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Short review on veterinary forensic pathology and animal abuse

Az állatkínzás felismerése az állatorvosi igazságügyi patológia eszközeivel – rövid áttekintés

ABSTRACT

The recognition and prevention of animal cruelty require vigilant observation and thorough investigative practices as specific indicators cannot be verbalized by the affected animals. Veterinarians must develop skills to identify signs of abuse and maltreatment through physical examinations, clinical evaluations, and forensic pathology. The evolving field of veterinary forensics has gained importance in addressing animal cruelty, notably due to studies linking animal abuse with violence towards humans.

This review highlights key aspects of veterinary forensic pathology, emphasizing the historical context, the necessity of precise diagnostic techniques, and the current challenges faced within the discipline. It explores different forms of animal abuse such as physical, sexual, and emotional harm, neglect, and poisoning, and their legal considerations. Understanding these dimensions not only aids in protecting animal welfare but also reinforces the role of veterinary professionals as possible first responders in domestic violence situations.

ABSZTRAKT

Az állatkínzás felismerése és megelőzése éber odafigyelést és alapos vizsgálati eljárásokat követel meg, mivel az érintett állatok nem képesek verbálisan jelezni az állapotukra utaló konkrét tüneteket. Az állatorvosoknak olyan készségeket kell elsajátítaniuk, amelyek lehetővé teszik számukra, hogy a bántalmazás és az elhanyagolás jeleit fizikai vizsgálatok, klinikai értékelések, valamint igazságügyi állatorvosi patológiai elemzések során felismerjék. Az állatorvosi igazságügyi szakértői vizsgálatok fejlődő területe egyre nagyobb jelentőséget kap az állatkínzás kezelésében, különösen azoknak a tanulmányoknak köszönhetően, amelyek kapcsolatot mutattak ki az állatkínzás és az emberek elleni erőszak között.

Ez az áttekintés az állatorvosi igazságügyi patológia kulcsfontosságú aspektusaira összpontosít, hangsúlyozva a történelmi kontextust, a pontos diagnosztikai technikák szükségességét, valamint a szakterület jelenlegi kihívásait. Megvizsgálja az állatkínzás különböző formáit, például a fizikai, szexuális és érzelmi bántalmazást, az elhanyagolást és a mérgezést, valamint azok jogi vonatkozásait. E dimenziók mélyebb megértése nemcsak az állatok jóllétének védelmét szolgálja, hanem megerősíti az állatorvosi szakemberek szerepét is, mint lehetséges első beavatkozóként a családon belüli erőszak eseteiben.

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Integrating forensic practices into veterinary medicine is essential for enhancing the legal standing of animal cruelty cases, providing robust evidence for the judicial system, and fostering public awareness of animal welfare issues. As the field advances, promoting interdisciplinary collaboration and standardized training will be crucial for veterinarians engaged in forensic investigations.

Keywords: forensic pathology, animal abuse, neglect, poisoning, pathology

Az igazságügyi szemléletmód integrálása az állatorvosi gyakorlatba elengedhetetlen az állatkínzási esetek jogi megítélésének megerősítéséhez, a bíróságok számára megbízható bizonyítékok szolgáltatásához, valamint az állatvédelem társadalmi jelentőségének tudatosításához. Ahogy ez a szakterület egyre inkább fejlődik, az interdiszciplináris együttműködés erősítése és az egységesített képzési rendszerek kialakítása egyre inkább kulcsszerepet játszik az igazságügyi vizsgálatokban közreműködő állatorvosok felkészítésében.

Kulcsszavak: igazságügyi patológia, állatkínzás, elhanyagolás, mérgezés, patológia

1. INTRODUCTION

Like humans, animals can suffer, but they cannot verbalize their pain and suffering. Therefore, it's crucial for veterinarians, caregivers, and pet owners to cultivate the skills needed to recognize signs of cruelty and abuse through physical exams, thorough inspections, clinical evaluations, or forensic pathology. While the responsibility of safeguarding animals falls on everyone, veterinarians, as dedicated defenders of animal welfare, play a key role in preventing cruelty and abuse by detecting potential maltreatment and raising awareness within the community.

Veterinary forensics is quickly gaining recognition as a unique field of veterinary medicine, stimulated by growing awareness of animal cruelty and its link to violence against people. The role of veterinary forensics is further strengthened by studies.[4,5] They explored the connection between child abuse and animal cruelty and found that animal abuse often occurred in the same households where child abuse was present, with 88% of physically abusive households engaging in the abusive treatment of pets. Furthermore, cruelty to animals by children is frequently a predictor of future antisocial behavior, which may progress into violence against humans.[6] This study also describes that abusive adults will sometimes kill or damage pets in order to control or silence children, particularly in cases of sexual or ritual abuse. Veterinarians might encounter indicators of abuse in both animals and humans, as pets are commonly part of families experiencing domestic violence, and this makes veterinarians potential first responders in identifying abusive environments.

