Professor is developing spray to identify fly spit at crime scenes

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The victim lay across the doorway of a home in Mount Airy, Md., a 12-gauge shotgun blast through his chest. The suspect had called in a confession, and the evidence was clear. But that day in April 1999, police puzzled over dark stains on a wall far from the man's body.

"It didn't make sense," said Mitchell Dinterman, a forensic investigator. "These were all the way across the room."

He noticed an open window. The stains, he realized, came from flies.

Crime scene investigators have long relied on their judgment to distinguish blood spatter from the look-alike stains left by flies that land on bodies, and then nearby. Now a biology professor at Loyola University Maryland in Baltimore is developing a spray that would remove the guesswork.

David Rivers has worked on and off for five years to isolate an enzyme distinctive to the fly gut. He got a $154,521 grant from the U.S. Department of Justice in December to complete development of his spray over the next two years.

His research stretches the limits of traditional forensic science - "even the crime shows don't talk about it," he said - and it's a field best avoided by the squeamish: forensic entomology, the study of bugs in deaths.

"It's unsettling to think flies are getting to a body," he said. "When we're

thinking about someone's loved one, we don't want to think about that."

Rivers teaches the only college course on forensic entomology in Maryland, he said. At his research lab, flesh flies and hide beetles feed on cow livers in screened cages. A cow skull and rat skeleton are picked clean. He urges visitors to remove their sweaters or wool coats.

"Certain fabrics retain the smell of death," Rivers said.

As a boy, Rivers kept fireflies in a mayonnaise jar in his mother's refrigerator. He wanted to be a scientist when he grew up, and planned to study genetics. But he found himself instead as a research biologist, milking venom from tarantulas.

Today he studies the flies that feed on corpses.

Blowflies are common in Maryland, identifiable by their metallic green or blue bellies, are able to sniff out death from a mile away. A corpse dumped in summer attracts the flies within 5 minutes, Rivers said. He sets up mock crime scenes around campus with caged animal remains. And the flies start buzzing around him when he's 10 feet out the door with the cages.

These flies grow two and three times bigger than house flies but can crawl inside a car with its doors and windows closed.

Rivers encountered the flies in the early 1990s while consulting on a case as a graduate student at Ohio State University. An elderly woman had died alone in her old Victorian home and the flies got in. The house was cleaned and sold to a young couple who found thousands of flies hidden in the air ducts. The sale was rescinded under Ohio's lemon laws, Rivers said.

"They're very aggressive," he said. "You tend to forget they're everywhere."

Also, they're slobs. Flies slurp and dribble and wear their food. They spit up after eating or before they begin. Their digestion can occur outside the body.

That makes for a gruesome mess, considering blowflies' taste for body fluids. Mealtime may proceed like this: Flies lap up blood, mix it with digestive juices and spit it out. They wander off to wait out the digestion and return to sponge up their meal.

Swarms can really muck up a crime scene.

"They leave these little marks and it resembles a lot - quite a lot - like impact spatter," said Chief Steven O'Dell, director of the Baltimore city police crime lab. "It could lead you to a wrong conclusion, to decide a witness statement is incorrect, or maybe an impact happened over here, or maybe there's some other body that's missing.

"It confuses you," he said. "It can slow the investigation down."

Investigators routinely measure the tiny tails of blood spatter to calculate the angle and location of a violent blow. That is called "directionality."

Flies leave nearly identical tails when buzzing around and spitting up, which can further confound investigators.

"It creates these little streaks that look like bloodstains that hit an object with some directionality," O'Dell said.

Still, scenes disturbed by flies remain an uncommon occurrence, mostly found in suburban and rural communities where bodies may linger

undiscovered. In Baltimore, shootings typically happen on streets, and such evidence rarely factors into investigations.

"We actually see it quite a bit down here," said Holly Latham, a forensic scientist with the Kansas Bureau of Investigation, who has presented case studies on blood spatter at meetings of forensic investigators with the International Association for Identification.

Latham was unaware of Rivers' project.

"It does sound intriguing," she said.

A study published in November 2003 in the journal Forensic Science International offered investigators tips for distinguishing fly spots from blood spatter.

Tails of fly spots will point in random directions, the study said. Another clue: spots found in rooms without a body. And flies will concentrate on lights, mirrors and windows.

The study presented a case from June 1997, in which two men were found shot dead in a Nebraska apartment. Spray around the apartment suggested a struggle, perhaps a robbery. But investigators ruled out the stains as fly spots, changing their theory to an execution.

"If you can develop something that's more reliable, well, you don't make these kinds of mistakes," said the study's co-author, Larry Barksdale, a former police officer and forensic science professor at the University of Nebraska-Lincoln.

The first known case decided by forensic entomology happened centuries ago in ancient China, said Neal Haskell, a prominent forensic entomologist. After a Chinese peasant was killed by someone with a

hand sickle, the local magistrate ordered villagers to lay down their sickles.

Blowflies alighted on the killer's blade.

Haskell has testified in 32 states and recalls a case in which a victim's hands were battered by cockroaches feeding on dead skin; in another case, matted grass didn't signal a dragged body, but maggots crawling off en masse dod.

He also has challenged evidence in court, testifying that blood spatter was actually fly spots. A reliable spray would be invaluable to investigators, Haskell said.

"If this technique works, that will help immensely," he said.

Sometimes technicians can detect fly spots by shining blue or purple light on stains and observing the specks through an orange filter. It's an inexact method, but fly spots often glow. At Loyola, Rivers has tested this method in his lab, finding that true blood stains also glow. Routine field tests for human blood do not distinguish fly spots.

"Every test that law enforcement has available should test positive for human blood, but the reality is it winds up being derived from flies," Rivers said

A student's casual question years ago - shouldn't there be some way to tell? - launched his research to invent the spray. He has isolated the flies' digestive enzyme and developed a binding antibody. Tests of 10 common fly species revealed the enzyme, but there remain dozens more to test over the next two years in his lab. And that's just fine with the professor.

"The odor doesn't bother me anymore," he said.