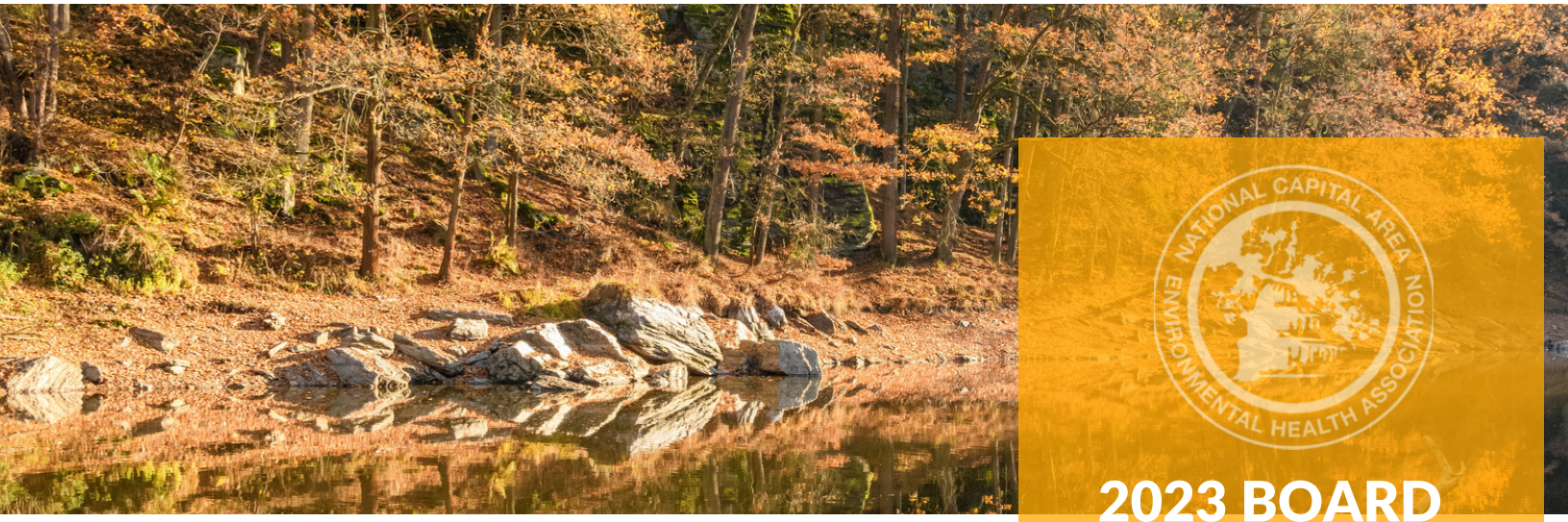
VOL. 24 | ISSUE 2

THE PREVENTATIVE MEASURE

FALL 2023

Triannual Newsletter of the National Capital Area Environmental Health Association



In This Issue

2023 BOARD

President
Nicole Gragasin

Vice President of Membership/
Jan Jaminal

Vice President of Programs & Professional Development
Amanda Coletti

Secretary
Kendra Washington

Treasurer
Julia Balsley

Virginia Representative
Marcella Sikon

Maryland Representative
Erin Miller

DC Representative
Amanda Barto

Industry Liaison
Caroline Friel

Directors of Communications
Eva Rama, Kara Hoisington

President's Message

Happy Fall!

I hope you all are having a wonderful start to the season as pumpkin everything makes its way into the menu! As for myself, it was a great start to the season as I welcomed a healthy baby girl early this September! 👶 So with that, I will be on Maternity Leave until the end of the year, and in the meantime, our VP of Programs and Professional Development, Amanda Colletti, will be acting as interim President during my absence. Please feel free to submit any questions or concerns to ncaeha.vp.programs@gmail.com for now!

As we approach the end of this 2023 year, we keep the momentum going with our Fall Educational Conference, 2023 Elections and plan our year for 2024! Before I delve into that, let's recap all that NCAEHA has accomplished since my last update on the Spring 2023 Preventative Measure Publication. Last May, we held a successful Spring Educational Conference in collaboration with DC Health in Washington DC where we learned about the new FDA Food Code updates, Whole Foods' Food Safety Measures, Environmental Noise Exposure and relation to hearing loss, and ended the day with a short Open Forum Discussion on EH Implementations and Successes.