In summary, veterinary forensic medicine and pathology play essential roles in cases of animal cruelty and abuse and are used in legal investigations to help courts understand the causes and significance of injuries or diseases in animals. They also educate veterinarians and animal keepers about the protection and justice the animals deserve.[7] However, while forensic science is well integrated into human medicine, its application in veterinary cases is still catching up. Many veterinarians lack comprehensive training in veterinary forensic practice and may be uncertain about applying this

4 DeViney, Dickert & Lockwood 1983, 321–329.

5 Monsalve, Ferreira & Garcia 2017, 18–26.

6 Arkow 1994, 1004–1007.

7 Brooks 2018, 1–2.

field to legal cases. Nevertheless, research and publications are steadily expanding the knowledge base in veterinary forensics, including educational programs helping veterinarians with better and new tools and techniques to handle cases involving animals.[8]

1.1 The history of veterinary forensic pathology

Forensic science has a long and distinguished history, especially in human forensic medicine. It has evolved over centuries and has become a complex, multidisciplinary field.[9]

Its development began in the mid-1700s and initially focused on equine medicine due to the influence of military and noble interests, which delayed the attention to other species. Following developments in human pathology and encouragement for meat hygiene research in slaughterhouses, by the 19th century, veterinary pathology was taught in North America and Europe. Through the 20th century, pathology became more specialized with the establishment of organizations like the American College of Veterinary Pathologists (1949) and the European College of Veterinary Pathologists (1995), fostering standards in training.[10]

Traditionally, forensic investigations were performed by medical professionals who played the most relevant roles. Nowadays, the team comprises a larger group of forensic specialists, including forensic chemists, botanists, biologists, and others. This evolution reflects the maturation of forensic science as a discipline, with different subfields contributing to the overall understanding and investigation of crimes.[11]

Veterinary forensic pathology remains a much newer, less developed discipline in its early stages. This is partly due to the lack of formalized training, certification programs, consistent standards, institutional support, and established medicolegal structures in veterinary medicine, unlike human forensic science, which is supported by accredited educational programs and professional organizations.[12] However, due to the increased awareness of animal welfare, forensic veterinary pathology has seen a significant rise in demand, and international organizations such as the European Society of Veterinary Pathology have played a crucial role in promoting high standards.

Recently, initiatives like the European College of Veterinary Pathologists (ECVP) have been introduced to address the need for specialized qualifications and provide consistent standards for legal investigations involving animals. This progress is driven by public demand for better animal welfare enforcement, and forensic veterinary pathologists are increasingly recognized for their vital role in animal-related legal cases.[13]

Since that growth in popularity, accredited programs at universities and colleges have been established in nations like the UK, ensuring that forensic practitioners receive standardized and independently assessed training. On the other hand, the lack of accreditation procedures in veterinary forensic pathology hinders the field's growth and the acceptance of its practitioners as authorities in court. Additionally, human forensic medicine faces ongoing challenges in relation to scandals involving unreliable expert witnesses or the privatization of forensic services. These issues enable valuable lessons for veterinary forensic pathology. By learning from these challenges, the veterinary field can build a more robust and reliable forensic framework, avoiding the pitfalls that have weak-

8 Parry & Stoll 2020, 110069.

9 Daniel, Cooper & Cooper 2010.

10 Munro et al. 2020, 83–88.

11 Daniel, Cooper & Cooper 2010.

12 Daniel, Cooper & Cooper 2010.

13 Munro et al. 2020, 83–88.

ened public trust in human forensic medicine in some cases.[14]

In conclusion, as veterinary forensic pathology continues to evolve, it must follow the example set by human forensic science by embracing interdisciplinary collaboration, formalizing training programs, and establishing accreditation standards. Only then can the field fully mature and contribute to investigating animal-related crimes with the same level of precision and authority as its human counterpart.

1.2 Importance of veterinary forensic pathology

Unlike diagnostic necropsy, forensic necropsies involve careful evidence handling, adherence to standardized protocols, and comprehensive documentation to ensure legal reliability.[15] The examinations aim to discover and look for injuries, abnormalities, or diseases and interpret them so they can be used legally to bring out the cause of death or the harm that it entails. The work of veterinarians in these cases includes reviewing medical histories, conducting scene investigations, performing pathology necropsies like post-mortem examinations, documenting findings through photography and reports, and providing testimony in court as experts.[16] Investigations often involve different species, requiring pathologists to adapt their techniques and to consider anatomical and physiological differences. The field plays a critical role in addressing not only domestic animal abuse but also wildlife crimes, which are often linked to environmental issues. Animals can serve as victims, witnesses, or even perpetrators in crime scene investigations, requiring veterinarians to interpret their findings within a broader medico-legal context.[17] The importance of these examinations is highlighted by their potential to illuminate broader societal issues, such as the connection between animal cruelty and interpersonal violence.[18] Thus, forensic pathology must be included in a multidisciplinary field combining skills such as scene investigation, forensic examination of dead and live animals, and analytical chemistry.[19]

