COMPANION OR PET ANIMALS

Forensic examination of a decapitated rabbit: interdisciplinary investigations on perpetrator’s traces

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SUMMARY

A pet rabbit was found dead outside its enclosure; the head was missing. The investigation of cruelty to animals was commissioned, as decapitation might result from human mutilation, for example, due to occult rituals or neighbourhood disputes. A first external examination showed circular disruption rostral of the pectoral girdle with lack of the head and palpable bone fragments of both forelimbs. CT scan revealed extensive, irregular trauma to soft tissues and skeleton. The decapitation left a cut-like but irregular, partially wave-like wound margin with multiple small triangular, divergent defects more closely examined by postmortem examination. Swabs from the margin of the wound and tissue samples were collected for forensic genetic analysis and histology. Considering these interdisciplinary investigation results combined with experts’ knowledge, a predator attack was highly likely. Further evidence on geographical distribution and physiological behaviour of putative predator species led to consensus on the identity of the most likely perpetrator: a red fox.

BACKGROUND

Sudden death of previously healthy pet animals in the absence of the owners are frequent events and are often supposed to occur due to third-party interference. A well-known former case which attracted much media attention is the alleged ‘Croydon cat killer’, where assumed cat killings by a human perpetrator were finally shown to be fox predation. On that score, a close and precise work-up of particular cases is essential, as some of them might be brought to court. The differentiation between human mutilation and predator kills is often not evident. Interdisciplinary approaches are therefore beneficial to establish a reliable, medico-legal diagnosis. This report describes the careful investigation procedure of a forensic case, on one hand to clarify human involvement, and on the other hand to identify the predator species, and highlights the importance of interdisciplinary cooperation.

CASE PRESENTATION

A decapitated adult female black-furred pet rabbit was found inside its enclosure within the owner’s garden in the northern part of Switzerland in December 2017. The head remained missing. A second companion pet rabbit was found alive and unharmed within the enclosure. According to the oral report given by the cantonal public prosecutor, the enclosure appeared secured closed and no influence of a third party was detectable. Nevertheless, the investigation of cruelty to animals was commissioned, as decapitation of animals might result from human mutilation, for example, due to occult rituals or neighbourhood disputes. The carcase was immediately deep-frozen by the cantonal prosecution and forwarded to the Department of Poultry and Rabbit Diseases, University of Zurich (UZH) with request for an expert opinion.

INVESTIGATIONS

First, the external torso and the extremities were macroscopically examined and systematically photographed. The remaining pelage was shiny, silky and intact. Neither bald spots nor scratches nor injuries could be detected. The cutis and subcutis were unremarkable besides the circular disruption rostral of the pectoral girdle with lack of the entire head. The nails were not frayed and no foreign material such as embedded fur was discovered. Comminuted fractures of both forelimbs were suspected because of multiple palpable bone fragments. The subsequent CT scan (Clinic for Diagnostic Imaging, Department of Clinical Diagnostics and Services, UZH) localised the separation of the cervical spine at the intervertebral disc space C3/C4 with decapitation and excessive irregular penetrating soft tissue trauma. Extensive irregular avulsion of the cervical skin with a widespread emphysema was visualised (figure 1A). Furthermore, irregular laceration of soft tissues of the right pectoral girdle led to dorsal displacement of the right forelimb shown in a bone window (figure 1B). Additionally, an open comminuted fracture of the right proximal humeral diaphysis, a longitudinal fracture of the right spine of the scapula and a comminuted fracture of the dorsal parts of the right scapula with loss of the dorsal part of the right supraspinous fossa were revealed. Moreover, a comminuted fracture of the left scapula with moderate medial displacement of fragments had occurred.

In cooperation with the Institute of Forensic Medicine (IRM-UZH), subsequent postmortem examination was performed and consecutively photographed. It revealed a well-nourished and fostered adult female pet rabbit. Due to deep-freezing, the carcase was reasonably fresh with only slight decomposition and no maggot activity. Low-level infestation with Leporacarus gibbus (fur mites) without clinical relevance was observed, but endoparasites could not be detected. Decapitation left a cut-like but irregular, partially wave-like wound margin with multiple small triangular and divergent defects, whereas the remaining exterior...
did not show any other wounds, bite marks or indentations. The wide wound cavity revealed few parts of plants and dirt, the residual cervical spine and a severe irregular loss of paravertebral muscles. The right forelimb was effortlessly displaceable due to a lack of connectivity to the right pectoral girdle. Despite the massive trauma described above, the internal organs were without gross pathological findings.

Swabs from the margin of the wound and tissue samples (lung, dorsal musculature, wound margin) were collected for further investigations at the IRM- UZH. Additionally, various organ samples were submitted for histological examination (Institute of Veterinary Pathology, UZH). The forensic genetic analysis of the swabbed target area was negative for human, canine and wolf DNA. The histological investigation of liver, kidney, heart, ovary, uterus, caecum and dorsal musculature yielded no histopathological alterations, while the cellular architecture of the wound margin was only altered due to the mechanical tissue damage described in gross pathology. However, the Sudan stain of lung tissue (double-knife cut) revealed a moderate (grade 2) pulmonary fat embolism (PFE) with multiple disseminated emboli. PFE occurs after injuries depending on the survival time and is a strong evidence for both the vitality of the victim at the impact of trauma and the severity of the blunt trauma.

