



Bedbug Infestations in the News: A Picture of an Emerging Public Health Problem in the United States

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Abstract

Bedbug (*Cimex lectularis*) infestations have become a major complaint in all but three states in the United States. Increasing infestations have also been reported in Asia, Australia, Europe, and Canada. Newspaper articles often herald the onset of a new health issue for the public, and they can be used for epidemiological tracking of increasing populations of irritating and potentially serious vectoring pests. This news coverage model is useful in validating the typical spread of a new contagious entity, or in predicting the waves of public reaction to the spread of a new pest or health problem. The authors' analysis covers the years 2001 to 2006, showing the incidence of bedbug news coverage from the East Coast, the Midwest, the South, and the West in the United States. Rural and urban examples are included in a four-year time frame starting with news in the Northeast and ending with an attempt to eradicate the pest from the state of Hawaii.

Introduction

The bedbug insect (*Cimex lectularis*) is making a strong comeback in the world, particularly in developed countries where it has been absent for half a century. Coast to coast, the United States is one of the many countries now playing host to a growing number of infestations. An MSNBC *Dateline* special in March 2006 indicated that bedbug infestations have been treated in all but three states (Murphy, 2006). The infestations are no longer limited to crowded, unclean, or urban locations, and they are occurring in hotels, dormitories, vacation resorts, and personal dwellings (Hwang, 2005); bedbugs have re-emerged as a significant public health pest. Interestingly, some researchers speculate that the resurgence is related to a successful reduction in other household pests

such as cockroaches and ants, and consequent changes in pesticide use.

Bedbug Natural History

Although bedbugs (*Cimex lectularis*) have been common in U.S. history, their populations fell dramatically during the mid-20th century. They were almost eradicated in industrialized countries but have been thriving in underdeveloped countries. Bedbugs have been mentioned in historical writing from as long ago as ancient Greece. Approximately seven different species of bedbug feed on human blood, but the two most common species are *Cimex lectularis* and *Cimex hemipterus* (Cleary, 2004). *C. lectularis* is distributed worldwide, while *C. hemipterus* is found mainly in the tropics. Bedbugs have not yet been positively incriminated as vectors of a specific

disease; however, hepatitis B virus (HBV) DNA has been detected in bedbugs and their excrement for up to two weeks after feeding (Silverman, 2001). Bedbug bites are also responsible for numerous secondary infections such as impetigo, ecthyma, and lymphangitis (Burnett, 1986). Bedbugs can cause welts, induce nervous and digestive disorders, and initiate allergic reactions. Allergic reactions can range from localized urticaria to bullous reaction to, in rare cases, anaphylaxis (Thomas, 2004). Children who are forced to live in badly infested homes will become listless and pale, while adults report anxiety, insomnia, and occasional systemic reactions. Clearly, though not directly vectors of disease, large bedbug populations cause human discomfort and health problems.

Adult bedbugs are wingless insects that are flat, roughly oval in shape, and approximately 4–7 mm long in the adult stage—roughly the size of Lincoln's head on a penny (see photo on page 25). Although typically gray or brown in color, after a blood feeding they turn a deeper red color. The small, flat shape makes the insect particularly adept at hiding during the day in cracks and crevices in the wall, in upholstered furniture, in mattress seams, and behind loose wallpaper. Bedbugs have three pairs of legs, and a short, broad head with a pair of prominent antennae (Thomas, 2004). The abdomen has 11 segments, the tarsi have three segments with claws, and the antennae have four segments (Elston, 2000). Since bedbugs do not have wings, they travel by crawling, sometimes going more than 100 feet to obtain a blood meal (Tvedten, n.d.).

The lifecycle of a bedbug involves incomplete metamorphosis; the nymphs are miniature adults. The female, slightly smaller than the male, can live for approximately 9 to 18 months and after mating can lay two or three eggs per day throughout her life. Before she dies, she typically produces 200–500 cream-colored eggs, laid in the harborages provided by cracks and crevices (Thomas, 2004). Bedbugs prefer rough surfaces such as wood or paper for harborage. The eggs are about 1 mm long, yellowish-white, and vase shaped. At room temperature (20°C), they hatch within one to two weeks. Immediately after hatching, nymphs begin to feed. They pass through a total of five immature (nymphal) stages before reaching the adult stage. Each nymph requires at least one full blood meal before molting to the next stage. The maturation cycle takes anywhere from 9 to 18 weeks. The modern widespread use of central heating and sealed windows provides higher temperatures and stable humidity, allowing continued feeding and a subsequent increase in the number of bedbugs throughout the winter.