2. TYPES AND INDICATORS OF ANIMAL ABUSE AND CRUELTY

Animal cruelty and abuse, much like the abuse of humans, can be classified into different types, with each having its distinct characteristics. As Munro and Munro (2008) discuss,[20] there is significant confusion regarding the terminology about animal abuse because it includes a variety of situations, such as "cruelty", "maltreatment", and "ill-treatment". Although these terms are often used, their applicability may become unclear, and different societal views about the proper treatment of animal groups exacerbate this uncertainty. Types of injuries in cases of animal cruelty can vary immensely, from physical trauma to environmental injuries. Understanding these different types of harm is crucial for both legal cases and veterinary forensic pathology, however the legal definition of animal abuse is always exact in every country. In the following, some of the most common injury types observed in cases of animal abuse are presented.[21]

Societal views on what is deemed acceptable for the care and slaughter of farm animals, the trapping and poisoning of vermin, and the use of laboratory animals in research often contrast sharply with the standards for pet animals. In essence,

14 Brooks 2018a, 1–2.

15 Brownlie & Munro 2016, 919–928.

16 Touroo & Fitch 2016, 880–887.

17 Salvagni et al. 2012, 37–38.

18 Monsalve, Ferreira & Garcia 2017, 18–26.

19 Bailey 2016, 12–20.

20 Munro and Munro 2008, 3–5.

21 Vetter 2024, 146.

practices tolerated for one category of animals might be seen as "abusive" for another.[22]

In the context of companion animals, this confusion can be effectively minimized by adopting a classification system that the medical field has successfully developed for identifying child abuse, which can also be applied to animal cases. This typology categorizes abuse into four main types: physical, sexual, emotional, and neglect.[23] Physical abuse, also known as non-accidental injury (NAI) or battered pet syndrome, involves actions that cause bodily injury to the animal. The term "animal sexual abuse" refers to using an animal for sexual gratification. In contrast, injuries resulting from such an act can be severe, depending on the type of act and the animal's size. Emotional abuse involves verbal harassment, threatening behavior, or failure to provide psychological comfort. Closely related to emotional abuse is neglect, which describes the inability to provide basic necessities like food, water, shelter, and veterinary care for injury or illness, for instance, abandoning an animal or allowing a collar to constrict as the animal grows.

It is possible to note that more than one type may occur in one case. This approach is beneficial because it is straightforward, allows clear communication between veterinarians and other professionals like pediatricians, and helps standardize terminology, which is essential for conducting and comparing research in this challenging area.

2.1 Physical injuries

In forensic pathology, analyzing wounds and injuries is critical to determining the cause and harm done to the animal. Identification and interpretation can provide evidence in cases where animal cruelty and abuse are suspected. External forces cause wounds and may affect the skin, deeper tissue, or both. In forensic veterinary medicine, injuries are categorized into different types based on the nature of the force and the tissues affected.[24] Distinguishing between accidental and non-accidental injuries is a critical aspect of investigations into animal trauma. Non-accidental injuries are intentionally inflicted traumas that often result from abuse or neglect. These injuries are characterized by specific patterns that separate them from accidental harm. Radiographic evidence in NAI cases usually reveals multiple fractures across different body regions or fractures at varying stages of healing, indicating repeated abuse over time. Transverse fractures are noticeably more common in NAI cases, typically caused by blunt force trauma, such as beating or kicking. The delayed presentation of injuries is another hallmark of NAI. Animals subjected to abuse often show advanced fracture healing, such as callus formation, suggesting that medical care was postponed or completely ignored. In contrast, accidental injuries arise from unintentional events, such as road traffic accidents, falls, or dog attacks. These injuries are often localized to a specific body region and typically present as spiral fractures rather than the transverse fractures common in NAI. Pelvic fractures are a frequent finding in accidental trauma, reflecting the high-impact forces of road accidents. Unlike NAI, unintentional injuries are usually treated immediately, and radiographs often show recent trauma without evidence of long-term neglect or healing.[25]

Differentiating accidental from non-accidental injuries remains difficult without comprehensive medical records or detailed anamnesis. However, forensic necropsy techniques, including careful analysis of lesions and toxicological testing, play a crucial role in identifying malicious intent.[26] This distinction is vital in legal proceedings, where accurate identification of NAI can lead to the prosecution of perpetrators and the protection of

22 Munro and Munro 2008, 3–5.

23 Munro and Munro 2008, 3–5.

24 Bailey 2016, 12–20.

25 Tong 2014, 392–398.

26 de Sequiera et al. 2012, 723–728.

