FORENSIC RESEARCH DIGEST

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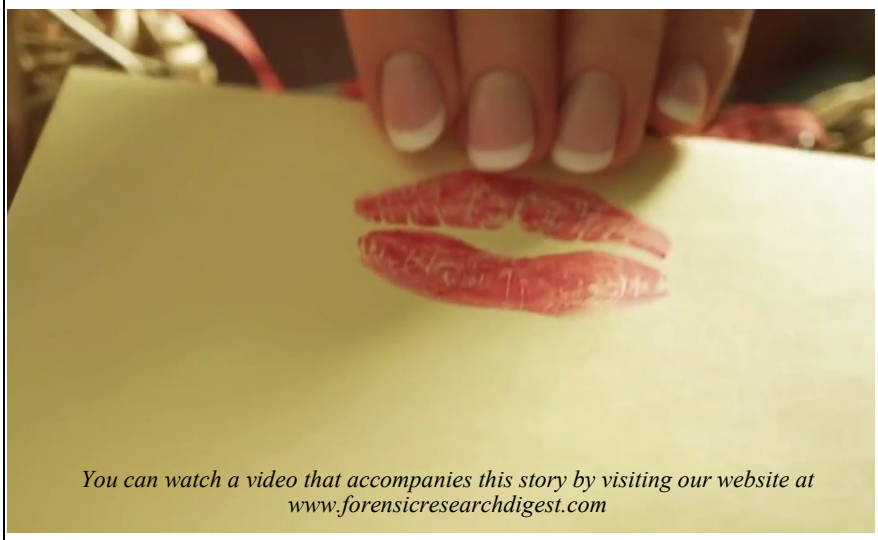
Inside this issue:

Catching criminals using lipstick stains



You can watch a video that accompanies this story by visiting our website at www.forensicresearchdigest.com

NEWSWISE —It's a common forensic TV show trope: A crime is committed, there are no suspects, and then detectives find a faint lipstick mark. The sample is put in an evidence bag and sent to the lab. Then boom, they analyze it in minutes and get a lead. In real life, forensic analyses are not nearly as fast or straightforward. But scientists now report progress on the technical front. They have developed an improved method for lifting lipstick samples from surfaces and have found that gas chromatography is an ideal way to analyze them.

The researchers presented their work last month at the 251st annual meeting of the American Chemical Society (ACS), world's largest scientific society. A video on the research is available at the Forensic Research Digest website.

"Working on this investigation has opened my eyes to the fact that TV has it wrong — things take much longer in real life," says Bethany Esterlen, an undergraduate student and lead researcher working on the project in the lab of Dr. Brian Bellott, an assistant professor chemistry at Western Illinois University.

For years, forensic scientists have applied various methods to remove lipstick samples from crime scenes and analyze their chemical constituents. Many current methods involve difficult or expensive steps such as a tedious lipstick removal process or examination of samples by Raman spectroscopy or X-ray diffraction. But these methods require specialized equipment and training, which are in short supply in under-funded and over-worked crime labs.

So, Bellott, Esterlen and colleagues decided to develop a better way to lift these samples and further analyze them. They began with an established method of lipstick sample extraction, but then eliminated unnecessary steps and improved upon the rest. The final method is a two-

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Southern hemisphere's first "body farm" inundated with offers of donated bodies

By David Cook

It is one of the hardest things to talk about, what to do with your body when you die. Some want to be buried, some cremated. Some donate their organs; others donate their corpses to medical schools. A new one is to have your cremated remains buried with a newly planted tree. One option people seldom consider is to donate their corpse to a body farm to further research that helps solve homicides.

However, the Australian Facility for Taphonomic Experimental Research, the southern hemisphere's first body farm is reporting that it is swamped with inquiries from all over the world from people who want to donate their bodies. There are several body farms operated by universities in the United States.

A body farm is a research facility that studies the decomposition of corpses through various settings. The body of knowledge developed is useful in death investigations as it helps determine when a person has died. The period between death and the discovery of the body is called post mortem interval, or PMI.

Corpses decompose in a fixed sequence of stages. The order of the stages never changes, but environmental factors such as temperature, humidity, shade, rain, sunlight and many others affect the duration of each stage. Before the advent of organized body farms, researchers usually studied PMI using dead pigs as an analogue.

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D I G E S T

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Forensic Research Digest maintains ongoing journalistic surveillance of developments in the forensic sciences, defined as the use of scientific principles to analyze extant evidence in order to understand historical events. This can be anything from a murder, to a plane crash, to the Battle of Stalingrad. The most widely known application of forensic science is its utility in solving crimes.

