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SEVERE INFESTATION BY TROPICAL BEDBUGS (CIMEX HEMIPTERUS) IN MEDELLÍN, COLOMBIA. CASE SERIES

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ABSTRACT

Introduction: Bedbugs are obligate hematophagous parasites that are difficult to control and eradicate, which can cause a great psychological and economic impact. This paper presents three clinical cases secondary to a tropical bedbug infestation that were morphologically and genetically identified.

Case presentation: A three-member family (mother aged 53 years and two daughters aged 25 and 22 years) living in Medellín (Colombia) requested a private teleconsultation due to generalized pruritus and psychological symptoms (feeling of isolation, anxiety, difficulty sleeping, and jumpiness). During the appointment, it was found that the patients presented subtle welts on the upper and lower extremities. Therefore, a visit to the family home was scheduled, finding 155 insects that were later identified as *Cimex hemipterus*. The patients were prescribed symptomatic treatment and informed about measures to control infestations. A pest control company made several visits to eliminate the bed bugs, but they were ineffective. Finally, the insects were eradicated after 3 months of meticulous daily cleaning with steam and heat.

Conclusion: These cases confirm the presence of a tropical bedbug (*C. hemipterus*) in Colombia and illustrate the significant psychological burden that bedbug infestations can cause and the difficulty of controlling them, thus making this issue an important public health problem.

RESUMEN

Introducción. Las chinches de cama son parásitos hematófagos obligados difíciles de controlar y erradicar, por lo que pueden causar un gran impacto psicológico y económico. Se presentan tres casos clínicos secundarios a una infestación por chinches de cama tropical, los cuales se identificaron morfológica y genéticamente.

Presentación de los casos. Familia compuesta por tres miembros (madre de 53 años y dos hijas de 25 y 22 años) y residente en Medellín (Colombia), la cual solicitó una teleconsulta privada por prurito generalizado y síntomas psicológicos (sensación de aislamiento, ansiedad, dificultad para dormir y nerviosismo). En la teleconsulta se evidenció que las pacientes presentaban ronchas sutiles en extremidades superiores e inferiores, por lo que se programó una visita a la vivienda familiar, en donde se encontraron 155 insectos que posteriormente fueron identificados como *Cimex hemipterus*. A las pacientes se les recetó tratamiento sintomático y se les informó acerca de las medidas de control para infestaciones. Una empresa de control de plagas realizó varias visitas para eliminar las chinches, pero estas fueron ineficientes y finalmente estos insectos fueron erradicados después de 3 meses de realizar limpieza diaria meticulosa con vapor y calor.

Conclusión. El presente caso confirma la presencia de la chinche de cama tropical (*C. hemipterus*) en Colombia y muestra la importante carga psicológica que pueden ocasionar las infestaciones por estos insectos y la complejidad de su control, lo cual las convierte en un problema importante de salud pública.

INTRODUCTION

Bedbugs are emerging hematophagous parasites from the family *Cimicidae* (1), and they cause a major psychological and economic burden (1,2). There are three types of bedbugs that are considered human parasites: *Cimex lectularius*, *Cimex hemipterus*, and *Leptocimex boueti* (1,2).

In the last decade of the twentieth century, the number of infestations and outbreaks by both *C. hemipterus* (tropical bedbug) and *C. lectularius* (common bedbug) increased dramatically and synchronously worldwide (3). Said infestations presented changes in their usual characteristics, as evidenced by the information about the presence of *C. hemipterus* outside its usual geographical distribution, considering that it was historically limited to the tropics and subtropics and did not cross the Tropic of Cancer or the Tropic of Capricorn (4-8). In Colombia, although the relevant literature is scarce, the historical presence of both *C. hemipterus* and *C. lectularius* has been reported in several regions of the country (9-12). Even so, the origin of these animals is still unknown.

As for parasitism, bedbugs inoculate various products and substances during the biting process that can induce reactions similar to those produced by other hematophagous insects (wheals or pruritic welts) (13-15). However, bedbug bites may have a linear pattern known as the breakfast-lunch-dinner sign (16), which is formed due to the interruption of their feeding process. The most common bite sites are the extremities, trunk, and face (17).

