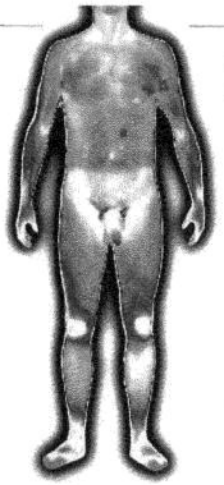
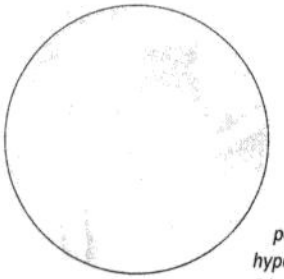
Time since death

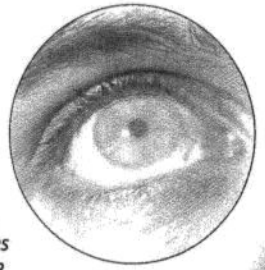
Estimating how long someone has been dead is an inexact science. However, even a rough idea of when death occurred is vital if it is known that a suspect was at or near the crime scene at a certain time. The temperature and stiffness of the body provide the first clues. A more precise assessment of time since death is made by careful observations at the crime scene combined with laboratory tests.



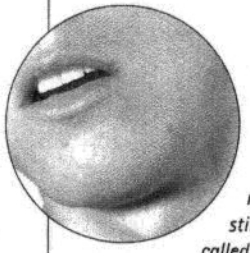
◀ BODY TEMPERATURE
A simple way of estimating time since death is to measure the temperature of the body's core (not the extremities, which are cooler, as this thermal image shows). Core temperature falls roughly 1.5°F (0.8°C) each hour, though clothing, ambient temperature, humidity, air movement, and the size of the body may speed up or slow down the cooling process.



◀ BLOOD POOLING
When blood stops flowing, it settles to the lowest parts of the body, turning the skin pink-red. This process, which pathologists call lividity or hypostasis, is complete within 6 hours (it does not affect the very dark-skinned). Slight pressure reduces it.

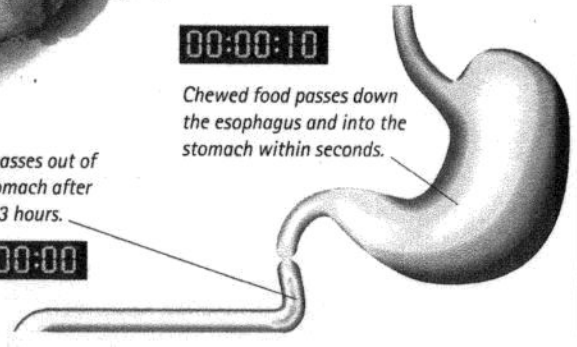


EXAMINING THE EYES ▶
Within minutes of death, a thin film forms over the eyes, and the eyeballs become soft as the pressure of the fluid inside them falls. If the eyes are open, the lenses may turn cloudy in less than 3 hours. An opthalmoscope reveals a subtler change—red cells in the veins of the retina (the light-sensitive area at the back the eye) continue moving for several hours.



◀ STIFFENING
Between 30 minutes and 3 hours after death, the muscles begin to stiffen, in a process called rigor mortis. This is first noticeable in the eyelids and jaw, and rigor mortis spreads to the whole body in 6–12 hours. It stays for another 6–12 hours, then disappears over the following 6–12 hours. Many factors affect stiffness. It may not develop at all at low temperatures, and muscles that were very active before death stiffen more

GUT CONTENTS ▼
Food in the guts of a homicide victim provides important clues to the time of death, especially if the time of the victim's last meal is known. But it cannot fix the time precisely. Heavy foods such as meat stay in the stomach for longer than lighter meals, and speed of digestion is affected by factors such as illness, fear, alcohol, and drugs.



GREEN SKIN COLOR ▶
About 48 hours after death (depending on ambient temperature) bacterial action gives the corpse's skin a greenish tint, except in the very dark-skinned. This starts at the lower abdomen, and spreads outward, reaching hands and feet last. Within 4–7 days, the skin has a marbled appearance, and veins close to the surface become more conspicuous.

CLUES BEYOND THE BODY ▶
In addition to the clues provided by the body, other factors may yield important evidence of the time since death. These include the environment in which the body is found, and information about the victim's day-to-day movements and habits. The longer a body has been left undiscovered, the less reliable are estimates based on changes in the body's physical condition. A more accurate estimate may then be provided by environmental evidence (such as insects or weather) or personal details about the victim's activities (associated evidence).

Within 6 hours of a meal, most food will have traveled halfway through the small intestine.

06:00:00

An empty small intestine suggests that the victim's last meal was at least 8 hours before death.

08:00:00

Digested food travels more slowly through the large intestine.

32:00:00

In all, the process of digestion may take more than a day.

◀ WHEN DID HE DIE?
Besides the physical signs shown here, chemical analysis can help a pathologist to determine time since death. The most common test is of the vitreous humor—a transparent jelly that fills the eyeball. Potassium is low in the living eye, but rises at a known rate after death. Biochemical testing seems more objective than other methods, but this precision is misleading. All techniques of estimating time since death are approximate, and responsible pathologists recognize this by giving investigators an interval of confidence that reflects the uncertainty of even the best methods.

CLUES FROM CORPSE FLIES

Though decay erases much of the evidence that pathologists use to estimate time since death, it also introduces new clues. Of the millions of insect species, only a hundred or so scavenge on corpses, and the different infestations follow each other in a fixed and predictable order. So by identifying the maggots, flies, and beetles on a body, and by knowing the pupa stages of each, forensic entomologists can narrow down the time since death to within a day or so if a body has been left undiscovered for 3–4 weeks.

Bluebottle maggots

Bluebottle fly