vulnerable animals.[27] In a documented case, a cat was presented in the clinic with skull fractures and abdominal hemorrhages, where radiographic imaging revealed healed rib fractures as an indication of prior abuse. The ability to distinguish these as non-accidental injuries led to the conviction of the perpetrator under animal cruelty statutes, as the evidence was clear that the owner's claim of accidental injury from a fall was not possible.[28]

The distinction between blunt force trauma (BFT) and sharp force trauma (SFT) is essential to understand the nature and cause of injuries. They differ in their mechanism and forensic implications. BFT results from non-sharp objects and involves kinetic energy transfer, leading to abrasions, contusions, lacerations, or fractures, influenced by factors such as impact area, force magnitude, and duration. In contrast, SFT is caused by sharp objects, such as knives, and results in specific wound patterns that can be challenging to diagnose accurately. Correct diagnosis is crucial in assessing whether injuries are accidental or intentional, particularly in cases of animal abuse.[29]

Blunt force trauma occurs when a blunt surface collides with an animal's body or when a blunt object strikes the animal. There must be movement involved, either from the object, the animal, or both. This motion and the resulting impact are necessary for the trauma to occur. Abrasions occur when the skin is scraped against a rough surface, while bruises form due to bleeding beneath the skin, often influenced by tissue density and proximity to bones. Lacerations caused by stretching or crushing forces are irregular tears in the skin that are frequently accompanied by bruising or abrasions. Blunt force injuries are common in accidents, such as falls or vehicular collisions, but can also indicate deliberate acts of violence, such as beating or kicking.[30] Abdominal injuries may not always show external bruise, but severe internal damage, such as ruptures of the liver or spleen, can occur. The lack of visible signs makes internal examination crucial in identifying trauma to these organs with the help of radiographic diagnostics. In young animals, the flexibility of their rib cages may result in internal bruising without external signs, making it important to reflect the skin carefully during an examination.

Incised wounds, also known as cuts, occur when sharp objects like knives, broken glass, or other objects are drawn across the skin. These wounds tend to be long and shallow, with clean edges and profuse bleeding, but not as deep. In veterinary cases, knives of various types, such as hunting knives or box cutters, are commonly used to inflict these injuries. In most cases, it is not possible to provide information about the weapon used, but they often bleed heavily due to the clean-cut.[31] Stab wounds, or puncture wounds, are penetrating injuries caused by thrusting sharp objects like knives, swords, or even scissors into the body. These can result in severe internal bleeding and damage to organs, such as the lungs or heart. The depth of a stab wound is usually greater than that of a surface wound and can be misleading, depending on the dynamics of the incident. Perforating wounds, which pass through the body, are also a type of stab wound. The angle, direction, and depth of the stab wound can sometimes offer clues about the circumstances in which the injury was inflicted. These injuries typically suggest intentional acts of violence, though accidental sharp force trauma can also occur.[32]

27 Tong 2014, 392–398.

28 de Sequiera et al. 2012, 723–728.

29 Byrd, Norris & Bradley-Siemesn 2020, 126–150.

30 Eze & Ojifinni 2022, 94.

31 Munro and Munro 2008, 30–47.

32 Eze & Ojifinni 2022, 94.

In the case of gunshot wounds in animals, the injuries are highly complex and influenced by the firearm type and projectile designs, such as velocity, energy transfer, and the anatomical characteristics of the affected animal. Veterinarians often rely on human medical literature to understand gunshot wounds, yet the dynamics are different between humans and animals. For instance, military munition is designed for human targets with consideration for survival, while hunting munition, used in animals, aims for a quick, lethal impact.[33] Gunshot wounds typically have distinct entry and exit points, with the entry wounds often being smaller and more defined due to the projectile's impact. Exit wounds, if present, are usually larger and more irregular because of tissue disruption as the projectile exits. Wound channels are straight paths the projectile creates as it passes through the body, often significantly damaging tissues, bones, and internal structures.[34] When a bullet impacts bone, it can lead to fragmentation, creating secondary projectiles from shattered bone pieces. This can result in a complication of the wound, causing multiple tissue injuries around the bullet's path and increasing the risk of infection. Furthermore, gunshot wounds are highly prone to contamination because the projectile carries bacteria and debris into the body. In some cases, gunshot wounds are not recognized in time, either due to neglect or the lack of severe injuries at the entry point and the absence of an exit point. Figure 1 shows an example of a cat shot in the eye, where a post-traumatic ocular sarcoma has developed – the bullet was an accidental finding during histopathologic examination after enucleation because of the tumor.

