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Bed Bugs: They ARE Back!

The Role of the School Nurse in Bed Bug Management

Patricia Sciscione, MSN, RN, CSN-NJ

Recently there has been a resurgence of bed bugs in all facets of our society. Bed bugs have even been found in schools, causing unnecessary exclusion of students and unfounded hysteria. School nurses are again called upon to be front-line sources of information to quell the hysteria and confusion related to this unsavory condition. By arming themselves with the best evidence regarding proper identification of bed bugs and their bites and information about integrated prevention measures to control transmission of infestations, school nurses can contribute to the control and management of bed bugs and aid in the overall battle against this “new and improved” invasion of the bed bugs.

Keywords: bed bugs; *Cimex lectularius*; integrated pest management; infestation

Introduction

Bed bugs have recently been identified as having resurfaced with a vengeance in many venues across the globe. No longer are bed bugs confined to bedrooms. Bed bugs have been reported in all types of environments where human beings live, work, and play. Areas of infestation are as diverse as private

homes and apartment buildings to school dormitories and homeless shelters, hospitals and jails, retail stores and office buildings, and even cruise ships and luxury hotels (Berg, 2010; Gangloff-Kaufmann & Schultz, 2003; Hwang, Svoboda, De Jong, Kabasele, & Gogosis; 2005; Potter 2008). Media accounts have reported bed bug sightings in subways, schools, and a major New York City performance center (Haddon, 2010; Pogrebin, 2010; Strauss, 2011). Since transportation has progressed to the point that people can travel across continents in hours, bed bugs have spread far and wide and have now made appearances in all types of communities, regardless of race, ethnicity, or socioeconomic status of the population that resides there. It seems like no one can remain safe from bed bugs, but there is hope. There are many precautions that can be taken to keep bed bugs at bay, decrease the likelihood of infestation, and increase the success of eradication if an infestation does occur.

Many reasons have been cited as the cause of the major resurgence of bed bugs, such as an increase in international travel, changes in the types of pesticides used, an increased resistance to pesticides, a lack of knowledge about how to prevent the spread of bed bugs and how to contain

and eradicate infestations, and the ease with which bed bugs are spread (Eddy & Jones, 2011; Hwang et al., 2005; Jones, 2004; Romero, Potter, Potter, & Haynes, 2007), but ultimately these reasons are just speculation. The true answer is that even the experts do not know why bed bugs have come back with a vengeance after almost 50 years (Pollack, 2011). The key to bed bug management is to keep up to date on the latest information about bed bugs from legitimate sources (Pollack, 2011). Ironically, by becoming intimately knowledgeable about the life cycle and appearance of bed bugs, their habits and hiding places, and methods of transmission, one can greatly decrease the chance of ever meeting these insects “up close and personal” in the bedroom.

Bed Bugs and Humans: The Early History

Cimex lectularius, otherwise known as the common bed bug, is found throughout the world and has been associated with humans for about 3,550 years. Originally the primary hosts of the bed bug were bats; as men started to live in caves, the bed bugs developed the taste for human blood and eventually moved with humans out into other domiciles (Boase, 2004; Usinger, 1966). Fossilized remains of the ectoparasite from approximately 1350–1323 BC

Figure 1. Adult Bed Bug



Source: IdentifyUS (2010). Used with permission from Dr. Richard Pollack.

found during archeological excavations at the Workmen's Village in Cairo, Egypt, provide the earliest evidence of the coexistence of man and bed bug (Panagiotakopulu & Buckland, 1999).

In medieval times, only rich colonists were burdened by the presence of bed bugs because the warmth in their homes was conducive to bed bug survival (Gangloff-Kaufmann & Schultz, 2003). In the late 16th century, improvements in home construction and insulation provided an impetus for bed bugs to move out into all socioeconomic environments. Up until the mid-1900s, their presence in homes was quite common until pesticides containing DDT to kill cockroaches became widely used and bed bugs may have been annihilated as well (Gangloff-Kaufmann & Schultz, 2003). After World War II, due to improvements in hygiene and new household innovations such as the vacuum cleaner, which made housecleaning easier, bed bugs were virtually eradicated from most households (Gangloff-Kaufmann & Schultz, 2003).