FRD summarizes peer-reviewed journal articles as well as news relevant to the forensic science community. Stories are chosen based on how poorly understood a topic is. This means that recentness of research is treated with less weight than a story's value in correcting erroneous beliefs about a subject.

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Please see back panel.

OPINION

David Cook, Editor

We see ads on TV for cheap life insurance to pay for expensive burials. Then there is cremation, which is promoted by the Neptune Society. A new trend is to have cremated remains buried with the root mass of a newly planted tree. I really hadn't thought of it much as for myself. However, an option that few consider is body donation to a body farm.

One of the most fascinating, if ghoulish fields of forensic science is forensic entomology. It is the study of how bugs decompose animal tissue. The process is a fixed sequence of stages, and by knowing the extent to which a particular body has decomposed can help determine the time of death. However, there are many factors that affect the duration of each of the five or six stages, (depending on whether you treat the last two as one stage or not, it is a matter of professional preference among entomologists) and the length of time can get ambiguous. So, scientists have done experiments for decades to help catalogue how the different conditions affect the process to make the analysis more accurate. The benefit is that when an unidentified body is found, forensic entomologists can examine entomological evidence and determine within a range, when the person died. From this, investigators can check to see if and who has been missing since then. Further confirmatory tests are needed of course, but it takes facts like this to get the first wedge to pry open some kind of crack in a case that decides whether a murder will ever be solved. You have to start with something.

Each researcher has a different focus. Some are interested in the entomology angle. Some want to train cadaver dogs.

So today, I will leave you with the contact information six body farms in the United States in case you want to consider making an obscure but truly helpful anatomical gift.

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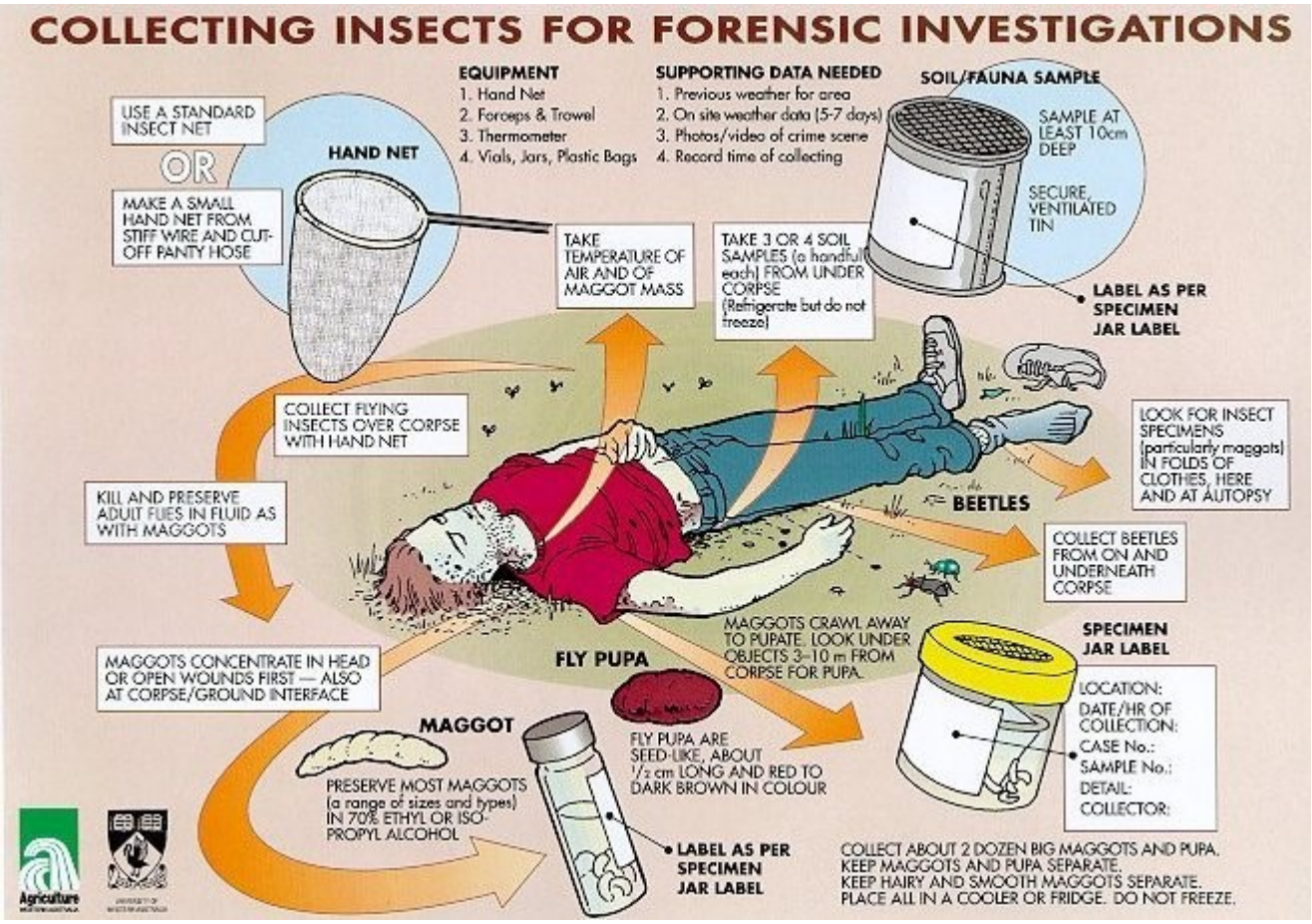
PROCEDURE SUMMARY