Figure 1 Intraocular bullet found in a cat's eye after enucleation due to neoplasm formation (feline post-traumatic ocular sarcoma) (Courtesy: Anna Szilasi, DVM)

In cases of illegal shootings or animal abuse, veterinarians are called upon to assess gunshot wounds for legal purposes, which highlights the importance of understanding ballistics, wound characteristics, and interpretation of the findings accordingly in forensic cases.[35]

2.1.1 Organized animal fights

Dogfighting originated in mid-1800s England after bullbaiting was banned in 1886. Over time, bulldogs were bred for fighting, leading to the development of the pit bull terrier. Dogfighting is categorized into street fighting, hobby fighting, and professional fighting. Street fights are unplanned and without rules, often linked to gang activities. Hobby fights are organized a few times yearly, while professionals make a full-time living from breeding, selling, and fighting dogs, often at national and international levels.[36]

33 Felsmann et al. 2014, 279–287.

34 Vlizlo et al. 2024, 76–96.

35 Felsmann et al. 2014, 279–287.

36 Brooks 2018b, 97–100.

In many countries, breeds such as Pit Bull Terriers, American Bulldogs, Staffordshire Bull Terriers, and Kangals are still abused for dogfighting. However, it is essential to know that these breeds are abused for dogfights and are not born as "fighting dogs". This confusion often leads to misinterpretation and false conclusions.[37] These dogs are specifically bred and trained using cruel methods to increase their aggression. Training includes using treadmills to enhance endurance, blood-soaked carpets are used as stimulants during fights, and in some cases, even bait animals are allegedly used to provoke dogs (Figure 2). Dogfighting in many countries is also linked to broader criminal activities (eg. prostitution, drug-related offenses, personal and property crimes, etc.), with these dogs often serving as weapons or status symbols for criminals, who exploit the animals only for financial gain and prestige.

Figure 2 Treadmill adapted to fighting dog trainings to enhance their aggression and endurance. (Courtesy: Gábor Lorászkó, DVM)

Veterinarians may suspect dogfighting when animals present with multiple bite wounds, fractures, or dental injuries, especially when there are repeated veterinary visits for such injuries. Furthermore, finding training equipment and medical supplies like sutures and intravenous fluids in suspicious settings can be a signal (Figure 3). In rural settings, they are chained, while in urban environments, they are often kept in crates, sometimes stacked in dark, cramped spaces. The lack of socialization and poor living conditions contribute to their aggressive behavior and represent an example of animal cruelty and abuse.[38]

Figure 3 Illegal drugs and medical supplies at a dogfighting area. (Courtesy: Gábor Lorászkó, DVM)

The wounds of spontaneous and organized dogfights can be differentiated based on different aspects, such as the form of the wounds. Forensic veterinarians are responsible for documenting these injuries; any scarring can help identify whether a fight was organized or spontaneous. In addition, it is necessary to look for other features of abuse, including fractures and/or infections. Babesia gibsoni, a common blood parasite found in fighting pit bulls that can be passed on through dog bites, should also be investigated as part of necropsy.[39]

In organized dogfighting, distinguishable wound patterns are observed. The study by the Cummings School of Veterinary Medicine at Tufts University[40] examined injuries in dogs involved in both

37 Eichelberg 2000, 91–93.

38 Brooks 2018b, 97–100.

39 Tuska-Szalay et al. 2021, 100048.

40 Intarapanich et al. 2017, 1424–1431.

spontaneous and organized dogfights, focusing on differences in the extent, distribution, frequency, and location of injuries. Dogs from organized fights showed a high prevalence of wounds concentrated on the thoracic limbs, dorsal and lateral aspect of the head, the muzzle and oral mucosa, as well as the dorsal and ventral part of the neck and chest (Figure 4). These injuries mainly include deep puncture wounds, avulsions of skin and tissue, and sometimes fractures with damage most commonly found around the oral cavity. This is because dogs in organized fights are specifically bred for this purpose and trained to be more aggressive, continuously attacking despite being injured. During forensic pathologic investigations, a chart is always used to document all lesions properly (Figure 5).

Figure 4 Lesions of deep puncture wounds (bites) concentrated on the head, thoracic, and forelimb areas of a fighting dog in case of an organized dog fight. (Courtesy: Anna Szilasi, DVM)

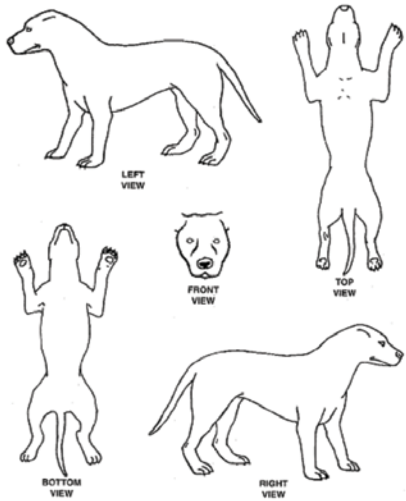

Figure 5 Dog fighting and injury chart[41]

In contrast, spontaneous dogfights resulted in superficial, less severe, and more isolated injuries, often located on the pinnae, neck, and front legs. Unlike organized fights, spontaneous fights typically involve fewer wounds, with dogs more likely to stop fighting after initial injuries and the absence of multiple wounds in different healing stages. This distinction in wound patterns makes forensic veterinarians able to identify whether a dog has been involved in organized dogfighting, with evidence-based injury patterns indicating more frequent and severe trauma in these cases.