Life Cycle and Habits of the Bed Bug

The female bed bug lays eggs in sticky clusters of 10 to 50 eggs at a time, attaching them to the surface of her hiding place with a sticky, glue-like covering (Lewis, Greenberg, & Klotz, 2009). Over her lifetime, the female bed bug lays approximately 350 to 500 eggs (Boase, 2004; Lewis et al., 2009; Potter,

2012). The individual eggs are whitish in color and are virtually invisible to the naked eye because they are about the size of a dust speck. After the incubation period, the eggs hatch into straw-colored nymphs about 1 mm in length, hardly larger than a pinhead (Potter, 2012). The nymphs then pass through four more nymphal *instars* in which they grow progressively larger until they final molt into adult bed bugs (Figure 1). A full blood meal must precede each molt, and the oldest nymphs and adult bed bugs may ingest up to 10 microliters of blood at one time (Boase, 2004). Once the bed bug reaches the adult stage, it is approximately 5 mm in length and is oval, flat, and dark brown in color (Pritchard & Hwang, 2009; Ter Poorten & Prose, 2005). However, following a blood meal, the insect becomes engorged and turns dark mahogany red in color (Ter Poorten & Prose, 2005) and has been likened to an "animated blood drop" (Gangloff-Kaufmann & Schultz, 2003, p. 1). When bed bugs are in a heated environment (70–80°F) with an adequate food source, they can reproduce all through the year with the potential to produce several generations (Potter, 2012). Adult bed bugs can exist in cooler environments for more than a year even if they have no food source available to them, such as when they are hiding in vacant apartments or on furniture that has been placed in storage for a length of time (Boase, 2004; Potter, 2012; Ter Poorten & Prose, 2005).

Bed bugs are wingless insects and must crawl to reach their preferred food source—human blood. They are nocturnal creatures who feed at night and hide during the daylight hours. When bed bugs initiate feeding, they inject an anesthetic substance into the bite so the human victim is unlikely to feel the bite and disturb their feeding. They typically feed for between 5 and 10 min, then return to their hiding places to digest the blood meal (Pollack, 2011). Bed bug bites often do not appear until several days after being bitten, and they typically present on areas of the body that are exposed during sleep such as

the face, neck, and extremities (Ter Poorten & Prose, 2005). Since the bites are itchy and swollen, they are most often mistaken for mosquito bites. Most people have minimal reaction to bed bug bites, and the bites heal within a week without any treatment (Pollack, 2011). However, repeated exposure to bed bug bites may result in more rapid and intense reactions (Reinhardt, Kempke, Naylor, & Siva-Jothy, 2009). Although classic bed bug bites have been described to be small, red, itchy welts that appear in a suspicious row referred to as "breakfast, lunch, and dinner" (Ter Poorten & Prose, 2005, p. 185), bites from many bed bugs can present as a widespread erythematous rash or urticaria (Doggett & Russell, 2009). Medical treatments such as oral antihistamines, steroids, or antibiotics may be required if a secondary infection occurs due to scratching at the site of the bed bug bites (Scheinfeld, 2004). On rare occasions, people may develop systemic reactions to the saliva of the bed bug, which result in asthma attacks or anaphylaxis requiring emergency treatment (Goddard & deShazo, 2009) or anemia due to excessive blood loss in extreme infestations (Pritchard & Hwang, 2009). There has yet to be any conclusive medical evidence that links bed bugs with the transmission of blood-borne diseases (Boase, 2004; Goddard & deShazo, 2009). However, there are other negative physical, psychological, and economic consequences caused by bed bug infestations that justify seeking a quick solution to a suspected bed bug problem before it becomes a major infestation (Boase; Lewis, Greenberg, & Klotz, 2009).

Transmission and Control

Bed bugs do not remain on their human hosts; they feed for several minutes and then detach and slink off into dark places near the sleeping area to digest their meal. Common hiding places are cracks and crevices in floors, in and around the bed frames and head boards, or in the seams of the mattresses. Bed bugs have also been found in base boards, under wallpaper,