Adult bedbugs are nocturnal and feed almost exclusively at night. They respond to warmth and carbon dioxide, using the daytime to digest their meals. To feed, they pierce the skin and inject their saliva, which contains an anticoagulant and an anesthetic-like substance. Because of the anesthetic, the sleeping victim remains undisturbed and notices the bites only upon waking, when the skin becomes irritated and inflamed. Complete engorgement of a bedbug, or a full meal, takes approximately 5–10 minutes (Crissey, 1981). The bites typically appear in a three-bite row, commonly referred to as “breakfast, lunch, and dinner.” Bedbugs can also feed on extravasated blood from damaged tissue or directly insert their tip into a capillary—where they liquefy epidermal tissue (Elston, 2000). They are extremely efficient at finding and extracting their blood meals and frequently attack exposed areas of the skin on the face, neck, hands, or arms (Honig, 1986).

Population Control Measures and Prevention

Changes in pest control methods, increased resistance to insecticides, and more widespread international travel over the past decade have been suggested as causes of the increase in bedbug populations in countries such as the United Kingdom, Canada, Australia, and the United States. It has also been suggested that the use of less toxic, less persistent pesticides is contributing to the resurgence of the bedbug population. Past use of pesticides such as DDT controlled

bedbugs, but with the elimination of many persistent pesticides, bedbugs are again reproducing unchecked (Cleary, 2004). Use of baits rather than insecticide sprays for ant and cockroach control also has allowed bedbugs to survive and flourish. The quicker breakdown of newer insecticides reduces their ability to penetrate the cracks and crevices where bedbugs reside. International travel and commerce are also thought to facilitate the spread of these insect hitchhikers because bed bugs are readily transported in luggage, clothing, bedding, and furniture. People do not carry bedbugs on their body, but luggage can easily pass through customs with bedbugs hiding in cracks and crevices.

Bedbugs can survive for long periods without a meal, which makes them challenging to eradicate. In luggage and personal belongings, they can last more than nine months without feeding. Finding bedbugs can be very difficult, as they prefer to hide in a variety of dark locations, often close to where people sleep. Common places for bedbugs are under mattresses, floorboards, painting, carpets, bed frames, and furniture (see photo at right). Although a social stigma has been associated with bedbugs, that stigma is becoming an assumption of the past. Bedbug infestations are no longer limited to a specific income or cleanliness level; they are invading all buildings without discrimination. Populations are rapidly showing up in hotels, hospitals, college dormitories, multifamily housing units, and single-family homes (Owen, 2004).

The awareness of the general public is important to slowing the bedbug infestations. Inspection of places that are dark, isolated, and protected will help identify the presence of bedbugs. Even if bedbugs themselves cannot be found, one can identify their hiding places by locating fecal spots that are often left in visible places. The dark spots are left on mattresses, along wallpaper edges, on sheets, and in other hidden spots. Telltale signs of bedbug presence are brown stains along the seams of mattresses or the perimeter of the sheets. Bloody spots are also left behind when engorged bugs are accidentally crushed by the sleeping individual. Another simple method of detection is to smell the area; when frightened, bedbugs leak a liquid that emits a sweet, sickly smell often likened to rotting raspberries (Tvedten, n.d.). It may also be useful to inspect suspected areas at night, with a red light, while bedbugs are active.

Proper recognition of a bedbug infestation allows affected individuals to promptly contact health department officials and curb the spread of the problem. It is critical that mem-



Cimex lectularis dorsal side. Feeding structures are tucked underneath the anterior end where the eyes are seen.



Arrows indicate typical infestation resting sites for bedbugs. Inspection should examine all areas indicated, as well as mattress and sheets, for bedbugs or bedbug blood spots. Photo provided by Mike Waldvogel.

bers of the public contact professionals when dealing with a bedbug infestation, as the bugs are tough to exterminate and spread very rapidly among rooms and buildings. Individuals should avoid the purchase of secondhand furniture and bedding that is covered in cloth (e.g., couches, armchairs). Newer bedding is being designed to eliminate creases and hidden depressions where bedbugs gather. Pest control literature emphasizes the importance of combining insecticide treatments with environmental measures such as daily laundering of bed linens in very hot water, vacuuming of rooms, and steam cleaning and vacuuming of mattresses (Hwang, 2005). Frequent vacuuming of common hiding areas for bedbugs will remove loose particles that may prevent insecticide penetration after treatment. It is also beneficial to caulk any cracks and crevices in a building's exterior to prevent the introduction of bedbugs from alternate wildlife hosts such as birds, bats, and rodents.

Since bedbugs can infest airplanes, ships, trains, buses, and almost any other travel vehicle, travelers should be alert to the signs of a

bedbug presence. Inspecting a hotel room may prevent an encounter with an existing bedbug population and prevent the introduction of the bug into new environments. It takes only one female to feed and begin a local infestation.