Additionally, bite wounds can frequently carry bacteria like Staphylococcus intermedius and Escherichia coli. This contamination can provide forensic insights, as the type and source of bacteria help identify the wound's origin and whether abuse or neglect is involved.[42]

41 Merck 2019.

42 Kožar, Hamilton & Koščová 2018, 39–47.

Last but not least, these wound analyses and interpretations help veterinarians with essential information on what may have happened to the animal. Furthermore, wounds or injuries as well as the cause of death are also differentiated in literature in categories in areas to distinguish between thermal trauma, firearm wounds, asphyxia, drowning, physical trauma, poisoning, and bite injuries.

Cockfighting is a cruel practice where roosters are forced to fight against each other, most often resulting in severe injuries or death. Only male birds, specifically mature roosters, are involved in these fights. A mature rooster is referred to as a „cock" once it is two years old and has completed its first molt. Younger roosters, also called the stags, may be used in fighting events known as stag derbies. Female birds are not fought but used for breeding.[43]

The preparation of the birds for such a fight is extensive and often involves a program called „the keep". This includes a strict diet and exercise program that may last two to four weeks. The birds undergo various exercises like running, flying, and leg pulls to build muscle strength and balance in this regimen. Sparring matches are also conducted to evaluate their fighting style and their fitness. Additionally, the roosters may be given dietary supplements and drugs, such as antibiotics and anabolic steroids, during this period to enhance their performance.[44]

Cockfighting involves physical alterations to the birds, such as removing their combs, wattles, and earlobes to prevent injuries and reduce their body weight, which gives them an advantage in the fight. Furthermore, birds sometimes trim off their feathers to avoid overheating during a fight.[45] In some extreme cases, their natural spurs are trimmed to allow the attachment of weapons like gaffs or knives to their legs to increase the lethality of the fights, making them even more dangerous. The fights are often end in the death of one of the birds. They usually last no more than fifteen minutes. Roosters who lose are often discarded or left to die from their injuries.[46]

2.2 Animal Sexual Abuse

Animal Sexual Abuse (ASA) involves a range of abusive behaviors toward animals, including fondling, penetration (vaginal, anal, or oral), masturbation, and the use of foreign objects. While not all instances of ASA cause physical harm, the presence of unexplained injuries, particularly to genitalia, should always raise suspicion. ASA can also involve other traumas like blunt force, ligature marks, tail and ear injuries, or strangulation, which may be inflicted either as part of the abuse or during attempts to restrain the animal.[47]

The terminology surrounding this subject is important. While most are familiar with the term "bestiality," which refers to sexual activity between a human and an animal, the term is problematic. Both "bestiality" and its synonym "zoophilia" focus primarily on the person involved, neglecting to address the harm suffered by the animal. A more appropriate and precise term is "animal sexual abuse", which focuses on the abuse and harm inflicted on the affected animal.[48]

Animal sexual abuse is distinguished by the focus on the animal's genitalia or the anus and rectum (or the cloaca in birds). Whether an animal is physically harmed depends on the type of sexual contact and the size of the animal. The injuries caused can range from mild to severe and, in some cas-

43 Brooks 2018b, 108–118.

44 Brooks 2018b, 108–118.

45 Miller & Zawistowski 2013, 441–452.

46 Miller & Zawistowski 2013, 441–452.

47 Rogers & Stern 2017, 348–361.

48 Munro & Munro 2008, 30–47.

es, may be fatal. Veterinarians have a vital role in identifying and managing injuries caused by animal abuse, although discussions should concentrate on the animal's suffering rather than the underlying motivations for the abuse.

ASA is not limited to a specific species or gender of animals, as well as the perpetrator's gender. Both male and female animals of various species, including companion animals, farmed livestock, and birds, are subjected to sexual abuse by both men and women. However, dogs are the most frequent victims due to accessibility and behavioral factors.[49]

When it comes to semen found at these scenes, it is essential that animal and human sperm can be differentiated so the origin of this evidence can be accurately identified, particularly when dog sexual abuse cases are investigated. The Kernechtrot-pico indigo-carmine stain, also known as Christmas tree stain, produces a unique staining pattern in dog sperm, where in the sperm head, a colorless band can be observed between the acrosomal and postacrosomal regions, a feature not present in human sperm. This band could serve as a marker for canine sperm in forensic examinations.[50] Besides morphology, biochemical tests are important for distinguishing between human and animal semen. Acid phosphatase, found in large quantities in human semen, is a marker that persists for up to 24 hours in the vaginal tract and hence is often used in forensic analyses. Since P30 is a glycoprotein that originates from the human prostate and is present in semen whether it contains sperm or not, it provides an excellent marker for human semen. In contrast, canine semen does not result positive to test for either acid phosphatase or P30, which essentially makes these biochemical markers very specific in evaluating doubt when committed human sexual activity is suspected.[51]

