Cases Using Evidence from Plant Anatomy

In this chapter, we describe some actual cases involving the forensic use of plant cells. Included are examples using gastric, intestinal, vomit, and fecal samples as well as some anatomy of nonfood plants. The nature of these crimes varies from burglary to homicide and rape homicide. The ways to use these simple plant anatomy techniques in forensic investigations are limited only by the imaginations of investigators and prosecutors as illustrated here.

One of the frustrations of professional forensic work comes when you have done your best, but no resolution of the case occurs. For us, one such a case occurred in Illinois where a murderer was found innocent at a retrial, even though the stomach contents of his victims indicated that he must had lied about his whereabouts at the time of the murder. The second involved the deaths of two young women in Colorado ski country several years ago that were linked by manner and cause of death as well as by their stomach contents revealing they had eaten the same last meal on the day of their disappearance. The third was the murder of an innocent 6-year-old girl in Boulder, CO, for whom justice awaits.

1. FORENSIC PLANT ANATOMY INVOLVING DETERMINATION OF TIME OF DEATH

As discussed in Chapter 4, comparison of gastric contents or vomit with a homicide victim’s last meal can be useful in determining time of death. Knowing time of death helps determine who the perpetrator might be.

1.1 The Boyfriend Didn’t Do It

A young college graduate working in Denver in the early 1980s failed to return home one evening to relatives where she was living. Her body was found the next day. Her last known meal was at midday with her boyfriend at a well-known fast-food restaurant known for their burgers (two all meat patties, lettuce, cheese, special sauce on a sesame seed bun) and fries. However, when the Jefferson County coroner did her autopsy, he noted that the stomach
contents appeared to contain vegetable materials not available at this fast-food establishment in those days. He contacted us to examine slides he had made of the stomach contents to see if we could identify this material. We identified plants that indeed could not have been obtained at that particular restaurant indicating she had consumed another meal before she died. We found fragments of red cabbage (pigments still present), kidney beans (skin still pigmented), and onions, none of which were available at that fast-food restaurant in those days. Although the boyfriend had no alibi for the afternoon, he did have one for the rest of the day, and so he was eliminated as a potential suspect since he lacked the opportunity to commit the crime. A few years later, it was established via a confession of a serial killer that she was on her way home from work when the killer met her by chance for a second time. Believing that he was a friend of her brother (since she had accidentally met him previously at her brother’s home), she agreed to have dinner with the killer at a restaurant that had a salad bar, explaining the contents of her stomach found at autopsy.

1.2 The Black Widow Case

On October 21, 1993, a domestic homicide occurred in Steamboat Springs, CO. The victim was Gerry Boggs. Gerry and his brother Doug operated a very successful hardware business located on Main Street. On this day, Gerry opened the store as usual and then went down the street at about 11 a.m. to the Shack restaurant where he had his usual breakfast consisting of coffee, hash browns, eggs, and toast. Since he wasn’t feeling well that day, he decided to go home and rest instead of continuing to work at the store. The next morning, he did not show up to open the store. Doug was concerned about his absence and called his home, but got no answer each time he tried during the day. Later, after closing the store, Doug went to Gerry’s home and discovered his body. He had been hit on the head with a shovel, burned with a stun gun, and shot three times.

The police were immediately called in. Doug and Gerry’s friends pointed their fingers toward his “estranged wife,” Jill Coit, as a person of interest for possibly committing the crime. It appears that Jill had been married many times before and Gerry was husband number 8. However, some time after their wedding, Gerry learned from her seventh husband that she hadn’t been legally divorced at the time of her wedding to Gerry. A longtime bachelor, this was Gerry’s first marriage. He obviously was upset by this information and he had the marriage annulled and asked the court to freeze her assets, which consisted of a bed-and-breakfast business he had helped her finance. Since then, Jill had been married and divorced from husband number 9 and had acquired a new boyfriend, Michael Backus. A court date to finalize the issue between Jill and Gerry was now pending and this was considered to be a possible motive for the killing because her past behavior of marrying vulnerable men for their money would come to light. Furthermore, one of Jill’s early husbands was a victim of an unresolved homicide in Texas.