During the summer, our VP of Membership, Jan Jaminal lead the committee to take nominations and select our 2023 Awards and Scholarship winners. The winners were recognized during our Annual Awards Dinner held at the Glory Days Grill in Falls Church, VA. Here, we presented 8 Awards to very deserving individuals/groups. Please visit our website at ncaeha.org/awards to view our 2023 winners! Later in the summer, we sadly had to say goodbye to our VP of Membership, Jan Jaminal, as he had to resign from his board position for personal reasons. Jan has been a delight to have during his time on board and we thank him for his efforts in assisting with our Spring Conference in DC, planning our Awards Dinner, and diving into a future Student-Membership Mentorship initiative. Best of luck, Jan!

Looking forward to the upcoming months, our Fall Conference will be coming up on October 26th! We will be holding this conference virtually, as we were accustomed to during the pandemic! Based on our results from last year's Annual Survey, we have decided to hold a virtual membership as requested by some of our members. Fees for our virtual conference will be held at a very low rate of $5 for active NCAEHA Members and $10 for non-Members–one of the best prices you can get for a full day conference! Registration is now open, please visit ncaeha.org/events to register! We hope to see you there!

This December we will be holding our 2023 Elections for Secretary, Treasurer, and Virginia, Maryland, and DC Representatives. In addition, we will be looking to fill the vacancy for VP of Membership. If you or know anyone interested in joining our NCAEHA Board, please feel free to reach out to me this November! Information coming soon!

Thank you all once again for a wonderful year with NCAEHA!

Nicole Gragasin
NCAEHA.President@gmail.com

Cockroaches and Food-borne Pathogens

Donkor, E.S. (2020). Cockroaches and food-borne pathogens. *Environmental Health Insights, 14, 1-6.*
doi: https://doi.org/10.1177/1178630220913365i

ABSTRACT

Food-borne disease is a widespread and escalating public health problem globally. About a quarter of the microorganisms isolated from cockroaches are food-borne pathogens including *Escherichia coli* O157:H7, *Staphylococcus aureus*, *Bacillus cereus*, *Shigella dysenteriae*, *Salmonella enterica* subsp. *enterica* serovar Typhi, *Rotavirus*, *Aspergillus fumigatus*, and *Cryptosporidium parvum*. Thus, cockroaches could be an important reservoir and mechanical vector of food-borne pathogens. Generally, the role of cockroaches in human infections is poorly understood and has been an issue of debate for several years. This article aims to elucidate the possible role of cockroaches in food-borne infections by reviewing the relevant research publications.

INTRODUCTION

Food is an important vehicle for the transmission of infectious pathogens to humans. The high incidence of food-borne diseases coupled with the emergence and re-emergence of foodborne pathogens, have placed food safety high on the agenda of public health issues. Cockroaches appear to be suitable mechanical transmitters for a wide range of food-borne pathogenic microorganisms due to their filthy behavior and occurrence in places where food is stored or handled. Microorganisms may be carried externally on the cuticle of cockroaches, or may be ingested and then later excreted or regurgitated. In this way, cockroaches can easily contaminate food when they come into contact with it. Although there exist about 4000 species of cockroaches, only 30 are associated with human habitations. The most common cockroach species found in human habitations or environments are *Periplaneta Americana*, *Blattella germanica*, *Blatta orientalis*, *Periplaneta australasiae*, and *Supella longipalpa*. Generally, the role of cockroaches in human infections is poorly understood and has been an issue of debate for several years. In the last 2 decades, there has been an accumulation of adequate research data that contributes significantly to our understanding of this subject. In this regard, the scientific community could benefit from a review of available research data that can provide a global understanding of the role of cockroaches in transmission of human infections. Therefore, in this review article, the author aims to elucidate the possible role of cockroaches in the transmission of food-borne pathogens by reviewing the relevant research publications.