In some sexual abuse cases, there is no sperm present due to a variety of reasons such as lack of ejaculation, condom use, aspermia from vasectomy, degradation of sperm over time, the natural drainage of semen, or that the perpetrator is a woman. In those cases, forensic experts can still detect male DNA from epithelial cells or lysed sperm. Still, interpretation can be challenging since the victim's DNA may hide that of the perpetrator. Y-chromosome short tandem repeats (Y-STR) analysis is a central tool to resolve these mixed profiles. Forensic tools such as the Sperm Hy-Liter test allow specific detection of human sperm heads without cross-reacting with animal sperm such as that of dogs, cats, and other species. The Rapid Stain Identification Semen (RSID) test detects human semenogelin and does not cross-react with animal seminal fluid or other bodily fluids, such as blood or saliva. This positive molecular identification is critical when dealing with instances of sexual abuse of animals by humans and when human as well as animal sperm may be present in the samples. Correct differentiation is essential to correctly indicating the responsible person and researching animal abuse.[52]

Even though ASA is seen as a taboo topic, veterinarians must remain aware that sexual abuse exists and is sanctioned more and more strictly internationally. They must recognize the injuries associated with it and include ASA in the differential diagnosis of lesions affecting the genitalia, anus, and rectum of animals.

49 Bolliger & Goetschel 2005, 2–13.

50 Stern 2020, 23–25.

51 Merck 2012, 239–241.

52 Merck 2012, 239–241.

2.3 Neglect

Neglect is frequently downplayed compared to other types of abuse, but it is a prevalent and harmful form of animal mistreatment. The general definition describes not providing an animal with its physical and mental requirements. Neglect can harm an animal's health and overall welfare and may even be considered a criminal offense in some cases.[53]

Neglect appears in different ways and can be categorized into other forms. Husbandry-related neglect is the most common form, where basic needs such as food, water, shelter, or veterinary care are not met. Economically motivated neglect describes cases resulting from cost-cutting methods or a lack of concern for animal welfare, like puppy mills. When animals are utilized for profit, such as racing horses or fighting dogs, they frequently suffer for a long time because their needs are ignored. Medical neglect is the failure to address obvious medical issues, such as embedded collars, untreated fractures, or visible tumors, which result in prolonged and unnecessary suffering. These cases often highlight apathy or a complete lack of regular interaction with the animal. Last but not least, a rare but concerning form of neglect, caregiver-fabricated illness or Munchausen by proxy syndrome, occurs when caregivers intentionally harm animals to seek attention or sympathy, where warning signs include animals presenting with unexplained symptoms that improve when separated from the owner or another abusive person.[54]

The five freedoms of animal welfare (freedom from hunger and thirst, discomfort, pain, injury or disease, to express normal behavior, from fear and distress) serve as the foundation for assessing neglect and are most often violated when discussing neglect. Failure to provide the minimal standard of care offends the animal keeper's duty (Figure 6). Financial distress is not an excuse for an animal to suffer.[55]

Figure 6 The consequences of keeping a dog constantly in a cage that is too small from a young age are distorted bones and joints, abnormal growth and posture, and a lack of social skills—a form of neglect[56]

Legal definitions of neglect differ depending on the location. Nevertheless, in cases, the „average person" standard is typically used to decide whether the pet owner should have been aware that their negligence would cause harm to the animal. Forensic veterinarians often approach the case with the questions whether the signs of neglect, such as malnutrition (Figure 7), untreated medical conditions, or behavioral changes, were evident to the owner. Any obvious indicators help establish that the neglect was willful. For instance, these indicators can include foul odor from an infection or a visible wound.

53 Brooks 2018, 37–66.

54 Levitt, Patronek & Grisso 2015, 110–125.

55 McCausland 2014, 649–662.

56 Nóng 2022.

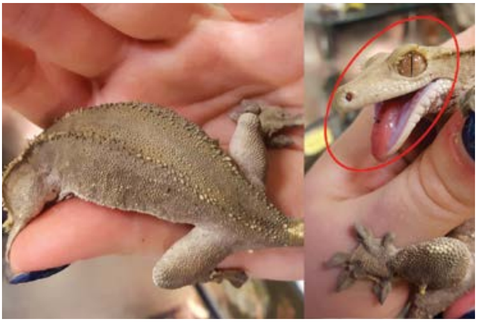

Figure 7 Metabolic bone disease in a crested gecko (Correlophus ciliates) due to malnutrition. (Courtesy: Anna Szilasi, DVM)

Furthermore, the animal's environment also provides crucial evidence of neglect. Unsanitary conditions, unsafe housing, overcrowding, and lack of basic resources such as clean drinking water, quality feed, or cat litter can all be indicators. Over time, these conditions influence the animals' health. Furthermore, they provide a timeline of neglect through evidence regarding indicators like the presence of old feces, scavenging, or signs of contaminated drinking water like algae in water containers.