On the day before the discovery of Gerry’s body, neighbors reported seeing two “suspicious” characters wearing what seemed to be disguises in the vicinity of Gerry’s home that afternoon. Jill and her boyfriend had an alibi for the entire evening and the next day before the discovery of Gerry’s body but not for the previous afternoon. Hence, it was very critical to pinpoint the time of Gerry’s death to determine if they had an opportunity to commit the crime.
We were asked by the Colorado Bureau of Investigation (CBI) to examine the stomach contents obtained at Gerry’s autopsy. The only plant materials we found were potato and onion (Figure 5.1). Since The Shack reported they did not include onions in their hash browned potatoes, it was concluded that perhaps he was killed in the evening after a second meal. Hence, Jill Coit and her boyfriend could not have been directly responsible for his death. However, we asked the investigator in the case to obtain some of The Shack’s hash browns for us to examine. When the investigator observed their preparation, he noted that the cook turned the hash browns on the grill with the same spatula he used for grilling onions. Sure enough, there were some onions residing in the hash browns he was served. Thus, the analysis of his stomach contents did match his last known meal and implied that the time of Gerry’s death was in the early afternoon.

Based on the stomach contents, authorities were able to obtain a search warrant for Jill’s car and home. They recovered a stun gun from the car and other incriminating evidence from her residence. The stun gun was shown to produce identical marks on fresh pigskin to those found on Gerry Bogg’s body. Once charged, Jill’s son from a previous marriage offered up additional evidence that was used at the trial where Coit and Backus were convicted of the crime. It was after her arrest that the news media in Texas dubbed her as “the black widow” since she was suspected of the shooting death in Texas of her third husband and because she had apparently relieved other husbands of their financial assets.

The Boggs murder case led to the publication of two popular books (Singular, 1995; Linedecker, 1995), a chapter in a third book on time of death determinations (Sachs, 2001) and two television forensic shows (True TV’s Forensic Files, “Order Up”; The History Channel’s Dead Reckoning Disc 1 “Body Clues”), all focusing on the importance of the forensic evidence in this case.

1.3 Lizzie Borden Style Pizza

In an Illinois town, a young father, David Hendricks, claimed he left late that November night on a business trip. Earlier that evening he had dinner at 6:30 with his three children at a local pizza restaurant that catered especially to children. His wife was attending a baby shower. The children played at the restaurant’s play area for over an hour after eating. According to Hendricks, he had tucked the children into their beds around 8:30 p.m. and the
wife returned home at 10:30. All was peaceful when he left for Wisconsin, according to his account. The next evening he asked friends to check on his family since he could not reach them by phone. The friends were also unsuccessful in contacting them and asked the local police to check on them. The police entered the Hendricks’ home and discovered a horrific site as the children had been killed with an axe while they slept. The mother was also dead. The autopsies revealed that a considerable amount of undigested pizza was still present in the children’s stomachs as evidenced by tomato remnants and the aroma of oregano. Their stomachs should have been empty by the time their father left home, especially since they had been very active immediately after eating, which accelerates gastric emptying (see Chapter 4). These observations suggested that the children were already dead before he left. Taken together with other information, the husband was arrested, tried, and convicted for the killings. However, there was no direct evidence linking the father to the crime. The case was written up in considerable depth, providing a general background of the accused as well as details of the crime and trial (Vogel, 1989). However, Hendricks was later retried due to a technicality and was found not guilty. In the second trial, the gastric evidence was, unfortunately, disregarded.

1.4 Death of a Tiny Beauty Queen

On Christmas Day, 1996, the body of 6-year-old JonBenet Ramsey was discovered in her family home in Boulder, CO, sparking an intense investigation that has yet to result in an arrest for her murder. Although her stomach contained no food, intestinal contents verified that she had eaten pineapple the night before as mentioned by her parents. Fresh pineapple contains unique crystals (raphides) not found in most commonly eaten foods (Figure 5.2), making it relatively easy to distinguish. We were also asked to compare wood fragments found in tissues examined at autopsy with a possible source found at the crime scene. Later, a Grand Jury did issue an indictment, but the Boulder District Attorney chose to disregard the indictment as he believed he could not get a conviction with the evidence available at that time.

