Cadaver Odour

Some forensics regarding the evolution of cadaver odour

Extract from →Cadaver Dogs: Also known as ‘decomp dogs’, these specially trained canines are trained to follow the scent of decomposing flesh in order to locate the bodies of deceased human beings. Whether the cadaver is on the surface, buried underground or under water, a dog’s nose is powerful enough to pick up the scent and trace it back to its source. Cadaver dogs can not only locate actual human remains, but also the location in which a corpse or body parts may have previously been stored by tracking down residual scents. Depending on the use of the cadaver dog, they will be trained to detect specific decomposition odours. For example, some may be trained to detect odours associated with the early stages of decomposition, whereas others may be required to locate older remains. Some dogs are specifically trained to detect dead bodies underwater, with the canine situated on a shoreline or boat. A newer concept is that of historical human remains detection dogs, which are trained to locate historical or archaeological graves.

How much times takes a body to express cadavar odour which may be smelled by cadaver dogs?

See in general: → CSST Canine Specialized Search Team

See for the following extract: →CADAVER SCENT PROJECT

This research project was initiated in January of 1997 as a response to a frequently asked question by agencies that use our services. How, we are asked, do the dogs define death? At what point during the decomposition process of a human body will the dogs demonstrate that they recognize the scent as post-mortem? We set up this research project to begin to understand when and how our dogs can discriminate live scent from post-mortem scent. All of the dogs used in this project have been “cross-trained”, that is trained in both the discipline of finding and indicating on live human scent and also on post-mortem (cadaver) scent. * The general medical definition of death, “The irreversible cessation of respiratory and heart activity” (Spitz and Fisher, 1993), describes the exact moment a human being becomes a dead body. Physiologic changes begin immediately, and within the first two hours after death onset of lividity, chemical changes in the blood, relaxation of muscle tissue, and other changes have been documented. In fact, in some cases, lividity can be seen as soon as 15 minutes post-mortem. Between 2-4 hours after death, body temperature begins to drop (Haglund and Sorg, 1997), chemical changes in muscles begin and autolysis advances.

We want to begin to learn, understand, and document the minimum post mortem time interval for which our dogs can perceive the difference between live and dead scent. Our window into the vivid realm of canine olfaction is, obviously, the dog's body language and more precisely, the alert sequence. The dog uses the alert to intentionally communicate to us “I have found a smell that you want”. We want to know the minimum interval at which our dogs can classify a scent as dead, as opposed to live, and when that classification is distinct enough that the dog is moved to perform the trained alert.

ICF RESERCH PAPER #97-1-1: POST- MORTEM INTERVAL FOR WHICH TRAINED K9s DIFFERENTIATE LIVE HUMAN SCENT vs DECOMP SCENT

*All post-mortem scent samples consist of sterile gauze pads, (sealed until just prior to use) placed on abdominal area of decedent for exactly 20 minutes. Gauze pads are then placed in unused plastic bags and double sealed with packing tape. All post-mortem scent samples are handled with latex gloves, and at no time do these samples come in skin contact with live human scent. *All Live Human scent samples are placed on the abdominal area of a living person for exactly 20 minutes, then placed in unused plastic bags and double sealed in the same manner as the post-mortem samples.

All trials are conducted using a lineup method: Each consists of a line of three gauze pads - one exposed to post-mortem scent, one exposed to live human scent, and one sterile unused pad opened with gloved hands just prior to each trial. All trials are done on a hard surface, either asphalt, cement, or hard packed dry dirt ground. Each dog is given the “cadaver” command by its handler and walked through the lineup. The dog is then asked to choose and indicate to the handler which gauze contains post-mortem scent. Every trial was “blind” to each handler working it, that is the handler had no prior knowledge of lineup sequence.

Dogs are given only a single choice per trial. Choices are recorded as CORRECT or INCORRECT only. Any dog that appeared unwilling to commit to a single sample was removed from that trial and the choice was recorded as Incorrect. All samples are properly disposed of after each trial.

TRIALS BEGUN: January 1997

NUMBER OF DOGS USED: Five different dogs

POST-MORTEM INTERVAL RANGE: From 70 minutes to 3 days

NUMBER OF TRIALS COMPLETED: As of July 1997, total of 52 trials completed

PRELIMINARY RESULTS: The **shortest post-mortem interval** for which we received a correct response was **one hour and 25 minutes**. However, the post-mortem interval for which we received a **consistently correct response from all dogs involved is 2.5 - 3 hours**.

How long after the event can dogs smell the scent?

See at →RESIDUAL SCENT IN BUILDINGS for more

One of the questions we are commonly asked as forensic canine handlers is “How long will scent last in any given situation?” This is a very complicated question, but we want to begin to unravel the secrets. We know some of the elements that will affect residual scent are heat/sun, wind, humidity and rain. Our first project was conducted in a closed, unused building. Items were placed in different rooms for 5 hours and then removed.

