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LETTERS TO THE EDITOR

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Hospital microbiota vectored by ants

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Dear Editor

Very recently, we had the opportunity to receive the first edition of this novel specialized Journal, introducing interesting papers about microbes and infections (1). Indeed, the Editorial message made well clear the main purposes of this new option of open access manuscripts published under rigorous technical and scientific criteria (1). The objective of this Letter is contributing to higher awareness about the role of ants, commonly neglected insects as vectors of hospital infections by multi-resistant bacteria.

Inaugural papers appeared in the scenario of uncontrolled pandemic with efforts focusing the mechanisms of infection and development of an effective management. The wards and critical care units are often with overload of severe COVID-19 cases, a predisposing condition to development of hospital acquired infectious complications. Besides the usual concerns in this setting, one should consider unsuspected interactions of insects with diverse pathogenic microorganisms in the hospital environment (2-8).

Ants are dispersers of opportunistic microorganisms in places where forage (4). First reports in Europe (1972) and in Brazil (1990s) raised the interest on this field (3). Worthy of note is the variation in number of articles by year in two Brazilian reviews. In 2015, the distribution 40 of studies was: 2 (5%) from1993 to 2000; 25 (62.5%) from 2001 to 2010; and 13 (32.5%) from 2011 to 2015. *Tupinoma melanocephalum* (33.9%) and *Paratrechina longicornis* (28.8%) predominated among the 59 species of ants (3). In the majority (65%) of the included studies, bacteria (61.5%), fungi (11.5%), or both microorganisms (27%) were detected in association with the captured hospital ants (3). In a very recent review with the inclusion of 16 manuscripts, 11 (68.75%) of them were published in the period between 2005 and 2010, and 31.25% from 2011 to 2020 (2). At least in part, this significant difference could represent some careless supervision related to the presence of ants as mechanical vectors for microorganisms in the hospital (2). *Staphylococcus spp., Pseudomonas spp., Streptococcus spp., Escherichia coli spp.*, and *Klebsiella spp*. were more often found, but fungi were also detected in this review (2). Another study about ant species composition and bacterial contamination in a public Brazilian hospital of Amapá evaluated ants from 15 sites of the Emergency Hospital (4). A total of 9,687 ants were captured and 9 species were identified from 3 subfamilies: *Monomorium pharaonis* was the most common (39.2%) of the total specimens; 92 bacteria isolates included 12 species, and *Pseudomonas aeruginosa* was the pathogenic bacteria most frequent (10.9%) of the positive samples. The most contaminated ant (38.3%) was *M. pharaonis*, the dominant ant species in this hospital environment (4). The authors focused the presence of bacteria on ants and associated with dissemination of pathogens that cause hospital infections, making mandatory this pest control (4). Susceptibility to antibiotics of multi-resistant bacteria carried by 132 “workers” belonging to 3 ant species was evaluated in two public hospitals of Bahia, Brazil (5). Twenty four species of bacteria were isolated (57.3% and 84.2% of collected ants were associated with bacteria), and respectively 26.7% and 61.4% of them were opportunist. Gram-positive bacilli, Gram-positive cocci, and

Gram-negative bacilli were found (5). The authors highlighted the same bacterial resistant isolates taken from the hospital ant "workers" that associate them with bacteria dissemination and proliferation, and suggested that the risk of contamination by ants is similar to any mechanical vector (5).

A research done in two hospitals of Anápolis-GO, Brazil showed that *Staphylococcus spp*., Gram-positive bacilli, *Klebsiella ozaenae, K. rhinoscleromatis, E coli spp., and Yersinia pseudotuberculosis* were carried by T. *melanocephalum* and *P. longicornis* (6). Ants were captured at wards, intensive/semi-intensive care units, and nutrition sectors, and Staphylococcus spp. was the most frequently isolated microbe in this research. The authors emphasized the current scarcity of national studies with a similar objective (6). In a research performed in a University hospital of Uberaba-MG, Brazil the unique detected ant was *T. melanocephalum* acting as a carrier for 60 microorganisms (7). These were Gram-positive cocci (36.7%), filamentous fungi (28.3%), Gram-negative bacilli (23.3%), and Gram-positive bacilli (11.7%). Microbes identified from captured ants were *Bacillus sp., Burkholderia cepacia*, Coagulase-negative *Staphylococci, Enterobacter aerogenes*, Filamentous fungi, Group D *Streptococci*, *Hafnia alvei, Pseudomonas sp*., and *Staphylo-coccus saprophyticus*. The highest resistance to tested antibiotics was detected in Pseudomonas, Staphylococcus, and Group D *Streptococcus*. The collections of ants occurred at Intensive Care Unity and surgical center areas, by sterilized tubes containing honey; while tubes without ants were used as control group. The authors stressed the need of studies of correlations between the microbes isolated from hospital ants and those isolated from patients with hospital acquired infections (7).

Additional research for new antimicrobials also involve insects and microbiota, mainly insect symbionts and their metabolites to search the role in drug production (8). Such studies allowed the discovery of new biomolecules as peptides and polyketides. Worthy of note, Cyphomycin, from a Streptomyces symbiont of a Cyphomyrmex fungus-growing ant, is the most promising insect symbiont-derived antimicrobial (8). The antibiotic resistance has grown and a potential source of novel antimicrobials is insects, as indicated by literature covering insect-derived antimicrobial compounds. Lowering of drug resistance can reduce the yearly estimated 700.000 global deaths (8). The promising expectations seem to justify the purpose of the items herein commented.

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