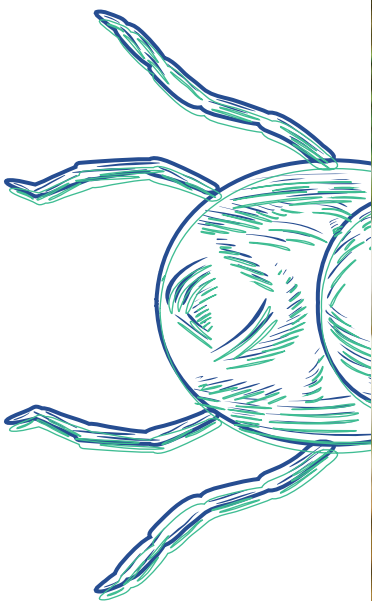


FIELD



BIOLOGY PROFESSOR GIDEON WASSERBERG collects ticks and chiggers in the field with mentees Reuben Garshong – who graduated with his Ph.D. from UNCG and is now a postdoc at NC State University – and Noah Holland.



When Dr. Gideon Wasserberg and his students began collecting chiggers across North Carolina, they didn't expect to find disease-causing bacteria typically only seen in the Eastern Hemisphere.

But that's just what they discovered. Their observation of *Orientia* bacteria in North Carolina chiggers – part of a collaboration with NC State University – was published in *Emerging Infectious Diseases*.

The scientists were tracking the statewide prevalence of chiggers, mites that feed on human and animal skin tissue while in their larval stage. They were also assessing what – if any – disease-causing bacteria these parasitic arachnids host.

"We tested for *Orientia* because it's really the only known pathogen of medical concern to be vectored by chiggers," Wasserberg says. "But we did not really expect to find it because scrub typhus, the disease associated with *Orientia*, is typically seen in south and east Asia and northern Australia."

Scrub typhus is a potentially lethal disease that can lead to headaches, muscle pain, and mental confusion, and affects approximately 1 million people each year.

The unexpected findings have stirred media interest about potential implications for North Carolinians who spend time outside and may encounter these chiggers.

"We still don't know if the *Orientia* we found is capable of causing disease," Wasserberg says. "This is part of the next phase of our research."

CHIGGERS AND TICKS OF NC

While still unfolding, their findings have the potential to make a big impact – particularly for hikers who hope to avoid insects and arachnids that could make them sick.

Wasserberg led the data collection component of the study, traveling with UNCG graduate students, including study co-author Reuben Garshong, to state parks across North Carolina. The scientists use

everyday items to collect the tiny bugs, simply placing a small black tile on the ground and waiting for chiggers to emerge from their hiding spots.

"Chiggers are known to occur near sheltering items like logs, bricks, and rocks in shaded areas," Wasserberg says. "Once they sense a host, they come crawling out searching for it like little zombies."

Rather than a host, these chiggers encounter a tile and a scientist, who uses a fine paintbrush dipped in alcohol to transfer the chigger to an alcohol-containing vial.

This relatively simple sampling technique, followed by laboratory analysis at NC State, led to their exciting discovery. Now, Wasserberg and biology master's student Noah Holland are working to better understand where and when chiggers appear across North Carolina – and where and when they carry *Orientia*.

Wasserberg is also conducting CDC-funded research in collaboration with the

NC Department of Health and Human Services to track ticks across the state.

"Our findings indicate that blacklegged ticks – some carrying the bacteria that causes Lyme disease – are most prevalent in the northwestern counties of North Carolina," Wasserberg says. "We also sporadically see them in the Piedmont and coastal regions."

SOLITUDE AND SCIENTIFIC SUCCESS

To study insects and arachnids, Wasserberg spends a good deal of time outdoors – a passion he developed in high school at a remote boarding school in the deserts of Israel.

"There's a meditative solitude in nature," he says. "It helps you to see things clearly."

During long hikes as a student, Wasserberg would keep a close eye out for sand flies. A bite from a sand fly infected with a protozoan parasite can cause a disease called Leishmaniasis, commonly characterized by severe skin lesions.

Little did Wasserberg know that the sand flies he was avoiding would become a cornerstone of his career.

Over the past two decades, his research on sand flies and Leishmaniasis prevention has been funded by the National Institutes of Health, Department of Defense, National Science Foundation, and North Carolina Biotechnology Center.

Wasserberg's work has netted over \$2 million in funding, which is not surprising given that Leishmaniasis affects an estimated 1 million people each year in tropical and arid regions of the world. One form can even be fatal if left untreated.