What is Residual Scent?

Residual is defined by Webster's dictionary as - leaving a residue remaining effective for some time. Within this paper we are using the term in conjunction with decomposing human scent. Residual scent searches are those conducted when no physical form is present. Residual scent is what is left when

the decomposing item has been removed. It is something we cannot see and humans cannot necessarily smell.

Introduction

This project began by accident, so was not preplanned as a residual scent research paper. We make no claims to having ruled out all variables, but are using this project to learn what the variables are and how to more effectively set up our next residual scent project. Our goal in this paper is to look at residual scent in a closed, unused building and see if we can find out how long a trained cadaver / forensic evidence dog can locate the original scent location. All the dogs used in this project ranged from those with some basic training in the finding of cadaver scent to specialized trained dogs in forensic evidence / body recovery. We see this as just the beginning of ongoing residual scent undertakings.

On November 9, 1996 several items were placed in different areas of a building. The building used was built in the 1930's and was used as classrooms up until 1995. It is part of a large developmental hospital that was built before 1900. Most of the furniture is now gone. There is still human clothing around, chairs, desks, shelves with things on them, wardrobes, curtains, and boxes of books and general effects. The facility has been closed down and most of the buildings are scheduled to be demolished.

Room #11 was used as an activity or day room. It is a large open room. The scent sources were blood (3cc) left to dry on the floor and door in the room. Room #16 is a closet/storage room off room #11. The scent source was blood (approx. 1cc) on paper on the floor. Room #5 is a large storage room with closets and shelves. The scent source was a soil sample with dried fluids from a gunshot to the head suicide enclosed in a 50ml vented container. The upper window has been open the whole time in this room. Room #18 is a large living room. Scent sources were; hair mixed with cadaver scent in the fireplace flue, and a very small amount of blood inside a trash can. Room #9 is a tiled utility area across the hall from a kitchen area. Scent source was hair and blood in a 50ml container placed in the foot of standing ironing board, so the sample was 5 feet off the ground.

Since the original set up date on November 9, 1996, we have returned to the building 4 times: January 8, 1997, April 2, 1997, July 23, 1997 and December 7, 1997. On our visit in April we found that they had removed most of the original furniture and some boxes of trash, so the building had little left in it. Two of the objects (the ironing board and a box of trash), that had held scent sources were now missing.

Results

Each dog participating in this project was able to find most or all of the locations where the decomposing scent articles had been. We saw dogs, which varied, from full alert and pinpointing to general interest in the room or area.

What we have found so far is; **residual scent will last 1 year in a building with minimum environmental influence, or human disturbance. Even after the objects where the scent source had been were removed, the dogs were able to locate the rooms, general area, or pinpoint where it had been.** Each time we have worked the problem we have included teams that had not worked the area before. We now have had 16 teams work the residual scent problem. The dogs have ranged from veteran cadaver trained certified teams to 1 year old puppies (who have been training from 8 weeks of age on cadaver and residual scent).

Observations

We noticed that there was a big difference between teams that do mainly live person searching and teams that specialize in forensic evidence / body recovery searches. The general difference being, forensic evidence / body recovery dogs are searched slower, have been taught to do a fine search, check items for scent sources, and alert without seeing an object. Most live human search dogs are trained to keep looking until they find the person and then to alert. Younger and less experienced dogs had fewer problems and were willing to commit to an alert more readily than some of the mainly live human search dogs.

How can an object be contaminated with cadaver odour?

Cadaver odour stems from chemical liquids which are produced by microbes eating up a dead body. Contamination occurs first if an object is in physical contact with such a dead body by sucking up at least some small amounts of those liquids.

Next those liquids will evaporate into a → gaseous state and then will be solved perfectly into the surrounding air. At this point somebody may smell cadavour odour by his olfactory sense. But as far as the air is not saturated with cadaver odour no other objects will be contaminated. This but will occure in later states, when the air gets over saturated by those gases, e.g. in closed rooms not before a minimum of several hours or days. In this case the gases will condense again to microscopic drops of liquids and may also contaminate objects, which were not in direct physical contact with the dead body.

Cadaver odour <u>cannot</u> be compared to tobacco smoke or →smoke at all. Tobacco smoke contains e.g. even such agressive particles as →tar. Smoke is a collection of airborne solid and liquid particulates and gases emitted when a material undergoes combustion or pyrolysis, together with the quantity of air that is entrained or otherwise mixed into the mass. Smoke particles are an aerosol (or mist) of solid particles and liquid droplets that are close to the ideal range of sizes for Mie scattering of visible light. Thus smoke, e.g. tobacco smoke, will contaminate even objects which are not in physical contact very effectivly even from the very beginning of smoking on.