FIGURE 5.2 Pineapple raphides. (A) Loose raphides from macerated pineapple tissue. (B) Raphides packed within a pineapple parenchymal cell. Photomicrographs by author.
1.5 Institutional Meals Can Help Fix Time of Death

Two homicide cases from California involved victims living in confined circumstances: one a mental hospital, the other a prison for the criminally insane. Investigators were attempting to determine when the inmates died. In both cases, the victim’s diet was prepared according to institutional policy. Hence, we were provided not only with stomach contents from the victims but also precise menus for all meals served prior to the death.

There were two groups of suspects in the prison. One group claimed to have seen the victim alive after lunch, but not after supper, while the second group claimed they had seen him alive after the evening meal. We were sent stomach contents of the victim and the prison dietician gave us detailed lunch and supper menus. The meals were distinct from one another. Examination of the plant materials in the stomach contents showed the victim had died after lunch, not after supper. This led the investigators to focus their efforts on the second group of inmates.

1.6 Abusive Husband Gets the Axe

In 1996, a young German immigrant killed her abusive American husband with a borrowed double-headed axe after he had allegedly attacked her while she was asleep in her bed. He allegedly had been physically and sexually abusing her since he had returned from the Gulf War in 1991. She apparently laced his beer with Nytol® and when he fell asleep, she hacked him more than 30 times with the axe while their three children were asleep. The question was raised whether this was a consequence of the nighttime attack or was it premeditated since the axe was borrowed recently by the wife. Our examination of his stomach contents revealed the presence of corn and potato fragments as well as meat fragments from the meal she had served him for supper. Furthermore, the muscle cells from the meat appeared quite fresh microscopically, suggesting the meat had been in the stomach for only a short time before his death. This finding supported the prosecution’s contention that he had been killed earlier in the evening and supported the conclusion that his murder had been premeditated. However, the jury, believing the history of abuse was a mitigating circumstance, found her guilty only of second degree murder.

1.7 Sometimes Plant-Derived Food Can Be Identified

Baked goods and processed cereals usually are difficult to identify microscopically. In August 1988, a mother left her 4-year-old daughter all day (10 a.m.–5 p.m.) in her parked car while she was at work in the Denver area. That morning she had fed the child a “zinger” (similar to a crème puff; Figure 5.3). The mother claimed she checked on the child’s welfare several times during the day. The last time she checked on the child at about 5 p.m., she said, she found the child dead in the car. The autopsy proved the child died from a blow to the head but it was possible this had occurred in the morning not in the late afternoon. Police thought that the morning blow was administered by either the mother or the mother’s boyfriend. We examined the stomach contents and verified that the “zinger” was still recognizable in the girl’s stomach when compared to a freshly purchased “zinger.” This indicated she had died much earlier in the day. Faced with the autopsy information and the data on the stomach contents, the mother decided to plead guilty.
In an unrelated case in Washington state, investigators were able to compare distinctive cereal components with the content of vomit samples associated with the victim’s clothing (Schneck, 2004). Obviously, the strangled victim had regurgitated the cereal soon after eating it. A similar match was found with vomit stains present in the bed of the suspect’s vehicle. It was concluded that the victim was transported in the suspect’s vehicle. Furthermore, phytoliths in the soil associated with the dumpsite where the victim’s body was recovered matched the phytoliths in soil recovered from the suspect’s vehicle. After being arrested, the suspect committed suicide while in police custody.