In view of the changes in distribution and epidemiology of bedbugs and their worldwide resurgence, it is important to present all available evidence of new cases. Consequently, three clinical cases secondary to infestation by *C. hemipterus* in Colombia are described below.

CASE PRESENTATION

On March 26, 2021, 3 patients from the same middle-class family (53-year-old mother and 2 daughters aged 22 and 25 years) voluntarily attended a private telemedicine appointment due to symptoms related to a bedbug infestation. All three patients were from Medellín (Colombia) and had not traveled abroad prior to the infestation. During the appointment, the family reported that they initially found a specimen in their eldest daughter's bedroom and afterwards they began to notice the appearance of slightly erythematous and pruritic welts on their bodies, especially on the forearms, legs and face, and that some of them formed a linear pattern (breakfast-lunch-dinner sign). They also reported that new lesions appeared every morning when they woke up and that the older ones disappeared relatively quickly. A photograph (Figure 1) taken by the patients allowed to identify *Cimex spp.* as the possible cause of their signs and symptoms.



Figure 1. *Cimex hemipterus*. Specimen found at the patients' home.

Source: Photograph taken by the patients.

During that first appointment, the patients reported that no relatives or neighbors had experienced similar symptoms and that none of them had or had had fever or other systemic or severe symptoms requiring emergency treatment. The history and main symptoms in each of the cases are presented below:

Case 1

53-year-old woman with a family history of hypertension and cancer on her mother's side, with no other relevant medical detail, with a family nucleus consisting of two daughters with whom she lived in a three-bedroom apartment located in an urban residential area, with access to all public services, and where a cleaning person was hired once a week to help with the housework. On examination, slightly erythematous and pruritic wheals were observed, which were almost imperceptible and had a grouped and linear distribution. No hypopigmented or hyperpigmented lesions were observed, and no superinfection was diagnosed.

Case 2

22-year-old woman with the same family history as her mother, social drinker, with no other relevant medical detail, who lived in the same three-bedroom apartment with her mother, in her own room. On examination, there were slightly erythematous and pruritic wheals, almost imperceptible, with a grouped and linear distribution. No hypopigmented or hyperpigmented lesions were observed, and no superinfection was diagnosed.

Case 3

25-year-old woman with the same family history as her mother, with no other relevant medical detail, who lived in the same three-bedroom apartment with her mother, in her own room (where the insects were first found). On physical examination, the patient was found to look well groomed, although slightly anxious. She presented with mildly erythematous and pruritic wheals, almost imperceptible, with a grouped and linear distribution. No hypopigmented or hyperpigmented lesions were observed, and no superinfection was diagnosed.

Taking into account the clinical manifestations described by the patients and the photograph, a diagnosis of bedbug bite dermatosis was established. The following plan of action was devised: to treat the symptoms, they were recommended to wash the affected area with soap and water and to use topical antihistamine (diphenhydramine 2 times a day) for 1 week; if symptoms worsened, they were indicated to use systemic antihistamine (cetirizine orally 10mg once a day). Patients reported no adverse events with this treatment.

They were also explained that bedbugs are insects that feed on people and hide in their personal belongings or clothing so they can spread, but that they do not transmit diseases among humans and are not a sign of poor personal hygiene. Therefore, they should avoid placing blame on themselves or others for the infestation.

Regarding control measures, they were informed that there are several options offered by integrated pest management (IPM) companies, and that it was not necessary to change the affected furniture, but it was important to start using mattress protectors, pillows, and other furnishings such as sofas. They were also instructed to fill cracks in furniture, walls and floors to eliminate possible hiding places; steam vacuum the entire apartment, especially the cracks and crevices; and dispose of the vacuum cleaner filter and bags in a hermetically sealed plastic bag three times a week until the insects were completely eradicated and then continue with the usual cleaning routine.