BRIEF OVERVIEW OF FOOD-BORNE INFECTIONS

The World Health Organization estimates that food-borne diseases cause about 600 million illness episodes, 42,0000 deaths and 33 million healthy life years lost (disability-adjusted life years, DALYs) annually. Food-borne disease is most prevalent in Africa and South-East Asia, where more than a third of all food-borne illness occurs. Food-borne pathogens account for the vast majority of food-borne diseases, and diarrheal agents are responsible for more than half of the global burden of food-borne infections.

Although all human beings are at risk, the impact of food-borne infections is most severe in very young and elderly people, as well as immune-compromised individuals. Food-borne illness is associated with huge economic costs. For example, in the United States, food-borne illnesses cost the economy between US $10 and US $83 billion. In Australia, the cost of food-borne illness has been estimated at US$1.289 billion per year, whereas in New Zealand, it costs US $86 million. The cost of food-borne illness in Sweden was estimated to be as high as US $171 million. Generally, data on the financial costs of food-borne illness in the developing world are lacking, though the majority of food-borne cases occur in these countries.

The pathogens implicated in food-borne infections cover a wide spectrum of microbes including bacteria, parasites, viruses, and fungi. The incidence/prevalence of food-borne diseases caused by different pathogens has changed in the last few decades. For example, in the United Kingdom, in 2010, *Campylobacter* displaced *Salmonella* as the prime cause of food-borne disease while the incidence of *Listeria monocytogenes* rose between 2001 and 2009. Viruses are implicated in an increasing number of food-borne cases in the United Kingdom currently, while toxin-producing *Escherichia coli* such as E coli 0157:H7 remain less common, but serious pathogens due to their clinical impact. In the next decades of years, new food-borne pathogens are likely to emerge globally driven by factors such as microbial evolution and changes in food production processes. In addition, food-borne infections due to existing pathogens can be expected to increase, especially in developing countries, partly because of environmental and demographic changes, as well as massive consumption of risky foods. The many food-borne pathogens can be classified into 3 main groups depending on their reservoirs. The first group are pathogens that are sustained in human reservoirs and contaminate food through the feces of infected humans. This group contains pathogens such as *Norovirus*. The second group are pathogens such as *Campylobacter* spp. and *Salmonella enteritidis*, which are sustained in animal reservoirs and contaminate animal source food of humans such as meat, milk, and eggs. They could also occur in the feces of infected animals and contaminate human food. The third group are pathogens that persist in the environment and can contaminate food usually through poor environmental hygiene. This group includes a wide range of pathogens such as *Clostridium perfringens* and *Bacillus cereus*.

Table 1. Potentially contaminated foods and the microbial pathogens implicated.

Food	Major organisms involved
Unpasteurized milk, cheese, and other dairy products	*Salmonella, Campylobacter, Escherichia coli* O157, *Listeria, Mycobacterium bovis, Brucella*
Unpasteurized fruit or vegetable juices	*E. coli* O157, *Salmonella, Clostridium botulinum*
Eggs	*Salmonella*
Raw or undercooked meat, poultry	*Salmonella, Campylobacter, E. coli* O157, *Yersinia, Listeria, Toxoplasma, Brucella, Trichinosis*
Raw fish and shellfish	Vibrios, norovirus, hepatitis A, many other pathogens, toxins and parasites
Fresh fruits and vegetables	*Cryptosporidium, Cyclospora*, calicivirus, norovirus, *Giardia, Shigella, E coli* O157, other *E coli* species, hepatitis A
Sprouts (alfalfa, mung bean)	*Salmonella, E coli* O157, hepatitis A
Honey	*C. botulinum*
Cream-filled pastry; potato, egg, or other salad with creamy dressing	*Staphylococcus aureus, Bacillus cereus*

Adapted from Centers for Disease Control and Prevention,[11] Redel,[13] and Lake et al.[12]

COCKROACHES AND FOOD-BORNE PATHOGENS

In the 1950s, compelling evidence incriminating cockroaches as possible vectors of human infections was provided through a study that reported a correlation between the incidence of hepatitis A and the lack of cockroach control. From 1956 to 1959, the Carmelitos Housing Project had 20% to 39% of the hepatitis A cases in Los Angeles. However, through a concentrated pest control program, there was a sharp decline in the incidence of endemic infectious hepatitis: in 1960, the hepatitis A incidence at the housing project reduced to 6.6%, then further to 3.6% in 1961, and to 0.0% in 1962. Meanwhile, around the same period, every other place in Los Angeles County that was not receiving the pest control service experienced increasing incidence of the infection.