2. FORENSIC PLANT ANATOMY AND AGING GRAVESITES

We are charter members of NecroSearch International (NSI), a nonprofit organization of scientists, law enforcement people, and other experts who volunteer their time and expertise to law enforcement agencies in order to locate clandestine graves (see also Chapter 9). NSI also conducts courses to train others in their crafts. They utilize a variety of sophisticated approaches to locate clandestine gravesites including aerial surveys, forward-looking infrared (FLIR), ground-penetrating radar, highly trained cadaver dogs, entomology, anthropology and archeology, forensic botany, geology, and other tools. NSI has consulted on hundreds of cases in the USA and several other countries. In the following NSI case, forensic plant anatomy played an important role.

2.1 The Cher Elder Case: Getting to the Root of the Crime

In the late March of 1993, 20-year-old Cher Elder failed to show up for her classes at Barnes Business College in Denver and also didn’t appear at work. At first she was classified as a missing person, but then she was seen on a casino video in Central City accompanied by Thomas Luther, an ex-con with a history of brutal sexual assaults. According to Luther, Cher had had a fight with her boyfriend Byron Powers and Luther, who was a friend of Byron, had taken her gambling to “help her forget her troubles.” The Lakewood,
CO, police became suspicious and placed Luther under surveillance. Later that August, the police learned from an informant that Luther had bragged that he had killed a girl and buried her off of Interstate 70 where the police would never find her. Luther managed to get himself arrested for unrelated causes in April of 1995. A former cellmate of Luther’s from that time told the authorities that he had been to the gravesite with Luther and he identified the general area near Berthod Pass in the mountains west of Denver. A search of the area by members of NSI with a bloodhound failed to get a positive hit on a gravesite, but they did discover a peculiar collection of rocks. The investigators took a core of soil but did not find conclusive evidence that it might be a grave. Six weeks later, Cher’s former boyfriend, who was under arrest in relation to another homicide, told authorities that he also had been to the gravesite with Luther and could pinpoint the location. It turned out to be the same site already visited weeks earlier by NSI. But this time NSI investigators dug a deeper trench and NSI forensic anthropologist Dr. Diane France identified the distinct smell of decomposition. NSI members carefully dismantled the site and exhumed Cher’s body that was identified later by dental records. Although Luther maintained his innocence and pointed out that she could have been killed by someone and buried anytime during those 2 years, one of NSI’s forensic botanists, Victoria Trammel, examined the anatomy of the roots that had penetrated the grave. Microscopic observation of cross sections of these young roots (Figure 5.4) showed that they were approximately 2-years old, indicating the approximate age of the grave. This fixed the creation of the grave to be at a time when Luther could have been responsible. Luther later was convicted of second degree homicide in 1996.

**FIGURE 5.4** Cross section of a young woody eudicot root showing growth rings.
3. CASES INVOLVING FECAL MATERIAL

Comparison of plant cells in fecal samples may be useful in connecting a suspect to a crime scene. Fecal matter is often left on site following burglaries and may be matched to stains on a suspect’s clothing. Similarly, rapes and rape homicides may result in the presence of fecal stains on a suspect’s clothing, on upholstered furniture, or in a vehicle.

3.1 A Rape-Homicide Case Involving “Poo Prints”

A young woman was raped and murdered in 1996 after she left a party in Pueblo, CO. The suspect, who was on a work release from the local jail, met her for the first time at that party, had argued with her, and had left the party soon after she had. Later that night, he returned to the jail where the attendant noticed there were some obvious stains on the clothing he exchanged for prison garb. After her body was discovered the next day, the police investigated and identified him as a possible perpetrator of the crime. The clothing he had worn that day was confiscated as evidence.

The prosecutor in the case was aware of cases involving our analyses of stomach contents. He asked us if it were possible to identify plant material in two different fecal samples to determine if they came from the same source. To our knowledge, this had never been done, but we said we would examine the samples and see what we could find. We were supplied with stained pieces of cloth from the victim’s clothing and the suspect’s clothing as well as fecal matter from the victim. It was known that the victim, who had not been feeling well that day, had not eaten anything prior to attending the party. The last meal she had consumed was the night before, and it had consisted of Mexican style food.