After 2 weeks of the first telemedicine appointment (April 2021), a follow-up visit was made, during which more than 150 insects were found in closets, electrical outlets, and the joints of the sofa and the night table (mainly in the room of the third case). They were caught with entomological tweezers and included 73 eggs, 66 nymphs, and 19 adults.

The insects were preserved in cryovials with 70% ethanol, which allows the preservation of DNA for long periods of time (18), and subsequently identified as *C. hemipterus* (Figure 3) as per the morphological keys described by Usinger (1) and Walpole (19). A stereomicroscope (Olympus SZ61, Olympus Corporation, Tokyo, Japan) with 4X magnification was used for identification. DNA was extracted from 5 specimens (whole adults) using a commercial kit with a slightly modified protocol (Monarch® Genomic DNA Purification Kit). The 5 insects selected for extraction were dried at room temperature overnight and crushed with a homogenizer.



Figure 2. Pronotum of *Cimex hemipterus*. 4X magnification.

Source: Image obtained while conducting the study.

Fifteen days after the follow-up appointment, the insects were subjected to genetic analysis by conventional polymerase chain reaction (PCR) using previously published primers (Table 1) for two genes (mtDNA *COI* and mtDNA *rRNA 16S*) that have been used to barcode and perform several phylogenetic studies in bedbugs (4,20). Limitations such as possible mitochondrial heteroplasmy were considered (3).

Table 1. Primers used for DNA amplification.

Gene	Primer set (5'-3')	Program	Study
mtDNA <i>COI</i>	COIF - GCATTYCCACGAATAAATAAYATAAG COIR - TAAACTTCTGGATGTCCAAAAATCA	1	Chebbah <i>et al.</i> (3)
mtDNA <i>16S rRNA</i>	R-J-13007 - TTACGCTGTTATCCCTAA LR-N-13398 - CGCCTGTTTATCAAAAACAT	2	Szalanski <i>et al.</i> (20)

1. Initial denaturation for 2 minutes at 95°C, followed by 5 cycles of 40 seconds at 94°C, 40 seconds at 45°C, and 1 minute at 72°C. This was followed by 35 cycles of 40 seconds at 94°C, 40 seconds at 51°C, 1 minute at 72°C, and 5 minutes at 72°C.

2. Initial denaturation for 2 minutes at 95°C, followed by 5 cycles of 40 seconds at 94°C, 40 seconds at 45°C, 1 minute at 72°C, and then 35 cycles of 45 seconds at 94°C, 45 seconds at 46°C, 1 minute at 72°C, and 5 minutes at 72°C.

Source: Own elaboration.

Once the extraction was confirmed by agarose gel, the DNA was purified for subsequent sequencing, which was performed one week later at the Sequencing and Molecular Analysis Service of the Universidad Nacional de Colombia. A length of 410–430 base pairs was obtained for the *COI* gene and a length of 370–390 base pairs for *16S rRNA*; this sequencing used the same primer sets.

Following BLAST (Basic Local Alignment Search Tool) analysis, it was observed that the *COI* gene had homology >99% with tropical bedbug samples from Kenya

(MT423991), Iran (MG739322), Bangladesh (MH607404), Kenya (MT423988), and Malaysia (MW161336), while the 16S rRNA gene had 100% homology with tropical bedbug samples from China (MG813244), Czech Republic (KF018724), and Hawaii (MN946488). Sequences were uploaded to GenBank with accession numbers (OR113042 to OR113045). The phylogenetic tree constructed using the neighbor joining method can be seen in Figure 4 for the 16S rRNA gene and Figure 5 for the COI gene.

