

Editorial

Forensic Entomology and Environmental Toxins

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The risk-benefit analysis is the cornerstone of toxicology. There are certain chemicals in the environment that, even in trace amounts, can change how the body works, cause death, and slow down the rate at which dead corpses decompose. Numerous naturally occurring toxins that have been utilized in medicine, hunting, and warfare were found and documented by ancient cultures. Emperor Shen Nung of China (2700 B.C.) is known to have experimented with poisons and therapeutic herbs. One According to eight Egyptian papyri from 1900–1200 B.C., poisons were used early on. One The methods for gathering, preparing, and administering over 800 medications and toxic recipes—including opium for pain relief—are documented in the Ebers papyrus, which dates to 1500 B.C. From 800 B.C. to 1000 A.D., Hindu medicine in India made reference to poisons and counteragents. Dioscorides (A.D. 50–100), a Greek army physician, was tasked with categorizing toxicants. One Poisons were used for assassinations and executions by the Romans (A.D. 50–400). One The multidisciplinary master Avicenna (A.D. 980–1036) was regarded as an Islamic expert in poisons and their remedies. Rabbi Moses ben Maimon, who passed away on December 13, 1204, in Fustat, Egypt, produced a book titled "Poisons and Their Antidotes" in A.D. 1198. It served as a first-aid manual for treating poisoning. According to the father of modern toxicology, the Swiss physician Paracelsus (1493–1541), all substances are hazardous if taken in sufficient quantities. Lead poisoning has historically been blamed for the fall of the Roman Empire, and lead can still be poisoned by drugs today.³

Toxin-related deaths are significant in the field of medicine, especially forensic medicine. When cells die, a process known as "autolysis" occurs in which enzymes break down the cells from the inside out. Insects belonging to the orders Diptera (flies) and Coleoptera (beetles) are drawn to volatile compounds including

hydrogen sulfide, carbon dioxide, methane, ammonia, and sulfur dioxide, whereas intestinal tract bacteria degrade the liquids that produce soft tissue.⁴ According to Sung Tzu's book "The Washing Away of Wrongs," the earliest known instance of insects being utilized in a criminal investigation occurred in China in the thirteenth century.^{4,5} All of the suspects were instructed to put their sickles on the ground after a farmer was discovered dead in a field with a sharp object.⁴ The murderer confessed because only one sickle attracted blowflies to the minuscule amount of blood that was concealed from view.⁶ In France, entomological evidence was used as evidence to acquit the residents of a house where the skeletonized remains of a child were discovered in the 18th century, marking the beginning of the use of entomology as a tool in forensic investigations. By analyzing the insect succession on corpses, Mégnin (1828–1905) founded the field of forensic entomology.⁷ The useful field of entomo-toxicology seeks to ascertain the postmortem interval (PMI), or the period of death. The period of time between a corpse's death and discovery is known as PMI.

Insect colonization, determining the age of immature insect stages feeding on a corpse, and examining the necrophagous species found on a cadaver can all be used to determine PMI.^{5, 8, and 11} Additionally, entomo-toxicology has made great strides in identifying and detecting toxicants in carcasses that have been burned or significantly degraded, where tissue and fluids may be scarce.^{5, 8, 9} However, the insect composition and the time it takes to appear on a cadaver might be influenced by several environmental conditions. Certain home items, such as insecticide, have been shown to lengthen the time it takes for flies to mature, reduce their size as adults, and even affect the survival rates of insects.¹² Additionally, it has been observed that insecticides can change the entomological succession and insect fauna.¹³ According to one study,

during the winter months, the proportion of dipterous insects (adults and maggots) in zinc phosphide-intoxicated dead groups was double that of control, with a preponderance of coleopteran insects (adults and larvae).¹⁴ The insecticide did inhibit insect eating on the ortho-treated chicken, according to studies by Tellez et al.¹⁵, and as a result, the chicken's decomposition was considerably delayed. But after a week of the trial, the untreated chicken broke down, and there was a noticeable increase in insect attractiveness.

Given that the usage of chemicals, like pesticides, might skew or delay the normal insect succession, this suggests that the effects of environmental toxicants on a cadaver must be taken into account while doing research and estimating a PMI. Overall, environmental toxicants, such as pesticides and heavy metals, can change the rate at which dead creatures decompose as well as the living organisms. When doing forensic entomo-toxicology, this needs to be taken into account.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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