Neglect cases demand careful evaluation by both veterinary professionals and legal authorities. Without proper investigation, the suffering of neglected animals may continue to be unimpaired.[57] A form of neglect can include overcrowding, also called hoarding, representing the violation of the five freedoms. Hoarding, also known as the chronic form of neglect, is a form of animal cruelty that can be described as extreme neglect, where the keeper collects a large number of animals but is unable to meet their basic needs. This behavior is often linked to a mental health disorder, with the hoarder typically failing to recognize the suffering they are causing to the animals.[58] Furthermore, these conditions also pose significant health risks to humans, including zoonotic diseases and environmental hazards such as high ammonia levels.[59] Animals in hoarding situations experience physical effects, such as malnutrition, starvation, lack of medical care, and physical injuries, as well as psychological effects, such as chronic stress, anxiety, and developmental and/or social impairments. In many cases, there is competition between the animals to get the right amount of feed and water, leading to fights between animals. This can cause physical injuries such as bite wounds, scratches, infections, and overgrown nails that can become embedded in the skin. The lack of resources leads to underweight bodies, stunted growth, dehydration, starvation, and cannibalism. They frequently suffer from untreated medical conditions such as infections and parasitic infestations (fleas, ticks, intestinal worms, etc.) as well as from chronic diseases that the hoarding entails.[60]

2.4 Poisoning

Animal poisoning, because of incorporating any toxic material, can also be an accident or malicious human activity. Most reported poisoning incidents in the United States are accidental, with fewer than 1% being intentional. Intentional poisoning can still happen in goodwill (e.g., wrong choice of NSAIDS), and only a tiny percentage (less than 0.5% of reported cases) of poisoning is meant to cause harm. However, the suspected number of malicious poisonings is probably higher as many animal poisoners operate secretly, and malicious poisonings are easily misidentified as accidental.[61] Malicious intentions are hard to identify. To reduce the number of misinterpreted cases, the veterinary pathologist must consider all poisoning cases as potentially malicious acts that might have fo-

57 Merck 2012, 207–209.

58 Merck 2012, 219–221.

59 Reinisch 2008, 1211–1214.

60 Merck 2012, 219–221.

61 Gwaltney-Brant 2018, 37–44.

rensic relevance. In these cases, a more thorough necropsy and a more precise toxicology specimen collection might be needed. Even more importantly, a more accurate anamnesis is required, as the original intentions can only be revealed by carefully looking for clues as to potential sources of poisonings.[62] Anamnesis of suspected animal poisoning involves the exposure (e.g., whether exposure was witnessed, location, and timing of symptoms); the environment (it may include a thorough field investigation); and patient medical history (breed, age, vaccination status and treatments, etc.). The most common toxins used for intentional malicious poisonings are rodenticides (warfarin and related substances), pesticides/molluscicides (diquat, metaldehyde), and easily accessible toxic materials often used around the house (antifreeze solutions, acids, alkali).[63,64,65] A proper pathological diagnosis usually requires additional toxicological testing that may involve veterinary forensic toxicologists.

3. CONCLUSION

In forensic investigations of animal cruelty, the correct and appropriate interpretation of post-mortem changes is crucial. These findings help clarify the cause and manner of death, assess signs of abuse, and confirm whether the animal suffered before death. If post-mortem changes are misinterpreted, critical signs of cruelty might be overlooked or misidentified, potentially leading to an incorrect conclusion regarding the events leading to death and, therefore, misleading the court and other people. Mostly, these misinterpretations happen due to environmental or pathological factors that mimic ante-mortem injuries.

A well-structured post-mortem report is important to differentiate between injuries occurring before death and changes occurring after death. For instance, injuries may appear externally, like bruising or fractures, while internal findings can uncover hidden trauma, chronic malnutrition, or other indicators of any kind of long-term abuse. Proper documentation and unambiguous categorization of these findings facilitate adequate comprehension of the situation.

Additionally, forensic necropsy reports serve as a basis for legal evidence in animal cruelty cases. Therefore, they must present objective, detailed accounts, as courts rely on these interpretations to assess the possibility and extent of abuse. Errors in determining wound age, bruise age, drowning status, time since death, and other factors can easily lead to misleading interpretations.

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62 Gwaltney-Brant 2016, 1067–1077.

63 Giorgi & Mengozzi 2011, 173179.

64 Bury, Langlois & Byard 2012, 375–380.

65 Bille et al. 2016, 440–448.

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