By David Cook

Collecting entomological evidence does not have to be complicated. However, it is important to carefully follow a set of procedures. Understanding the underlying principles of forensic entomology will help the procedures make sense and reduce the occurrence of errors, and therefore prevent the evidence from being contaminated or its value to the investigation weakened.

When a person dies, the body decomposes in a fixed sequence of stages. While there are many factors that will affect the duration of each stage, but the order will never change. Forensic entomologists are able to estimate the length of time between the death and the discovery of the body, known as the Post Mortem Interval, or PMI. Because many factors such as temperature, humidity, exposure to sunlight, etc. affect the duration of each stage, it is important to collect and document evidence properly. Unlike some other kinds of evidence, biological evidence will continue to change after it is collected.

Collect representative live and preserved samples of insects found at the scene. Collect preserved specimens of fly eggs, larvae (maggots), pupae, and newly emerged adults. These are preserved so that the forensic entomologist can see the progress in the life cycle at the time that the evidence was collected. Live specimens are collected so that they will continue to grow. Many times, the species of an insect cannot be determined by a visual examination of the larvae, so the entomologist must allow the larvae to mature to know exactly what it is.

Fly larvae generally migrate from the scene toward the south; however, this is not set in stone as other conditions may change this. Be sure to look for pupae within clothing, adjacent to the body, and a few meters from the body. Look for empty pupae casings and for newly emerged adults. This will signal that there has been a complete life cycle at the crime scene.

Flies are only present at certain stages of decomposition, and other insects move in as flies move on. The most important for this purpose are predatory and necrophagous beetles. The transition is known as species succession. It is important to collect samples of any other insects that are present as well. This will give the entomologist additional data with which to estimate PMI.

Earth worms, pill bugs, spiders, etc. do not usually contribute to estimating PMI, but collecting specimens will not harm the investigation.

Further, record the exact location with GPS and record the ambient temperature, the temperature of the ground where it contacts the body and the maggot mass, and thoroughly photograph the scene.

It is also important that crime scene technicians are fully trained in the procedures.

Lipstick… from page 1

part process: First they add an organic solvent to remove most of the oils and waxes, and then they add a basic organic solvent to extract the remaining residue.

"Right now we are just lifting samples off of paper, but in the future we are hoping to use different articles and media that could be found at a crime scene," says Bellott.

Armed with a short, robust way to lift lipstick, Bellott's team turned to determining a quick, efficient method for analyzing the cosmetic. To avoid methods that involve complex training, the team investigated three types of chromatography: thin layer chromatography (TLC), gas chromatography (GC) and high performance liquid chromatography (HPLC). GC and HPLC methods both rely on injecting a sample into a machine and reading the results on a computer, whereas TLC involves researchers looking at samples on a special type of surface under ultraviolet light.

The team chose 40 lipsticks and made marks with them on paper to simulate finding smears at the scene of a crime. Different brands of lipsticks have unique compositions of organic molecules, which give distinct chromatography signals. Then researchers can compare spectra of crime scene lipstick to those of known lipsticks, which are compiled in a database, or "library." Once the brand is identified, law enforcement officials could investigate whether a suspect uses that particular cosmetic.

The team is still performing the analyses, but at this stage they see the best results with the GC technique.

Bellott says this overall method, from sample gathering to analysis, can be adopted by forensic labs as-is. However, the team is working on making it even better by continuing to build their extensive lipstick library and looking for ways to make it easier and more robust.

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