bug infestations reported, September 2010 through February 2011.

Number of reports	0	1–5	6–10	11–15	16–20	>21	Total infestations	Range	Avg
Health department	4	5	0	2	0	0	40	0–15	5.0
Pest control personnel	8	10	2	2	2	1	139	0–30	5.1

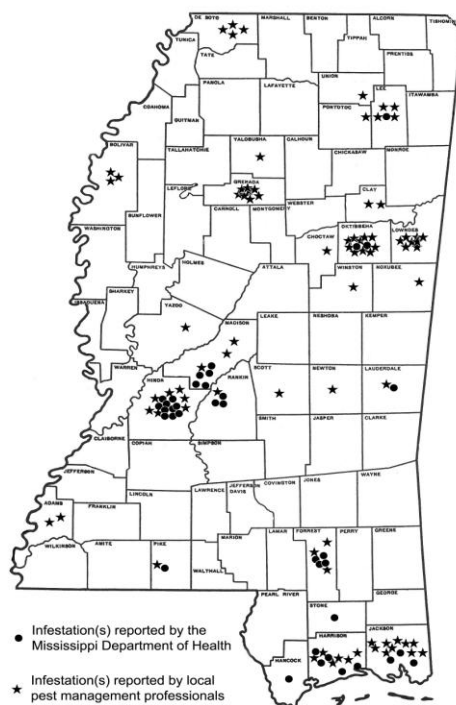


Figure 2. Reported bed bug infestations, Mississippi, September 2010–February 2011.

That trend (urban infestations) has been reported previously in a comprehensive global bed bug study involving nearly 1,000 U.S. and international pest management companies. This survey found that bed bug infestation rates are three times higher in urban than in rural communities (Potter et al. 2010). While most bed bug infestations in our study were reported from hotels, a large percentage were found in low-income, Section 8 (HUD) apartments (Figures 3 and 4). This is in contrast to a national survey (Potter 2008) that found that 80% of bed bug infestations were in single-family homes. Bed bug infestations in low-income housing (like those occurring in Mississippi) are an emerging problem, with a divergence of those who can and cannot pay for bed bug control. There is a segment of society who simply cannot afford the costs associated with bed bug control, and this might have significant ramifications for the future. In fact, some public health policymakers contend that bed bug infestations are a social justice issue if the lack of response to infestations disproportionately impacts underserved populations (Eddy and Jones 2011).

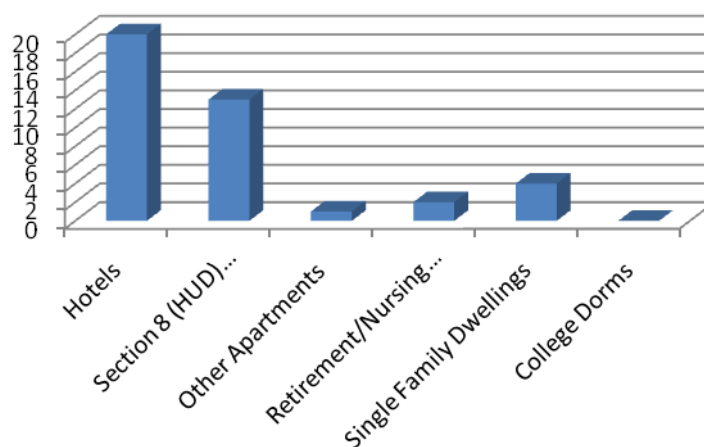


Figure 3. Bed bug infestations reported to the Mississippi Department of Health, September 2010 to February 2011.

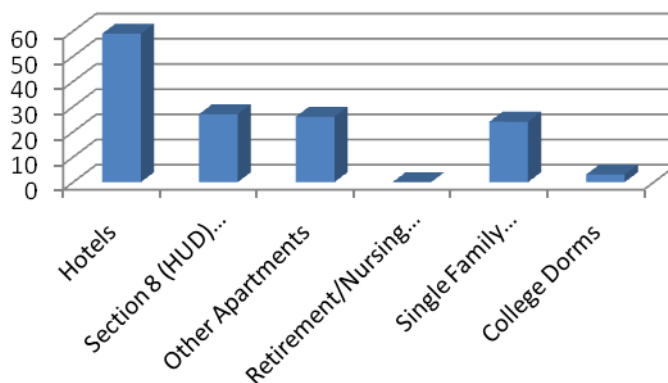


Figure 4. Bed bug infestations reported by pest control professionals, September 2010 to February 2011.

