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Scientists unlock the code of crime

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A soda can police allege Michael Bacon left at a burglary scene two years ago in Fort Pierce recently led to his arrest after his DNA was found on the aluminum can.

But extracting DNA from evidence and matching it to a suspect doesn't instantly happen — or even happen in an hour timeslot as portrayed in the "CSI" television series.

Advertisement It's an in-depth, scientific procedure with multiple steps performed by criminalists — not crime scene investigators, said Daniel C. Nippes, director of the Indian River Crime Laboratory in Fort Pierce.

"We do rely on crime scene (investigators) to not only collect relevant evidence that might contain DNA, but also to preserve it until it comes into the lab," said Nippes.

The regional crime lab, which covers Indian River, St. Lucie, Martin and Okeechobee counties, offered a rare look into what happens to evidence after it's removed from a crime scene and how DNA is processed.

LOGGING IN

Forensic scientists don't immediately see evidence when it comes into the crime lab.

Lab custodians first log the evidence, assign it an individual number and store it in a large vault about the size of a high school classroom.

A special climate control unit constantly regulates the temperature and humidity throughout the crime lab so delicate evidence with possible DNA deposits can be preserved for months, even years.

Most crime labs are understaffed and the criminalists overworked, according to Nippes. The Indian River Crime Laboratory is no exception.

Of the more than 4,000 cases submitted to the local lab each year, the criminalists only can analyze about half of them. That's why prioritizing them is so important, said Earl L. Ritzline, criminalist and forensic scientist at the crime lab.

"Murders and rapes are very high priorities," he said. "A case like the burglary with the soda can is still important, but we have to prioritize everything ... and that isn't high on the list. That's why it didn't get analyzed right away."

PHOTOS

Before criminalists even open the package, they take photographs of the container — usually a paper bag, envelope or box — clearly marked and labeled with red evidence tape and initialed.

The evidence is removed and photographed with a ruler beside it to give it scale. The digital images are automatically stored on the lab's server.

SWABBING

Forensic science is based a lot on common sense and logic, according to Ritzline.

When trying to find DNA on a soda can, for instance, criminalists wouldn't spend time swabbing the bottom or side of it. They would go right to the opening and swipe a cotton swab across where bodily fluids probably would have touched the can.

The swab is then put in a moisture-barrier package, sealed, labeled and stored. It can be frozen, which can preserve DNA for decades, Ritzline said.

EXTRACTING

Once the samples are determined to have cells, and the cells are retrieved and isolated, the biology aspect comes into play.

The cells are put into a machine called a robotic "liquid handler." Ritzline explained the almost \$100,000 machine goes through complicated and noisy processes that break open the cells and extract the DNA by using heat and magnetic beads.

The machine can extract DNA from up to two dozen separate samples in less than two hours. It would take a criminalist about eight hours to do one sample using the same method, according to Ritzline.

"Automation is a wonderful thing. And I feel it reduces the chance of error," he said. "This instrument also kind of standardizes it, too, because no two humans do this process the same exact way."



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Earl Ritzline, criminalist at the Indian River Crime Laboratory, prepares a sample of recovered DNA for analysis while demonstrating how evidence is collected and processed.

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"Plus, I can do other things while the liquid handler is running like take calls or write reports."

COMPARISON TIME

Criminalists use a machine similar to the robot liquid handler to determine how much DNA actually was extracted. After the DNA is amplified and copied millions of times, it is then run through a machine that converts the particulars of the unique DNA into a graph.

That information, the genetic profile, is then run through FBI-maintained local, state and national databases for possible matches.

"If there is a match, it's either that person or his identical twin," Ritzline said, adding the information is stored in the database indefinitely.

The criminalists often have to testify in court about the process and explain the DNA evidence they found.

REALITY VS. HOLLYWOOD

TV shows such as "CSI" may be entertaining, but some of the actions portrayed aren't how crime labs work.

Fact: Real crime labs use a \$100,000 machine called a "liquid handler" to isolate and extract DNA from cells collected off of evidence. The procedure takes about two hours.

TV: Crime labs pretend to use a (much cheaper) drug analyzer — with added lights and sounds for the camera — to extract DNA, which isn't possible. The process in TVland also only takes seconds.

Fact: Criminalists in real crime labs rarely, if ever, go out into the field to collect evidence. They also do not interrogate suspects, carry a gun or get sworn in as law-enforcement officers.

TV: Investigators do it all, from processing a crime scene and analyzing lab work to following leads and making arrests.

Fact: Real crime labs do not have the technology to clearly enhance surveillance footage enough to see credit card numbers, tiny facial scars, distorted tattoos and other small features, because the videos usually are poor quality.

TV: Investigators can transcribe notes verbatim from a convenience store's security video and magnify a street camera still shot of a distorted license plate reflected off of a nearby car.

Fact: Most real crime labs are not associated with law enforcement agencies to keep an impartial opinion of the evidence. True criminalists also strictly deal with the collected evidence and do not know the facts surrounding a case.

TV: Crime scene investigators work for a police department or sheriff's office and analyze everything.

"I admit, I really do like watching the 'CSI' shows. But I watch the drama part of it. The key thing I like to watch it for is I want to know what the public is being educated about. 'CSI' tries very hard to do a good job ... they do have real forensic experts as consultants, so they are somewhat accurate. But a lot of it is made up for TV."

Earl L. Ritzline, criminalist, forensic scientist for the Indian River Crime Laboratory in Fort Pierce

KNOW THE LINGO

Real criminalists and those portrayed on TV often use acronyms and distinctive words associated with crime and law enforcement. Here is a list of words you may hear on TV so you can talk like an investigator and know what you are saying:

Deoxyribonucleic acid: What DNA stands for. DNA is a component of virtually every cell in the body and is unique to each person.

CODIS: Combined DNA Index System, the federal DNA database protected and maintained by the Federal Bureau of Investigation. Crime labs throughout the country compare new DNA to the system for matches and frequently add extracted DNA evidence from convicted felons.

AFIS: Automated Fingerprint Identification System, a federal fingerprint database used to compare and match, what else, fingerprints from crime scenes.

GSR: Gunshot residue, gunpowder or other fragments that are expelled from a gun after discharge.

Trace: Any evidence collected from a scene that could have been touched or used — inadvertently or not — during the crime. Examples include gunshot residue, chemicals, glass and illicit drugs.

Through-and-through: When a bullet entered something — a body or object — and went all the way through it without getting stuck or lodged.

Spatter: Blood that has fallen on objects at a crime scene. The blood spatter pattern can help determine what type of weapon was used.

Latent: Fingerprint left by the transfer of sweat and natural oils, typically not visible.

Tool mark: A three-dimensional impression usually made with some sort of weapon used in a crime. A clay impression can be made of the mark and compared.

CONCERNS

Like the fingerprint database, the United States has built an elaborate database filled with millions of DNA profiles. However, DNA holds a lot more information than fingerprints such as hair and eye color, genetic defects and others. Some opponents say holding DNA profiles are a violation of privacy and fear information in the database could be used to discriminate against them.

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