Methods of Newspaper Trend Analysis

A survey of newspapers in the United States revealed the resurgence trend bedbugs exhibited from 2001 to 2006. A review of published articles using the guided news search system Lexis Nexis Academic Universe, which covers news publications from all 50 states, showed definite trends in public concern over bedbugs. As a geographic area felt more negative impacts from rising bedbug populations, the local newspapers covered the issue with increasing frequency. The number of media articles could thus be roughly related to the severity of the local infestation. Lexis Nexis divides the United States into four equal regions: Northeast, Southeast, Midwest, and Western and indexes roughly equal numbers of publications from each region.

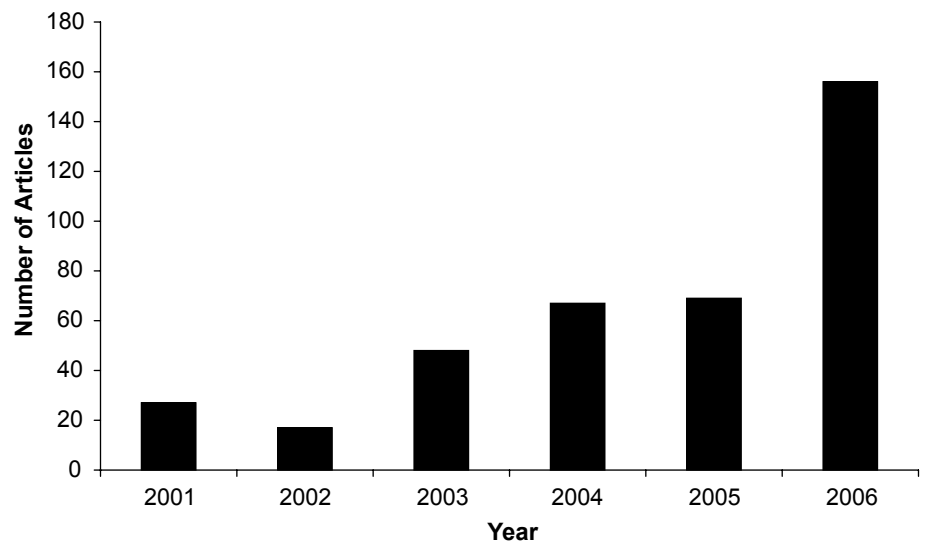
Results of Newspaper Trend Analysis

The analysis of articles in the four Lexis Nexis regions showed a definite increase in coverage of bedbug infestations beginning in 2003 and a further increase each year until 2006. According to our survey, roughly 20–30 newspaper articles on bedbugs were published in the years 2001 and 2002. In 2006, over 150 articles were found, with more articles referring to nationwide populations. Most of the articles were published in major cities in the Northeast, and many newswire articles originating in the Northeast were found.

The majority of the articles from 2001 and 2002 gave basic bedbug information, museums with bedbug exhibits, and other “background” bedbug coverage rather than reports of acute bedbug infestations or rising bedbug populations. In 2001 and 2002, news coverage of the World Trade Center attacks and the start of the Iraq war consumed much of the news space. Beginning in 2003, however, the bedbug article coverage nearly doubled, to about 50, and increased continually afterward (Figure 1). The most dramatic jumps were in 2005 and 2006, with the beginning portion of 2006 having a higher concentration of bedbug media coverage than any previous four-month period. Lawsuits over bedbugs in hotels and other public establishments have drawn further attention to a problem that was once considered strictly a

FIGURE 1

Number of Newspaper Articles in the United States on Bedbug Infestations



third-world issue. There were at least 10 articles about celebrity bedbug lawsuits during 2006.

According to the timing indicated by newspaper coverage, bedbugs began their appearance in the Northeastern United States and spread south and west from there. As illustrated in Figure 2, the Northeast region displayed increased coverage earlier than other regions of the United States and continued to have the largest amount of media coverage. In 2006, coverage decreased in some parts of the country, but it increased in the Northeast and the West. Articles tended to focus on urban environments, where the concentration of international travelers may have been greatest. In Boston and California, bedbug infestations were reported in college dormitories. Bedbugs apparently began their re-emergence in New York City and Washington, D.C., and subsequently spread rapidly outward to more rural areas and across the United States. The Midwest was the last to show widespread reporting, with the exception of large cities such as Chicago. Chicago was the area of concern in numerous Midwest newspaper bedbug articles, although Madison and Minnesota were included in 2006. The review of media articles found continual growth of bedbug coverage by year in the West and the Southeast (Figure 2). Both areas showed an increase in problems with bedbugs in both residential homes and transient quarters such as hotels and timeshares. Charleston, Birmingham, and Atlanta reported infestations in 2005 and 2006.