Only 15/27 (55%) of the returned questionnaires from pest control personnel offered comments concerning pest control methods and products, revealing reticence about revealing their proprietary tools for bed bug control. The vast majority of responders 13/15 (87%) relied primarily on pesticides for bed bug control; only 2/15 (13%) reported using both pesticides and non-chemical methods such as steam,

heat treatments, or vacuuming. Pest management personnel might be making recommendations to homeowners, tenants, and hotel staff about performing non-chemical control methodologies such as vacuuming or mattress encasements, but we did not ask for that information in this survey. Pesticides reportedly used against bed bugs included pyrethroids (primarily Suspend[®]), synergized pyrethrins, Temprid[®] (a combination insecticide containing a pyrethroid and imidacloprid), insect growth regulators (IGRs) such as Gentrol[®], Phantom[®] (a non-pyrethroid pyrazole analog), Nuvon[®] vapon strips (organophosphate), and inorganic dusts (Figure 5). Use of IGRs is interesting, and has been reported previously for bed bug control (Potter 2008) found that 65% used them; however there is little evidence that they are effective. Widespread resistance of bed bugs to pyrethroid insecticides has been reported (Romero et al. 2007), and it is worrisome that they were the most commonly reported products for bed bug control in Mississippi.

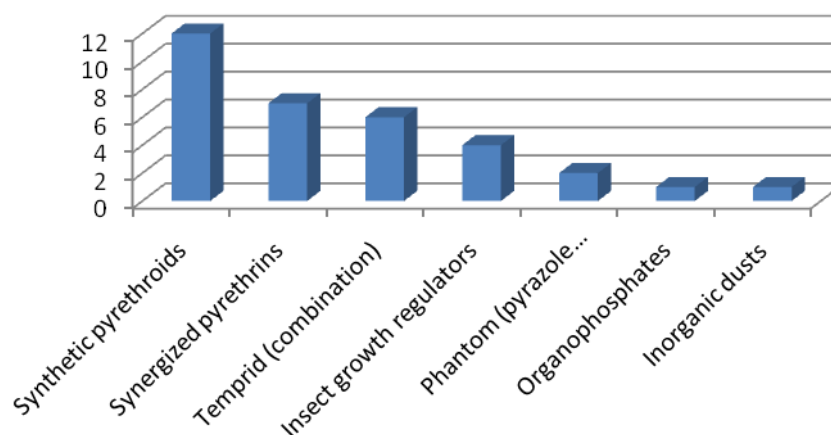


Figure 5. Pesticide products reported by professional pest control personnel for use against bed bugs in Mississippi, September 2010 to February 2011.

Results of this survey indicate that bed bug problems in Mississippi are significant and increasing when compared to previous infestation data provided by the state health department. Infestations are particularly difficult to eradicate in low-income, subsidized housing where tenants may not have the financial means for effective control. Pest management personnel rely heavily on insecticides for bed bug control, and especially pyrethroid products, which might be ineffective due to widespread resistance. New and expanded educational efforts aimed at both homeowners and pest management professionals are needed in the fight against this emerging pest.

Acknowledgements

Dr. Jeffrey Brown and Wendy C. Varando at the Mississippi State Department of Health, Jackson, Mississippi, were instrumental in designing and implementing this survey. Joe MacGown, scientific illustrator, Mississippi State University, did the map illustration. This article has been approved for publication as Journal Article No. J-11993 of the Mississippi Agriculture and Forestry Experiment Station, Mississippi State University.