DIFFERENTIAL DIAGNOSIS

At first glance, the wound margin seemed straight-lined, but on close examination an irregular appearance was seen as described above. Sharp-force injuries created by instruments such as knives, machetes and axes reveal cleanly cut hairs (or feathers in cases of birds), sharp and linear edges along the path of the wound, but absence of laceration and tissue bridging within the wound cavity. Elevated bone slivers or unique striations left on the bone, determining the blade type of the weapon, may be detected. Scavengers can cause similar marks on the bone, but predator bites are often associated with crushed or splintered bones and extensive soft tissue laceration in the depth, as found in the presented case. Moreover, the CT scan provided a strong indication of a bilateral dorsal force effect. Hence, a predator attack was highly likely. Measuring the intercanine width of bite marks is a valuable tool to identify the species, but in this case was not feasible due to the lack of puncture holes on the carcase. Nevertheless, the location, shape and appearance of injuries yielded information to identify the predator. Foxes prefer to carry off components of the carcase, foremost the head, and are well-known to store food in caches. Decapitation of their prey is reasonable because beheading is done fast without great effort and the brain contains a high amount of lipids. Foxes’ sharp small teeth cause fairly straight-lined wound margins resembling a cut with a knife to the untrained observer. The absence of extensive bleeding could be explained as a combined result of tissue compression through the bite, tearing and retraction of blood vessels, physiological stress response of vasoconstriction, and rapid or instant cardiac arrest. Red foxes (Vulpes vulpes) are indigenous in Switzerland and pets are a part of their diet according to a study of stomach contents of urban foxes. Moreover, they usually kill small animals by multiple bites to the head, neck or throat without excessive trauma to the rest of the body.

Besides foxes, other predators cause comparable kills and must be considered. Mustelidae may trespass enclosures through wire meshes without leaving marks and are known to potentially decapitate their prey and cache the food. The widespread stone marten (Martes foina) does not hibernate and is therefore also conceivable as a perpetrator of the herein described forensic case. Decapitation is also described for the eagle owl (Bubo bubo), but it is rather unlikely in the setting of this case, especially since eagle owls have not been detected in the particular urbanised area since 2000.

OUTCOME AND FOLLOW-UP

In conclusion, based on the assessment of the submitted headless carcase, no evidence of human involvement could be ascertained. The condition of the carcase, the missing head, the excessive irregular penetrating soft tissue trauma with multiple comminuted fractures of the forelimb and decapitation, the irregular but cut-like wound margin, and the absence of human DNA lead to the hypothesis of an animal attack, presumably that of a red fox (V. vulpes). As there is no red fox and Mustelidae DNA database at the IRM-UZH, the perpetrator could not be identified definitely. Forwarding the DNA extracts for further follow-up was not demanded, as predator kills are not impeachable and financial resources were limited.

DISCUSSION

The ‘Croydon cat killer’ represents an exemplary case how difficult it can be to differentiate human mutilation from kills of professional predators and how fast the media frenzy jumps to unsupported conclusions about human involvement. Very few comparable reports have been made in forensic veterinary medicine, especially when wildlife is the perpetrator. More effort has gone into the investigation of dog kills, as described in a recent short communication: four pink flamingos which were found dead, some of them beheaded and with wounds at the torso and on the thighs. The last two findings are crucial to differentiate the case from the present case’s decapitated rabbit and directed towards another predator. Subsequent investigations, comparable with the present authors’ inquiries, revealed a non-professional killer. The isolation and biomolecular research on salivary DNA from the edge of the wounds ruled out the red fox as initially supposed perpetrator and confirmed the predator species: a dog. However, the cogency of DNA evidence must be assessed critically. The presence of either human or animal DNA might be due to contamination (considering the ever increasing sensitivity of DNA technology). While roaming through backyards,
indigenous predators may leave DNA traces in the environment or on equipment, allowing indirect transfer to domestic and pet animals. To avoid contamination while transporting, storing or investigating a carcass in a place where occasionally predator species are examined (such as postmortem examination facilities of veterinary diagnostic laboratories), DNA collection directly at the crime scene by trained police personnel only is strictly necessary. Negligent contamination and false negative results due to inappropriate sampling techniques by untrained personnel are unlikely in the presented case, as only swabs taken by authorised agents are admissible in Swiss court. To sum up, DNA analysis may be of assistance, but can never replace thorough knowledge about predator biology and lesions associated with different predators. Pathologist and forensic biologists should explain these facts to investigators and thus prevent overzealous dependence on DNA results.

Learning points

► Interdisciplinary investigations deliver significant inputs; however, species-specific physiological characteristics need to be considered.
► Full-scale imaging investigation is highly recommended to obtain the ‘status quo’ before manipulation during postmortem examination and for medico-legal documentation.
► DNA samples must be collected at the crime scene by trained personnel only before any further investigations start.

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