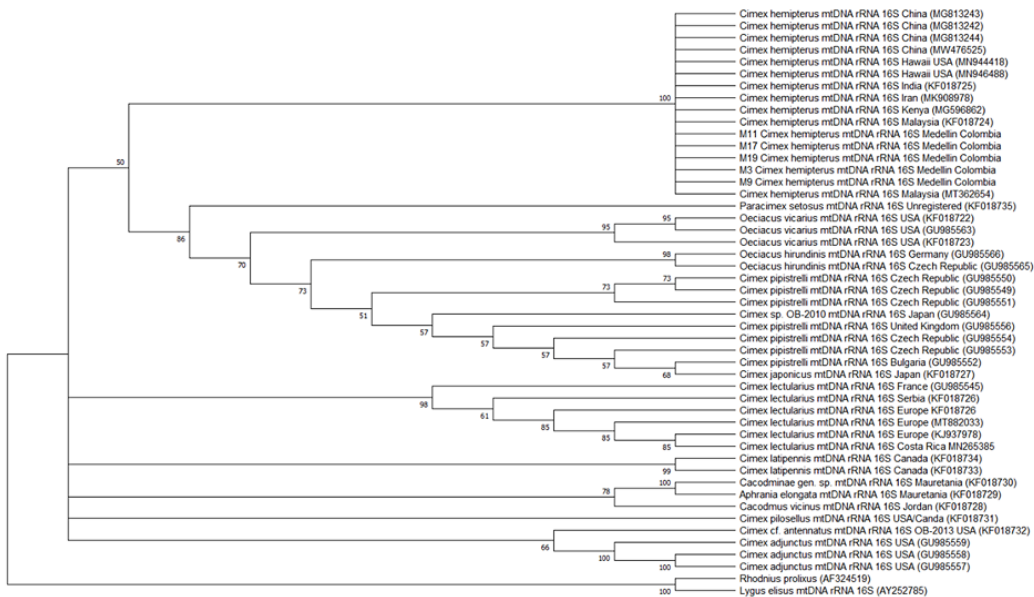


Figure 3. *Cimex hemipterus*. Phylogenetic tree based on 16S rRNA gene sequences.

Source: Graph obtained while conducting the study.

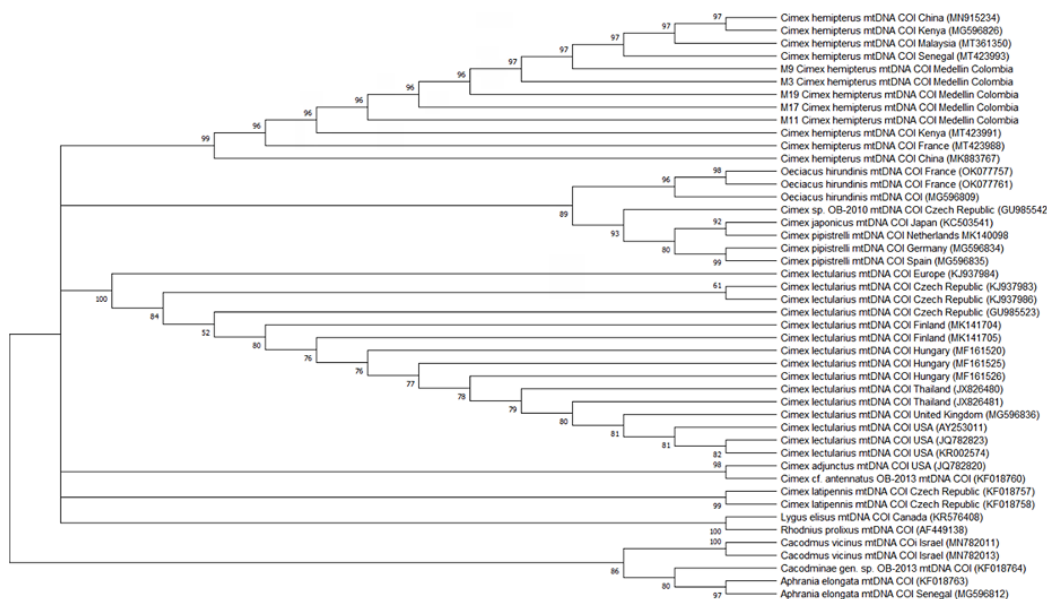


Figure 4. *Cimex hemipterus* phylogenetic tree based on COI gene sequences.