References

- Anderson, A. L., and K. Leffler. 2008.** Bedbug infestations in the news: a picture of an emerging public health problem in the United States. *J. Environ. Health.* 70: 24-27.
- Bircher, A. J. 2005.** Systemic immediate allergic reactions to arthropod stings and bites. *Dermatology* 210: 119-127.
- Brasch, J., and T. Schwarz. 2006.** [26-year-old male with urticarial papules]. *J. Dtsch. Dermatol. Ges.* 4: 1077-1079.
- Churchill, T. P. 1930.** Urticaria due to bed bug bites. *J. Am. Med. Assoc.* 95: 1975-1976.
- Cleary, C. J., and D. Buchanan. 2004.** Diagnosis and management of bedbugs: an emerging U.S. infestation. *Nurse Pract.* 29: 46-48.
- Eddy, C., and S. C. Jones. 2011.** Bed bugs, public health, and social justice, part I, a call to action. *J. Env. Health.* 73: 8-14.
- Elston, D. M., and S. Stockwell. 2000.** What's eating you? Bed bugs. *Cutis* 65: 262-264.
- Gangloff-Kauffmann, J., C. Hollingsworth, J. Hahn, L. Hansen, B. Kard, and M. Waldvogel. 2006.** Bed bugs in America: a pest management industry survey. *Pest Control Technology*, November issue, 46-60.
- Goddard, J. 2008.** Bed bugs bounce back. Mississippi Department of Health, Morbidity Report, Vol. 24 (6), June issue, pp. 2-3.
- Goddard, J., and R. D. de Shazo. 2008.** Rapid rise in bed bug populations: the need to include them in the differential diagnosis of mysterious skin rashes. *South. Med. J.* 101: 854-855.
- Goddard, J., and R. D. de Shazo. 2009.** Bed bugs (*Cimex lectularius*) and clinical consequences of their bites. *J. Am. Med. Assoc.* 301: 1358-1366.
- Hwang, S. W., T. J. Svoboda, I. J. De Jong, K. J. Kabasele, and E. Gogosis. 2005.** Bed bug infestations in an urban environment. *Emerg. Infect. Dis.* 11: 533-538.
- Kahn, C. M., S. Line, and S. E. Aiello [eds.]. 2008.** Merck Veterinary Manual. Merck and Co., Whitehouse Station, NJ.
- Little, S. E., and M. D. West. 2008.** Home infestation with *Cimex lectularius*, the common bed bug, affecting both dog and client (Abstract No. 61). Amer. Assoc. Vet. Parasitol. Annual Meeting, New Orleans, LA, July 19-22.
- Potter, M. F. 2006.** The perfect storm: an extension view on bed bugs. *Am. Entomol.* 52: 102-104.
- Potter, M. F. 2008.** The business of bed bugs. *Pest Management Professional*, January issue, pp. 24-29.
- Potter, M. F., B. Rosenberg, and M. Henriksen. 2010.** Bugs without borders: defining the global bed bug resurgence. *Pest World*, Sept/Oct: 8-20.
- Reinhardt, K., and M. T. Siva-Jothy. 2007.** Biology of the bed bugs. *Ann. Rev. Entomol.* 52: 351-374.
- Romero, A., M. F. Potter, D. A. Potter, and K. F. Haynes. 2007.** Insecticide resistance in the bed bug: a factor in the pest's sudden resurgence? *J. Med. Entomol.* 44: 175-178.
- Ryckman, R. E., D. G. Bently, and E. F. Archbold. 1981.** The Cimicidae of the Americas and Oceanic Islands, a checklist and bibliography. *Bull. Soc. Vector Ecol.* 6: 93-142.
- Stelman, C. D., A. L. Szalanski, R. Trout, J. A. McKern, C. Solorzano, and J. W. Austin. 2009.** Susceptibility of the bed bug *Cimex lectularius* L. (Heteroptera: Cimicidae) collected in poultry production facilities to selected insecticides. *J. Agri. Urban Entomol.* 25: 41-51.
- Thomas, I., G. G. Kihiczak, and R. A. Schwartz. 2004.** Bedbug bites: a review. *Int. J. Dermatol.* 43: 430-459.