Examination of the samples revealed that clothing samples from both the victim and the suspect contained evidence of black beans, chili peppers, and numerous unidentified but identical botanical parts that matched the materials found in the victim’s fecal sample (Figure 5.5). Since it is unlikely that the victim and the suspect had consumed identical meals and managed to stain their clothing with fecal matter, these results strongly suggested that the suspect had been at the crime scene. This evidence was instrumental in his eventual conviction for the sexual assault and homicide.

3.2 The Church “Poor Box” Robbery

A robbery occurred at a Catholic church in Florence, CO, during which the contents of the “poor box” was taken. However, the thief left an important signature in the form of fecal material at the crime scene. Clearly the thief had experienced an uncontrolled bout of diarrhea and, although he had attempted to use a toilet, he left a considerable amount of fecal matter behind. The priest had attempted to clean up the mess before calling the police. Nevertheless, the police were able to collect some remaining fecal material from the crime scene. The police immediately suspected a local man who had a police record and was known to suffer from Crohn’s disease. Sufferers of this malady often have difficulty controlling their bowels, especially if excited or anxious such as can occur during a robbery. The suspect was apprehended at the Alibi Bar, but he denied involvement and claimed he was with his sister.

\[1\] Later we learned of an early case in New Hampshire matching human feces on a shoe to a crime scene (Johnson, 1948).
at the time of the robbery. However, the police did find his blue jeans with a considerable amount of adhered fecal material in a dumpster behind the bar. When confronted with these observations linking him to the crime scene, the suspect told the police to “prove it.”

We were asked if we could compare the plant cell content in the fecal material from the crime scene and the sample from the blue jeans. There were 14 items found in the two samples that matched and no items that did not match (Figure 5.6). When presented with this information, the suspect confessed to the robbery.

FIGURE 5.5  Match of bean skin (seed coat) from (A) suspect’s clothing to (B) feces from the victim. Reprinted with permission from Norris and Bock (2000).

FIGURE 5.6  Example of unidentified trichrome present in a fecal sample. Even though the species of origin is unknown, the presence and frequency of occurrence of such items may be used to match two samples. Reprinted with permission from Norris and Bock, 2000.
3.3 A Charge of Child Abuse

A 20-month-old female infant had died while in the care of a babysitter. We were asked in 1998 to examine fecal material on her diaper to see if there was evidence that she had eaten recently. The sitter’s story was that she had been lethargic and had not eaten all day. The diaper was changed at about the time of the child’s death. The fecal sample contained bean cells and fragments of bean seed coat as well as some distinctive but unidentified trichomes and some epidermal fragments. There was nothing available to compare to the fecal sample from the diaper. Food travels faster through an infant’s digestive tract than that of an adult and it is possible that the fecal sample represented food eaten that day. However, we did not have a record of the last known meal nor of what was available to the babysitter for comparison. Apparently the investigators were looking for information that supported or questioned the story they had been told. Although we received a subpoena to testify in this case, we were never asked to report and never learned of the final outcome.

3.4 Threat of Botanical Fecal Analysis Yields a Confession

The appearance of our paper describing the forensic use of plant cells found in fecal samples (Norris and Bock, 2000, 2001) led investigators to contact us about a similar rape-homicide case in Pennsylvania. However, there were only a few small fecal stains on the suspect’s clothing and because of the discovery laws governing evidence, there was great concern that an initial analysis would consume all of the available material and there would be nothing left to turn over to the defense if they were to request an opportunity to do their own analysis. Hence, we suggested that the prosecutor approach the defendant’s attorney to involve the defense directly in the process by participating in the coding of the forensic samples such that we would not know their identity. They could also include some unknown samples of clothing, with and without unrelated fecal material, as internal controls. Thus, we would do the analysis blindly. We suggested that they show the defense our published papers as evidence that we could do such a comparison. As a result of our suggestions, the suspect with the advice of his attorney decided to plead guilty to third degree murder rather than take the chance of acquittal against a possible conviction for first or second degree murder if the case were to go to trial.

References