Source: Graph obtained while conducting the study.

Then, three weeks after the initial appointment (April 2021), the family contacted an IPM provider, who made a visit and used insecticides. However, the patients continued to find possible nests or infestation foci that were supposedly destroyed using home measures (cleaning with soap and water). The infestation seemed to be under control for a few days after taking these measures, but the insects and symptoms reappeared two to three weeks later (May 2021).

During a follow-up telemedicine appointment, which took place two weeks after the first disinsection, it was confirmed that the presence of bedbugs was not related to the cleaning service and that, once the infestation was successfully treated, they might have received visits from relatives carrying new bed bugs, so they were suggested to hire an IMP provider again. The family contacted a company that performed a second disinsection a week after the follow-up appointment (June 2021), which was also unsuccessful.

Due to this new failure, seven days after the second disinsection, the family made a new follow-up telemedicine appointment in which it was suggested to vacuum and/or steam clean daily and to hire again an IMP. On that occasion, the patients reported insomnia, distress, anxiety, social isolation, and skin lesions; they also reported that the younger patient's entomophobia was exacerbated by the infestation. The family reported that they sometimes did not sleep in their bedrooms for fear of the insects and their bites.

In August 2021, a new follow-up appointment was held, and the patients reported that the infestation had been completely eliminated approximately three weeks earlier due to the daily use of the steam cleaner and iron in the cleaning routine. At the time of the appointment, no new lesions were found on any of the patients.

At follow-up 12 months after the first appointment, no further bugs were found, nor were any further skin lesions reported or observed. Furthermore, the patients reported that the lesions resolved spontaneously a few weeks after the last bedbug was seen, and that their psychological symptoms improved rapidly once the infestation was resolved. No neighbor reported symptoms of bedbug bites.

The possible source of infestation was a possible infested suitcase of an acquaintance since this person, as well as a neighbor of this person, were also infested. Those patients did not cooperate and did not allow sampling or further contact; however, the affected family stated that these infestations had been treated. Two years later, the patients have not reported any new infestations.

DISCUSSION

This case series demonstrates the presence of *C. hemipterus* in Colombia and contributes to the epidemiological knowledge of this species. Moreover, like the study by Balvín *et al.* (21), it suggests a recent introduction or reintroduction of this tropical bedbug.

In the present study, the limited number of cases and the difficulties in following the other infestations reported by the patients raise questions about the

origin in Colombia of both the current and historical populations of *C. hemipterus*, a species that was first reported in the country in the first half of the twentieth century (9–11). Our case could have originated from a local infestation or be secondary to international travel, but since the affected patients did not travel, it suggests a locally acquired (autochthonous) infestation (21).

Similar to infestations secondary to *C. lectularius* (12,22–23), the most important aspects of a tropical bedbug infestation are eminently the medical, psychological, and economic burden of parasitism (17,24), as patients exhibit fear, anxiety, and increased stress levels.

On the other hand, the multiple times in which the infestation in this report was treated by IMP companies suggests a certain level of resistance to insecticides (12), which could also explain why the infestation lasted so long and why treatment with heat and steam was the only effective measure to eliminate the bedbugs. In this regard, it has been established that in cases like this, the use of silica gel can be useful (24,25). In view of this scenario, it is evident that further studies are needed to evaluate the resistance of *C. hemipterus* to insecticides and the behavior of these insects in Colombia.

This study contributes to the epidemiology of bedbugs in the country by recording the characteristics of one of the few cases reported here. It should be noted that these cases are different from the first cases secondary to *C. lectularius* reported in Europe and other regions of the world (6,26), but similar to cases secondary to *C. hemipterus* reported in some regions of Europe and Asia (although there are differences when compared to cases in countries such as Sweden and Russia caused by the same insect) (4,5,21,27). However, as mentioned, there is a possibility of a local infestation by both *C. hemipterus* and *C. lectularius* bedbugs in Colombia, but prevalence, incidence, and burden are still unknown (12,28).