SUPPRESSING SAND FLIES

Studying the ecology of Leishmaniasis and its primary vector, the sand fly, has led Wasserberg to several potential methods to control the disease.

As part of a prestigious NIH R01 project, he and collaborators at NC State have identified chemicals, visual cues, and bacteria sources that entice egg-bearing sandflies to lay their eggs, with the goal of creating attract-and-kill traps.

Sand flies must feed on blood to produce eggs, so egg-bearing – or gravid

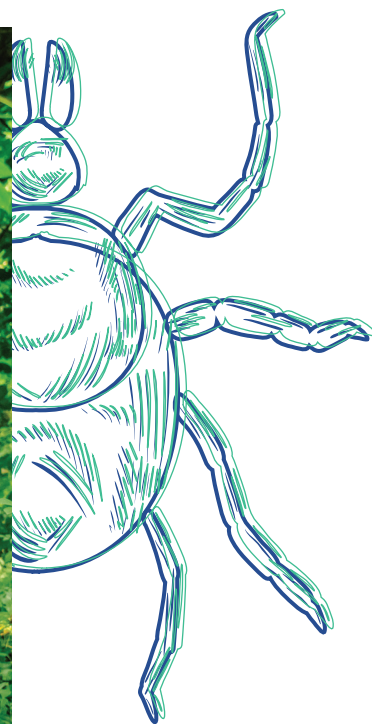
– sand flies are most likely to carry the Leishmaniasis parasite. "By attracting gravid females to a lethal trap, we can simultaneously impact sand fly population and Leishmaniasis parasite transmission," Wasserberg explains.

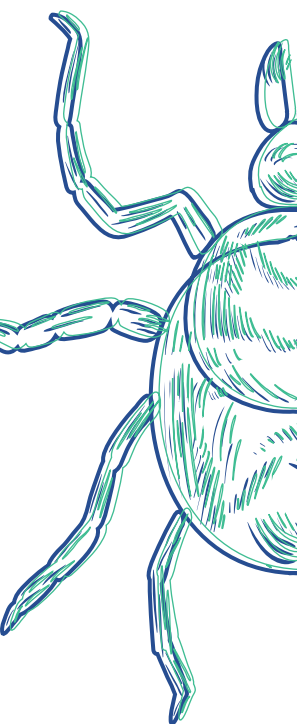
He and collaborators in Israel are also targeting the rodents that sand flies depend on. A rodent burrow in the desert is a hotbed of sand fly activity, serving as a shelter and a place where females feed on rodent blood and larvae feed on rodent droppings. That's why the scientists are field testing an insecticide-laced rodent bait.

"It's a trojan horse approach," explains Wasserberg. While the insecticide is harmless to the rodent, it's lethal to the sand flies waiting in the rat's burrow to feed on it.

So far, the researchers have observed decreased sand fly numbers in treated burrows and decreased Leishmaniasis infections in treated areas.

"This work will not eradicate Leishmaniasis in the world, but it could be helpful in reducing human exposure in affected areas," he says.





LITTLE BITS OF WONDER

To advance his research, Wasserberg maintains a sand fly colony in his laboratory here at UNCG. It's not easy, but Wasserberg says he enjoys working with the fascinating creatures.

His passion is infectious, and his protégés – from the students working with sand flies in the lab to those tromping through the woods in search of arachnids – are equally enthusiastic.

"He, like me, is someone who can just kind of enjoy a little bit of wonder and seeing things you don't necessarily expect," Holland says. During one fieldwork day, Holland and Wasserberg stumbled upon a dung beetle trying to roll a dungball uphill. "We both sat there for maybe five minutes watching and tried to help it get over a stick."

While Wasserberg spends extensive time conducting lab work and writing papers, fieldwork has a special spot in his heart.

"Sometimes I joke that science is an excuse for me to be out in the field," he says. "When you're in nature, it's fascinating and raises questions of why things are working the way they do."

UNDERGRADUATE RESEARCHER

Chelsea Akabueze was trained by Ph.D. student Dannielle Kowacich-Swaney to assist with the maintenance of the sand fly colony. "I took Dr. Wasserberg's class last year, and we learned about how environment, vectors, and hosts interact. Humans affect their environment, and there are consequences from that."



by Rachel Damiani & Sangeetha Shivaji
learn more at biology.uncg.edu/wasserberg-lab