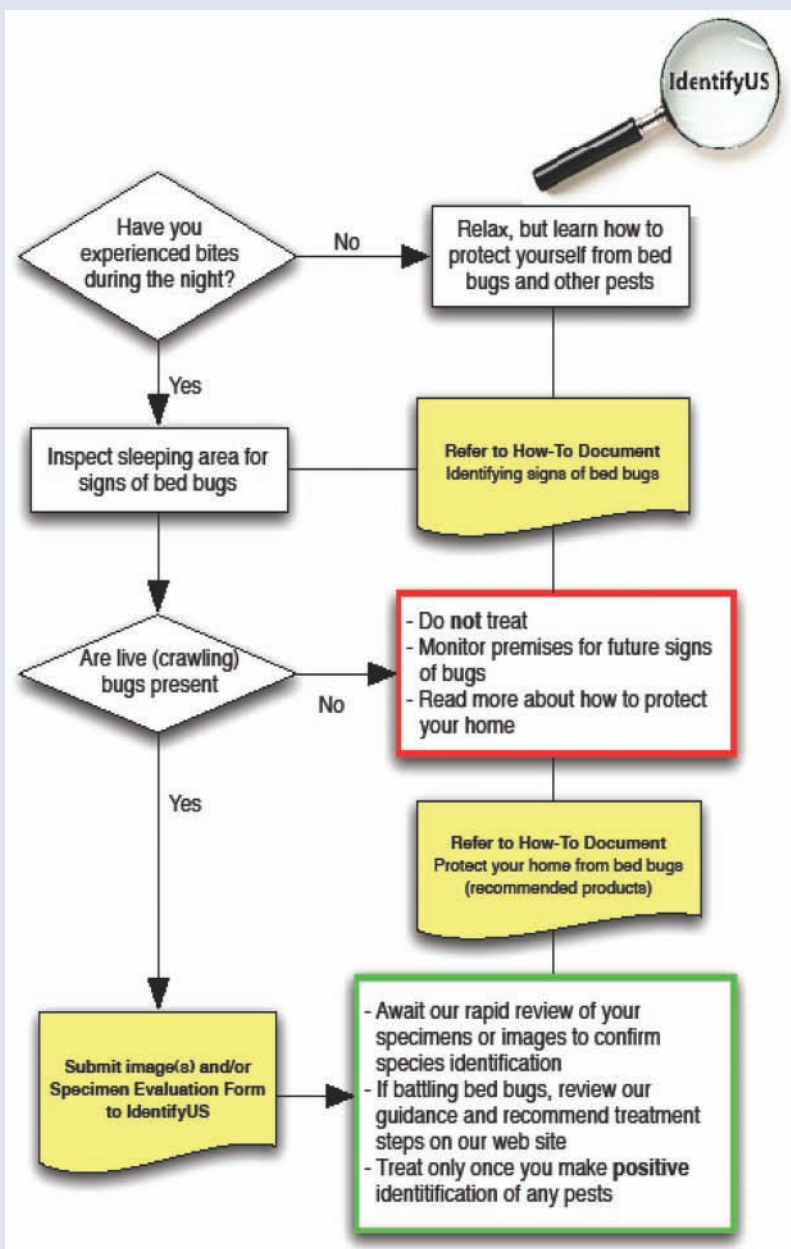
beneath the edge of carpeting, and amid piles of clutter (Pollack, 2011). Bed bugs tend to cluster all phases of the life cycle together (eggs, nymphs, adults) in one hiding place and can be hidden stowaways in bedding and clothing at any stage of development in the life cycle (Eddy & Jones, 2011). Although they choose to remain near the sleeping area of their human hosts, bed bugs may hide inadvertently in seams of clothing, book bags, brief cases, suit cases, luggage, purses, or any other dark crevice that affords them shelter and unwittingly migrate out into the world toted by human hosts. They may also harbor in furniture and bedding and be moved from place to place or be acquired by unsuspecting victims when they purchase secondhand furniture or bedding (Potter, 2012). It is easy to see how humans have contributed to bed bugs' becoming such cosmopolitan creatures, but it is much harder to understand how to control them from taking over our lives.

The first step in controlling a bed bug problem is to identify if you have the problem in the first place by consulting an expert (Figure 2). Any bugs that are found should be evaluated by a specialist to confirm the species. The most effective means of controlling bed bugs is a well-designed, integrated pest management (IPM) approach that incorporates nonchemical measures such as surveillance, making changes to the environment to make it less hospitable for bed bugs, getting rid of clutter, encasing bedding, and frequent vacuuming of all areas where bed bugs were found as well as the use of selective chemical treatments to kill bed bugs if deemed necessary by a licensed pest control specialist (Gangloff-Kaufmann & Schultz, 2003; Rossi & Jennings, 2010). There are selected Internet resources available that provide general information about bed bugs and integrated pest management techniques to aid in the war against bed bugs in the home setting (see Table 1).

Bed Bugs in the School Setting

Since there are many ways that bed bugs are transported, it is easy to see

Figure 2. Identification of Suspected Bed Bug Infestations



Source: IdentifyUS (2010). Used with permission from Dr. Richard Pollack.