Limitations of this report include the low number of patients and infestations, the inability to follow up on the other two related infestations, the limited number of genes analyzed, the limited number of bedbugs sequenced, and the type of primers for the *COI* gene (the primers proposed by Porter *et al.* (29) give a longer fragment and, therefore, more information). Strengths include the use of both *COI* and *16S rRNA* genes to perform the analyses, the number of bedbugs collected, the performance of a field visit, and the various follow-ups to the affected family.

For further research, it is suggested to evaluate insecticide resistance genes, laboratory insecticide resistance, and other primers. It is also recommended to evaluate laboratory colony rearing to analyze both behavior and response to insecticides, and sequencing of other mitochondrial and nuclear genes.

CONCLUSION

This case shows the importance not only of bedbugs, but also the public health problem posed by infestation. The presence of tropical bedbug populations in Colombia

is hereby confirmed, without being able to establish whether they are local or not, thus raising questions about the characteristics and origin of these colonies. The growing number of bedbug infestation reports indicates a need for further research and coordination by all sectors involved in the control of these insects.

ETHICAL CONSIDERATIONS

Written informed consent was obtained for the publication of this case, as well as for the use of the photographs and images obtained during the study period.

PATIENT PERSPECTIVE

One of the worst parts for us was the fear, anxiety, and frustration associated with the infestation of these insects, as well as the inability to get rid of them and the uncertainty of how long the infestation would last. We were able to get rid of the parasitic insects by following the recommendations. The IMPs helped but were not as effective as we had initially hoped.

CONFLICTS OF INTEREST

None stated by the authors.

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REFERENCES

1. Usinger RL. Monograph of Cimicidae (Hemiptera, Heteroptera). Baltimore: Entomological Society of America; 1966.
2. Levin ML. Medical entomology for students, 5th edition. *Emerg Infect Dis.* 2014;20(8):1430. <https://doi.org/kwfr>.