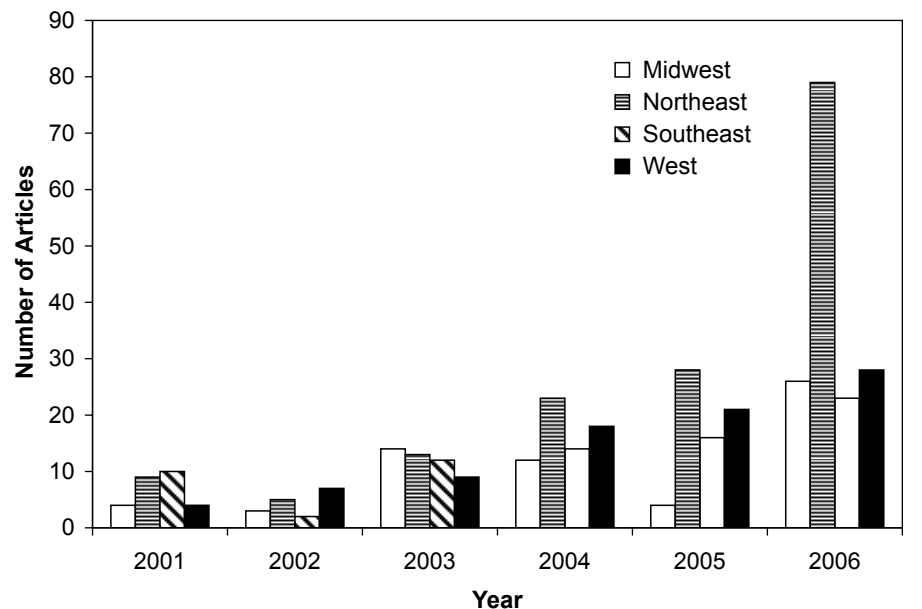
As a large population of an emerging or re-emerging public health pest is introduced, newspaper coverage follows and peaks with urban area infestations as residents become concerned about the emerging environmental health issue. As the pest becomes endemic to the area, however, media coverage drops off. This analysis applies to the media coverage surrounding a rapid introduction of large bedbug populations from 2001 to 2006.

Discussion and Conclusion

Our study of newspaper coverage has limitations that reflect the biases of news media decision making. News events compete for space, and the sensational is often front-page news because of reader interest rather than because of newsworthiness. Since bedbugs may be the most despised of all public health pests, they have been covered by the news media for the last several years in a progressive wave from New York to the Midwest and the South, and finally to the West Coast and Hawaii. Reports of bedbugs in Hawaii, which came late in the U.S. outbreak, provide evidence that bedbugs are spreading through tourism and other travel, since the Hawaiian Island chain is the most isolated land mass on the globe and hosts 700,000–800,000 tourist visits per year (Department of Business, Economic Development & Tourism, 2007). Eradication of a pest species is not feasible unless a habitat is thoroughly isolated, and in the modern world, true isola-

FIGURE 2

Number of Newspaper Articles on Bedbug Infestations, by U.S. Region



tion is a rare occurrence. Nevertheless, laws have been passed in Honolulu and New York to address the problem in hopes of preventing loss of income from tourists forgoing infested hotels (Brumback, 2006). As of the summer of 2007, all states, including the two Northwestern states of Oregon and Washington that were

uninvolved in 2006, now have in newspaper bedbug coverage.

Public health officials can use media coverage as a springboard in efforts to educate the public and prevent panic over a new pest introduction or infestation. Educating the general public about signs of bedbugs and the

biology of the insect is an important control method. Encouraging individuals to report a problem that no longer is unusual helps to prevent public prejudice and panic. Convincing individuals to report and have infestations properly treated will also help in the tracking and management of emerging pests and diseases. This help can be an advantage when a pest or disease is a serious vector or threat.

Clearly, the bedbug media coverage lends public credibility to what experts have reported and provides an epidemiological time line in the news. Bedbug infestations can negatively affect the quality of life and should be treated as a serious problem by local health departments and environmental health officials. Our study indirectly shows that the general reading public has become more aware and concerned about the prevalence of bed bugs. The environmental health professional must also be prepared with information, preventive measures, and solutions. There does not appear to be an immediate worldwide control measure for the resurgence of bedbugs in the United States and other industrialized countries, but environmental health and safety professionals must add provision of information on, and methods for dealing with, this public health pest to the other services they provide to the public. 🐛

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