Table 1. General Household Information and Integrated Pest Management Resources

www.nj.gov/health/eoh/phss/documents/bedbugfactsheet.pdf
www.epa.gov/bedbugs/
www.cdc.gov/nceh/ehs/Topics/bedbugs.htm
<http://www.ca.uky.edu/entomology/entfacts/ef636.asp>

Table 2. Integrated Pest Management Planning Resources for Schools

www.pestmanagement.rutgers.edu/ipm/schoolipm/tools.html
schoolipm.ifas.ufl.edu/Florida/bedbugpests.htm
schoolipm.ncsu.edu/bedbugs.htm
www.maine.gov/agriculture/pesticides/schoolipm/pests/bedbugs.htm

that school children do not hold the monopoly on bringing bed bugs to school with them. Bed bugs can be brought into the school setting by anyone who enters the school who may have bed bugs in their home. It is important that school nurses take the lead in educating the entire school population about bed bug identification and transmission to reduce the chance that bed bugs will become unwelcome visitors in the school setting (Krause-Parello & Sciscione, 2009). Schools are not the ideal place for bed bugs to live because they are nocturnal creatures and require regular nightly feedings to reproduce. They have been known to show up as visitors on students' clothing or in book bags or other baggage. Students who inadvertently bring bed bugs to school or are found to have bed bug bites on their bodies should not be excluded from the school setting (Pollack, 2010). If a bed bug is sighted in a school, it should prompt further investigation but not necessarily treatment. Insecticide use in the school setting must adhere to strict government guidelines and should never be used as a preventative measure (Pollack, 2010).

Social stigma, fear, and anxiety related to bed bugs may cause people to overreact to the possibility of a bed bug infestation that may directly affect them. There have been many false reports of bed bug infestations. Dr. Richard Pollack, who runs a bug identification laboratory and consulting service called IdentifyUS (<http://identifyus.com>), reported recently that less than half of suspected bed bug specimens submitted to his laboratory for testing were actually bedbugs. Most were household bugs that do not bite and are normally found in bedrooms, such as carpet beetles (Pollack, 2011).

The New York City Department of Education (NY DOE) has taken the lead in establishing excellent bed bug management resources and procedures for schools located on their website at <http://www.opt-osfns.org/dsf/reference/pest.aspx>. The NY DOE even provides bed bug kits for schools to use to send specimens of suspected bed bugs to a specialty lab for evaluation and detailed procedures to follow in the event there is a bed bug infestation in a school. The state of Maine and other state universities have also posted bed bug information and IPM measures online to guide schools with creating IPM management plans (Table 2). School nurses can use these examples as guides for planning bed bug management procedures in their own districts.

Implications for School Nurses

School nurses can play a vital role in bed bug control by educating the school community about infestations and transmission, advocating for bed bug policies that provide for a uniform response to suspected bed bug infestations, and collaborating with public health authorities to keep abreast of any bed bug outbreaks in the community (Krause-Parello & Sciscione, 2009). This global resurgence of bed bugs requires an unprecedented vigilance about bed bugs and a collaboration between parents/guardians and school officials to establish control. School nurses must take a proactive stance in bed bug management by acting as IPM educators and advocating for home and classroom surveillance on a regular basis, not just when an outbreak occurs. School nurses can assist with developing an IPM program for their schools and encourage parents and members of the school

community to develop one for their own homes (Rossi & Jennings, 2010).

When a student presents to the school nurse office complaining of insect bites, making a conclusive diagnosis from the appearance of the bites alone is not reliable since the reaction to the bites can vary greatly from person to person (Doggett & Russell, 2009). Misdiagnosis of bed bug bites as other skin disorders such as mosquito bites, flea bites, spider bites, chicken pox, and even scabies often results in inappropriate medical interventions (Doggett & Russell, 2009). Parents/guardians should be notified by the school nurse, and a thorough examination of the sleeping area of the student should be suggested (Krause-Parello & Sciscione, 2009). If the school nurse has already established an open forum in the school community about bed bug management, it will be easier to suggest this approach to the parents/guardians of the student. This method of management could lead to identification and treatment of the infestation and ultimately to the proper diagnosis and appropriate treatment of the student's skin condition.

When students are diagnosed as having bed bug bites and their homes are found to be infested, there can be significant physiological and psychological distress manifested by anxiety, sleep disturbances, and even depression (Eddy & Jones, 2011). They may also have feelings of social stigmatization and embarrassment because bed bugs are still associated with poor housekeeping and hygiene, even though they have now been found in five-star luxury hotels (Eddy & Jones, 2011; Doggett & Russell, 2009). Students will need encouragement and support from the school nurse to help them cope and realize that their reactions are normal in this situation. Educating them about management measures they can take for themselves that are reasonable for their age and developmental level will help empower them and give them a sense of control over the situation.

Conclusion

Bed bugs have been existing happily for centuries with humans and for them it

is literally a matter of life and death that they continue to do so. Of course, human beings see things quite differently. We would like nothing better than to stay far away from the insects, especially in the dark of the night, when they are up and biting. Staying far away from bed bugs is the ideal, but it will take a collaborative effort of everyone in the community. School nurses can play a major role in educating members of the school community to control infestations in their homes and, in doing so, reduce the chance that bed bugs will be unwelcome visitors in schools. ■

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