3. Doggett SL, Miller DM, Lee CY. Advances in the biology and management of modern bed bugs. Hoboken, NY: Wiley Blackell; 2018.
4. Chebbah D, Elissa N, Sereno D, Hamarshah O, Marteau A, Jan J, et al. Bed bugs (Hemiptera: Cimicidae) population diversity and first record of *Cimex hemipterus* in Paris. *Insects*. 2021;12(7):578. <https://doi.org/nt5z>.
5. Gapon D. First records of the tropical bed bug *Cimex hemipterus* (Heteroptera: Cimicidae) from Russia. *Zoosyst Ross*. 2016;25(2):239-42. <https://doi.org/nt56>.
6. Doggett SL, Russell RC. The resurgence of bed bugs, *Cimex* spp. (Hemiptera: Cimicidae) in Australia. In: Robinson WH, Bajomi D, editors. Proceedings of the Sixth International Conference on Urban Pests. Hungary: OOK-Press; 2008. p. 407-425.
7. Doggett SL, Geary MJ, Crowe B, Wilson P, Russell RC. Has the tropical bed bug, *Cimex hemipterus* (Hemiptera: Cimicidae), invaded Australia? *Environmental Health*. 2003;3(4):80-2.
8. Aukema B, Rieger C. Catalogue of the Heteroptera of the Palaearctic Region. Volume 2. Cimicomorpha I. Amsterdam: The Netherlands Entomological Society; 1996.
9. Antunes PC. Informe sobre una investigación entomológica realizada en Colombia. *Rev. Fac. Med*. 1937;6(2):65-87.
10. Figueroa A. Catálogo de los artrópodos de las clases Arachnida e Insecta encontrados en el hombre, los animales y las plantas de la república de Colombia-III. *Acta Agron*. 1953;3(1):1-7.
11. Patiño L, Afanador A, Paul JH. A spotted fever in Tobia, Colombia. 1937. *Biomédica*. 2006;26(2):178-93. <https://doi.org/drhd>.
12. Porras Villamil JF. Estudio epidemiológico de brotes recientes de chinche de cama, *Cimex* spp., en Colombia y en España [thesis]. Valencia: Universidad de Valencia; 2023.
13. Ennis AC, Pearson-Shaver AL. Bedbug Bites. Treasure Island (FL): StatPearls Publishing; 2024.
14. Francischetti IM, Calvo E, Andersen JF, Pham VM, Favreau AJ, Barbian KD, et al. Insight into the Sialome of the Bed Bug, *Cimex lectularius*. *J Proteome Res*. 2010;9(8):3820-31. <https://doi.org/fgvt38>.
15. Goddard J, deShazo R. Bed bugs (*Cimex lectularius*) and clinical consequences of their bites. *JAMA*. 2009;301(13):1358-66. <https://doi.org/cd53v8>.
16. Mullen GR, Durden LA, editors. Medical and veterinary entomology. Amsterdam: Academic Press Amsterdam.; 2002.
17. Doggett SL, Russell R. Bed bugs: What the GP needs to know. *Aust Fam Physician*. 2009;38(11):880-4.
18. Basnet S, Narain RB, Kamble ST. Preservation techniques affecting DNA extraction from *Cimex lectularius* (Hemiptera: Cimicidae). In: Davies MP, Pfeiffer C, Robinson WH, editors. Proceedings of the Ninth International Conference on Urban Pests; 20117.
19. Walpole D. External morphology of the legs of two species of bed bugs (Hemiptera: Cimicidae). *J. Entomol. Soc. S Afr*. 1987;50(1):193-201.
20. Szalanski AL, Austin JW, McKern JA, Steelman CD, Gold RE. Mitochondrial and ribosomal internal transcribed spacer 1 diversity of *Cimex lectularius* (Hemiptera: Cimicidae). *J Med Entomol*. 2014;45(2):229-36. <https://doi.org/c457hk>.
21. Balvín O, Sasínková M, Martinů J, Nazarizadeh M, Bubová T, Booth W, et al. Early evidence of establishment of the tropical bedbug (*Cimex hemipterus*) in Central Europe. *Med Vet Entomol*. 2021;35(3):462-7. <https://doi.org/nt55>.
22. Borel B. Infested: how the bed bug infiltrated our bedrooms and took over the world. Chicago: University of Chicago Press; 2015.

23. **Porras-Villamil JF.** Evaluación de la calidad de la evidencia epidemiológica acerca de la transmisión oral de Chagas agudo, estudios de casos y brotes en los últimos 30 años [master thesis]. Bogotá D.C.: Facultad de Medicina, Universidad Nacional de Colombia; 2019.
24. **Doggett SL, Dwyer DE, Peñas PF, Russell RC.** Bed bugs: clinical relevance and control options. *Clin Microbiol Rev.* 2012;25(1):164-92. <https://doi.org/fzhth8>.
25. **Doggett SL, Geary MJ, Lilly D, Russell RC.** The efficacy of diatomaceous earth against the common bed bug, *Cimex lectularius*. A report for Mount Sylvia Diatomite. In: Efficacy Testing of Diatomaceous Earth for Bed Bugs; 2008.
26. **Paul J, Bates J.** Is infestation with the common bedbug increasing? *BMJ.* 2000;320(7242):1141.
27. **Masetti M, Bruschi F.** Bedbug infestations recorded in Central Italy. *Parasitol Int.* 2007;56(1):81-3. <https://doi.org/dqhw9f>.
28. **Porras-Villamil JF, Olivera MJ.** Bedbug (*Cimex lectularius*) infestations in Colombia. Report of two cases. *Case reports.* 2023;9(2). <https://doi.org/nt6b>.
29. **Porter TM, Gibson JF, Shokralla S, Baird DJ, Golding GB, Hajibabaei M.** Rapid and accurate taxonomic classification of insect (class Insecta) cytochrome c oxidase subunit 1 (COI) DNA barcode sequences using a naïve Bayesian classifier. *Mol Ecol Resour.* 2014;14(5):929-42. <https://doi.org/f6c89m>.