

Houseflies and blowflies efficiently deliver pathogens from decaying matter right to your door

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Video Abstract

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Abstract

The next time you swat away that fly buzzing around your head, consider this: an international team of researchers has shown that common houseflies and blowflies are more than just annoying insects. Covered with hundreds of different bacterial species, they're also a type of airborne delivery service, transporting pathogens from organic decaying matter right to your countertops, food...and body. Although flies have been long known to spread disease, the researchers show that we've previously underestimated both the number and diversity of microbes that each insect can transmit. The team devised a new optimized way to collect flies without cross-contaminating them with other microorganisms and used the method to amass 116 flies from urban, rural, and natural sites on three continents. After performing DNA sequencing of the whole body of each fly, the researchers separated out the flies' own DNA and compared the remaining billions of fragments of genetic material against a database containing thousands of bacterial DNA sequences. The results showed that flies carry hundreds of species of bacteria, including pathogens capable of colonizing plants, animals, and humans. *Helicobacter pylori*, for example, were found in surprisingly high numbers on flies. These bacteria colonize the human stomach and are a major risk factor for stomach ulcers and gastric cancer. Having established that flies are airborne reservoirs of microorganisms, the team next investigated how the insects contaminate the surfaces on which they land. They broke down a blowfly specimen into four regions – head, thorax, abdomen, and legs plus wings – and then performed DNA sequencing on each region. While the abdomen contained the highest number of bacteria, the legs plus wings contained the highest diversity of bacterial species. To confirm the importance of this region in pathogen spread, the researchers had flies walk across a lawn of *E. coli* and then the surfaces of sterile agar plates. One day later, a trail of *E. coli* sprung up, marking the flies' footprints. Although unquestionably icky, the news isn't all bad. The researchers note that their method can turn flies into natural proxies of the environment – a sort of biological drone that can be released into contaminated areas and then lured back with bait, microorganisms in tow. Sequencing these microorganisms could help scientists identify which pathogens are in circulation, potentially creating an early-warning system for disease.