It was observed that the decline in hepatitis A incidence occurred simultaneously with a significant reduction (about 70%) in cockroach infestation due to the pest control program. The hepatitis A virus occurs in the feces of infected persons and is usually transmitted through consumption of contaminated water or food. The association of cockroaches with feces and food makes their transmission of hepatitis A virus highly plausible. Although the study was not supported with experimental data, it provides evidence supporting the theory that cockroaches play a role in the transmission of food-borne pathogens.

Experimental evidence supporting the possible role of cockroaches in the transmission of food-borne pathogens has been provided by several investigators. A study done in 1980 reported that exposure of cockroaches to *Salmonella enterica subsp. enterica serovar Typhimurium* resulted in occurrence of the pathogen in the excreta of the cockroaches in a dose-related fashion with outputs of 8×101 to 2×107cells/defecation over a range of 3 to 20 days. The investigators observed that *S. Typhimurium* was recoverable about 10 days longer in the cockroach gut compared with the feces, and persistence of the organism occurred primarily in the hindgut.

In another experiment in 1993, it was shown that cockroaches could be infected with a naladixic acid-resistant strain of *S. Typhimurium* from a contaminated food source. The investigators also showed that the infected cockroaches could transmit the naladixic acidresistant strain of *S. Typhimurium* to uninfected cockroaches, food (eggs), and water. Food-borne bacterial pathogens isolated from cockroaches include *Shigella boydii*, *Shigella dysenteriae*, *Shigella flexneri*, *Salmonella enterica subsp. enterica serovar Typhi*, *Salmonella Typhimurium*, *Escherichia coli O157:H7*, *Staphylococcus aureus*, and *Bacillus cereus*. It is important to note the several species of Shigella and Salmonella that have been isolated from cockroaches, which probably indicates that cockroaches are an important reservoir for these bacteria. As *Shigella spp.* and *S. Typhi* are mainly sustained in humans, their occurrence in food is thought to be associated with food handlers. However, these organisms could be disseminated by cockroaches in food environments. Shigella spp. have a very low infective dose (101-102 cells) and cause bacillary dysentery (shigellosis), a highly invasive intestinal infection characterized by fever, violent abdominal cramps, rectal urgencies, and complications such as intestinal perforations, septicaemia, and toxic megacolon. In particular, a strain of S. dysenteriae (one of the Shigella spp. isolated from cockroaches) is implicated in severe epidemics of bacillary dysentery through the production of shiga toxins. S. Typhi causes typhoid fever, which is a serious disease as it could lead to complications such as liver damage, inflammation of the heart, holes in the gut, and internal bleeding. The association of cockroaches with S. Typhi should be viewed with seriousness in developing countries where typhoid fever is most prevalent and lack of food hygiene is also of serious concern. *S. Typhimurium* causes a mild gastroenteritis and is often transmitted from animals through consumption of raw or undercooked animal source food such as meat. Compared with Shigella, Salmonella has a relatively high infective dose of 105 to 106 cells. The isolation of E. coli O157:H7 from cockroaches is interesting, as this organism emerged as a foodborne pathogen only in the 1990s. The organism resides in the intestinal tract of live animals and is shed in their feces, which may contaminate food, water, and the environment. It has unusual persistence features in the environment and survives at low temperatures and under acidic conditions. The infective dose of E. coli O157:H7 is very small (10-100 cells) and is implicated in severe clinical conditions including, hemorrhagic colitis leading to bloody diarrhea, hemolytic uremic syndrome and kidney damage. *S. aureus* and *B. cereus*, also isolated from cockroaches, are among the predominant foodborne pathogens globally. Both pathogens have an infective dose of 105 to 106 cells and produce toxins, which mediate the food-borne disease; S. aureus produces enterotoxins, which cause diarrhea, while *B. cereus* produces an emetic and enterotoxin responsible for vomiting and diarrhea, respectively. *B. cereus* is a spore-forming bacteria and can therefore survive for a very long period in the environment, which enhances its chances of contaminating cockroaches.