A possible problem understanding scent dogs

See →Box Effect. In some special circumstances, e.g. in closed rooms or either with burried bodies, there may appear a common problem of understanding dogs. This results from the effect, that the gases from a dead body or contaminated object may fall down and cummulate in a ground depression in the vicinity of the main source. In such cases the dog will show the scent pool by pointing to any object in it:

Extract: *Recalling the yahtzee search, we can see how the box was a **predominate object in a scent pool**. The yahtzee box meant nothing, it was simply something that stood out and the dogs picked it to show us. We insist during training that they show us something specific, so the dogs have learned that we expect them to show us a thing/location. When the dogs can easily find the scent source they will show us, but when they have a scent pool or are unable to get to or find the source, they show us something that probably has scent on it but is not necessarily the scent source. A **buried body** sometimes gives off less scent where it lies than does the scent pool that has formed,*

*and **the dog will show us the scent pool**. We tend to think that every thing our dogs do is significant. We feel we have trained them to show us where the scent source is. In training this is possible, but on a real search we may not know the correct answer. What we have done is train them to show us something so they can please their handler and be rewarded. They have learned to make us happy by showing us something within the pool - anything. Try setting up a training problem (buildings work very well) **where the scent source is up high or not accessible to the dog**, and watch several dogs work. Can be a wonderful handler learning experience.*

Such problems can mostly be circumvent by isolating the objects in question from the surroundings.

Further information on Putrefaction processes

Putrefaction is one of seven stages in the decomposition of the body of a dead animal. It can be viewed, in broad terms, as the decomposition of proteins in a process that results in the eventual breakdown of cohesion between tissues and the liquefaction of most organs.

In General:

→Putrefaction

In terms of thermodynamics, all organic tissue is a stored source of chemical energy and when not maintained by the constant biochemical efforts of the living organism it will break down into simpler products. The breakdown of proteins in a decomposing carcass is a spontaneous process but one that is accelerated as the anaerobic microorganisms, already present in the animal's digestive tract when it was alive, consume and digest the proteins that comprise the creature's cells. As cells and their proteins are digested, the tissues of the body are left in a weakened state. Proteins are broken down into smaller components and these are excreted by the bacteria. The excreted components, which include gases and amines such as putrescine and cadaverine, carry the putrid odor associated with a decomposing body. The gases are initially constrained within the body cavities but diffuse through adjacent tissues and into the circulatory system. Once in the blood vessels, the gases can then spread to other parts of the body. The result is visible bloating of the torso and then limbs. The increased internal pressure due to the rising volume of gas also helps to weaken and separate tissues. At some point, some part of the body will rupture, releasing the gas. As the bacteria consume all available proteins, the process of decomposition progresses into the next stage: skeletonization. The term decomposition is a generalized expression covering the overall process from the death of the individual until skeletonization of the body. Putrefaction is only one stage of that process. Material that is subject to putrefaction is called putrescible.

→Decomposition

Decomposition (or rotting) is the process by which organic substances are broken down into simpler forms of matter. The process is essential for recycling the finite matter that occupies physical space in the biome. Bodies of living organisms begin to decompose shortly after death. Although no two organisms decompose in the same way, they all undergo the same sequential stages of decomposition. The science which studies decomposition is generally referred to as taphonomy from the Greek word τάφος taphos, meaning tomb. One can differentiate abiotic from biotic decomposition (biodegradation). The former means “degradation of a substance by chemical or physical processes, e.g. hydrolysis. The latter one means “the metabolic breakdown of materials into simpler components by living organisms”, typically by microorganisms.

→Autolysis

In biology, autolysis, more commonly known as self-digestion, refers to the destruction of a cell through the action of its own enzymes. It may also refer to the digestion of an enzyme by another molecule of the same enzyme. The term derives from the Greek words αυτό (“self”) and λύσις (“splitting”).

Forensic specials:

Forensic issues overview: →Forensic entomological decomposition

Medicolegal entomology is a branch of forensic entomology that applies the study of insects to criminal investigations, and is commonly used in death investigations for estimating the post-mortem interval (PMI). One method of obtaining this estimate uses the time and pattern of arthropod colonization. This method will provide an estimation of the period of insect activity, which may or may not correlate exactly with the time of death. While insect successional data may not provide as accurate an estimate during the early stages of decomposition as developmental data, it is applicable for later decompositional stages and can be accurate for periods up to a few years.

Forensic experiments: →Body Farm (USA)

A body farm is a research facility where human decomposition can be studied in a variety of settings. The aim is to gain a better understanding of the decomposition process, permitting the development of techniques for extracting information (such as the timing and circumstances of death) from human remains. Body farm research is particularly important within forensic anthropology and related disciplines, and has applications in the fields of law enforcement and forensic science. Four such facilities exist in the United States, with the research facility operated by Texas State University at Freeman Ranch being the largest at seven acres.

Further scientific readings

extract from →CSST readings

suggested readings:

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