Compared with bacteria, the other types of food-borne microbes tend to be carried by cockroaches to a lesser extent. Four main food-borne parasites are reported to be carried by cockroaches: *Cryptosporidium parvum*, *Cyclospora cayetanensis*, *Entamoeba histolytica*, and *Giardia duodenalis*. These pathogens are transmitted fecal-orally from ingestion of their oocyst/cysts, which can persist and survive for long periods in the environment, water, and on foods. Animals are known to be a reservoir of human infection for *C. parvum* and *G. duodenalis*, but not *C. cayetanensis* and *E. histolytica*. Among food-borne viruses, rotavirus and hepatitis A virus have been reported to be associated with cockroaches.

Rotavirus is the leading cause of severe diarrhea in young children globally and is responsible for about 50% of pediatric diarrheal disease hospitalizations in developing countries. In this regard, the presence of cockroaches in homes could have serious implications for pediatric health. Hepatitis A is the most common form of acute viral hepatitis worldwide and therefore its association with cockroaches is a cause for concern, especially in the developing world where the infection is mostly prevalent. Several fungi implicated in food-borne infections have been isolated from cockroaches and include *Aspergillus spp.*, *Candida spp.*, *Mucor spp.*, *and Alternaria spp.* Among these fungal pathogens, *Aspergillus spp.* poses the biggest threat to humans through the production of aflatoxins, which are extremely potent liver carcinogens. The most pathogenic species of Aspergillus is *A. fumigatus*, followed by *A. flavus*, both of which have been isolated from cockroaches.

CONCLUSIONS AND FURTHER RESEARCH

Cockroaches could harbor and disseminate many foodborne microbial pathogens including bacteria, fungi, viruses, and parasites. These food-borne pathogens vary widely in their biological characteristics, host associations, virulence determinants, and transmissions. This implies that cockroaches could play a very broad role in food-borne infections. Given the association between cockroaches and food-borne pathogens, it is important to consider them in food-borne outbreak investigations, which has not been the case hitherto.

Further studies are needed to describe cockroach carriage of the several other food-borne pathogens that have not been reported previously. These include important food-borne pathogens such as *C. perfringens*, *C. botulinum*, *Campylobacter spp.*, norovirus, and hepatitis A. In addition, there is the need for a better understanding regarding host–microbe relationships that occur between cockroaches and food-borne microbial pathogens. Microbiome studies could provide invaluable insights in this regard.

Considering the food-borne risks associated with cockroaches, their presence should not be tolerated in the food industry. Similarly, cockroaches should not be tolerated in the hospital setting as they might spread nosocomial pathogens such as S. aureus and E. coli. Efforts to control cockroaches should involve good hygiene and sanitation of facilities and also the application of proper insecticides to cockroach hiding spots. It is also important to remove hiding places of cockroaches such as cardboard, as this will prevent future infestations.

References

1. Cochran DG. Cockroaches. Geneva, Switzerland: World Health Organization; 1982.
2. Cornwell PB. The Cockroach (Vol. 1). London, UK: Hutchinson; 1968.
3. Roth LM, Willis ER. The biotic associations of cockroaches. Smithson Miscella?neous Collect. 1960;141:1-470.
4. Donkor ES. Nosocomial pathogens: an in-depth analysis of the vectorial poten?tial of cockroaches. Trop Med Infect Dis. 2019;4:14.
5. World Health Organization. The World Health Organization estimates of the global burden of foodborne diseases: FERG project report. http://www.who.int/foodsafety/areas_work/foodborne-diseases/ferg/en/. Updated 2015.
Cont.

2023 NCAEHA FALL EDUCATIONAL CONFERENCE

Thursday, October 26th

9:00 am - 4:00 pm

Virtual (via Zoom)

5.5 hours of Continuing Education Credits will be granted for full attendance

Agenda

9:00 am - 9:10 am Welcome/Opening Remarks

9:10 am - 10:00 am Vicki Decker, Leadership & Partnerships in Food Safety Culture

10:00 am - 10:50 am Debora Brown, What the Fomite!

10:50 am - 11:00 am BREAK

11:00 am - 11:50 am Lori McKenzie, How Rodentology Can Help Improve Public Health

11:50 am - 12:50 pm LUNCH

12:50 pm - 1:00 pm James Speckhart, NEHA Update

1:00 pm - 1:50 pm Sean Kolaskar, Implementing an Informatics Strategy for Environmental Health Departments

1:50 pm - 2:00 pm BREAK

2:00 pm - 2:50 pm Todd Frantz, Optimizing Outcomes: Regulatory Relationships with Chain Restaurants

2:50 pm - 3:40 pm Amanda Barto, 2023 NEHA Annual Educational Conference Recap

3:40 pm - 4:00 pm Special Announcements/Closing Remarks

The National Capital Environmental Health Association would like to encourage its members to get more involved by joining the Board of Directors!

INTERESTED IN JOINING THE BOARD OF DIRECTORS? OPEN POSITIONS AVAILABLE.

State Representatives DC/MD/VA

Each Representative shall take responsibility for planning and coordinating one educational conference each year.
Together with the Vice President of Programs and the other two representatives, they will recommend conference dates and locations to the Board of Directors.
Representatives will submit a panel of speakers and topics dor each educational conference to the Board of Directors.

VP of Membership

Plans the Annual Awards Event and other Social Events. Selects the location, meal and entertainment.
Provides a current membership summary to the Board members and conducts membership satisfaction surveys.
Assists with registration at educational conferences.
Coordinates membership drives and sets membership goals.
Issues membership notices and maintains membership list.
At the request of the President, presides over the Annual Meeting or Board meetings.

Secretary

At the request of the President, presides over the Annual Meeting or Board meetings.
Chairs the Professional Development Committee in promoting professional credentialing and career development of Environmental Health practitioners.
Guides the Representatives in planning and coordinating educational conferences. Assists Representatives in recommending conference dates, locations, topics, and speakers to the Board of Directors.
In the absence of a Representative, plans the educational conference.

Treasurer

Maintains the Association's accounting records and manages financial accounts.
Obtains and provides receipts or valid statements for the distribution of monies.
Reimburses Board members for approved purchases within 14 days.
Arranges for an internal audit every 2 years.
Assists in registration at educational conferences, other Association events and the Annual Meeting.
Submits a written financial statement at each Board meeting and submit required tax returns to the proper authorities.

If you are interested in any of the listed positions, please contact NCAEHA.President@gmail.com.

IF YOU HAVEN'T ALREADY, IT'S TIME TO RENEW YOUR MEMBERSHIP!

BENEFITS OF MEMBERSHIP:

- **Be a part of a local association in the DC, MD, and VA area that is focused on environmental health (EH)**
- **Network with other local EH professionals in academia, industry, government, private sector, and other areas**
- **Advance your career by pursuing a credential or certification with our discounted annual courses like the REHS, CP-FS, CPO, and more**
- **Gain more knowledge and/or earn up to 15 Continuing Education hours per year by attending our nearby Educational Conferences**
- **Enjoy a good time with your EH colleagues and build new connections at our social events**
- **Recognize an EH professional by nominating them for an award or scholarship**
- **Pursue local EH employment opportunities with easy accessibility through our announcements**
- **Stay updated through our newsletter, website, and social media and announcements on other events, trainings, webinars, and more**

Memberships expire on December 31, 2023.
Regular Membership Renewal: $20.00
Student and Silver Membership Renewal: $5.00

Membership Renewal may be completed online at **www.ncaeha.org** by simply logging onto your profile and click the RENEW button! Payments are accepted online via credit card.