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Popular Article

Wild Life Forensics: Anatomical Applications

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Abstract:

The unauthorized exploitation of wildlife for commercial gain in the food, artifact, and cosmetic sectors has raised alarming concerns regarding the erosion of wild faunal diversity and underscores the need for stringent conservation measures. As a result of this veterolegal cases are rising specially with wild life. Veterinarians are often called for identification of species, breed, age, sex of the remains of the wildlife animals during veterolegal cases. They can be identified based on samples available like remnants of bones, hairs, teeth, meat, horns and blood through gross morphology, histology, electron microscopy and molecular techniques. Wildlife Forensics (WF's) is an emerging field of science, useful in not only identification of species and prosecution of wildlife crimes but also in monitoring the health and impact of environmental factors on the wellbeing of wildlife populations. Wildlife forensics heavily relies on the application of veterinary anatomy knowledge, which is essential to compensate for the limited availability of data on wildlife anatomy, emphasizing the importance of further research and focus in this field.

Keywords: Wildlife, Anatomy, Veterolegal, Forensics

Introduction:

Forensic science is an interdisciplinary science which involves application of knowledge of veterinary and other life sciences to solve veterolegal cases. Anatomy is a branch of biological science, examines the form and structure of animals through its subfields: gross anatomy, microscopic anatomy, and developmental anatomy, which collectively cover the study of organs, tissues, cells, and development from embryonic to adult stages. In wildlife forensics, "identification" refers to class character analysis, i.e. taxonomic or species identification, rather than identification of an individual specimen as in case of humans. Identification of both legally and illegally traded wildlife species and items is an intricate task for wildlife forensic experts. Although numerous agencies and legal bodies are working

round the clock for the protection of wildlife, yet prosecutions for more than 70 % cases of wildlife crimes are not possible due to improper identification of species or the seized items.

An Insight Into Anatomical Application:

The knowledge on osteology can be used to determine the sex, breed and species of animal. For instance, shape of the cranium is Slender triangular appearance in canines where as Short, wide, and rounded in felines. Supra orbital foramen is absent in lion and there is Prominent median crest in occipital. The sex of the animal can be identified by Os Coxae, mandible, teeth and foramen magnum. In recent study, linear measurements of the foramina magna were higher in male cats than in females (Zarife Selin Akbas, 2023).

Dentition is another part where the species, age and gender can be detected. For example, the tusks of elephants are upper incisors. The tusks are made of ivory which is a specialized dentine. Both sexes of African elephants have tusks but in India only males bear tusks. Ivory exhibits a distinctive microstructural feature known as Schreger patterns, characterized by measurable angles, enabling its identification. Furthermore, Raman spectroscopy has been employed to distinguish ivory from horn, hoof, and shell materials based on unique band patterns at varying wavelengths. Wild boars have enlarged upper canine teeth that form stout tusks. The African wart hog, in particular, has four curved tusks used for digging up roots and tubers.

Examining animal hair at a crime scene plays a crucial role in identifying species. Specifically, guard hair, one of the four primary hair types found in mammals, is the most significant for determining animal species, as noted by Tridico (2005). In hairs, certain features such as the pattern of cuticle scale, type and diameter of the medulla, and pigmentation compounds are the primary modes of identification between different animals. Ahmed et al. In his study he differentiated between domestic and wild mammals referring to cuticle scales that were imbricate in all tested samples except for donkey.

At Cellular Level:

Animal species can be initially identified through the morphology of blood cells, such as RBCs, eosinophils, and neutrophils. For definitive identification, genomic DNA testing via PCR amplification is preferred, with the TP53 gene serving as a reliable marker due to its species-specific fragment sizes, as previously reported by Bellis (2003) and Uppal (2011).

The analysis of cellular DNA, specifically mitochondrial DNA (mtDNA) and nuclear DNA (nuDNA) markers, allows for precise species identification

- **Mitochondrial markers:**

  Mitochondrial DNA (mtDNA), a conserved genetic material residing in cellular mitochondria, plays a pivotal role in phylogenetic research due to its diverse applications. Specifically, mtDNA markers – including Cytochrome b (Cyt b), Cytochrome c oxidase subunits I-III (COI-III), ATP synthase 6 (ATP6), NADH dehydrogenase subunits 3 and 4 (ND3, ND4), ND4L, 16S and 12S rRNA, tRNAs, and

the control region (D-loop) – have been successfully employed for profiling wild species. Notably, COI has emerged as the most widely used mtDNA marker, touted for its advantages such as compact size, high variability, and universal primers (Zhang et al., 2015). Due to its effectiveness, COI is often regarded as a universal "barcode" for animal species identification.

- **Nuclear markers:**

  The use of Nuclear DNA markers in individual identification mostly exploit Short Tandem Repeat (STR) profile of nuclear-DNA based on an animal species. Some of the frequently used nuclear markers are the Amplified Fragment Length Polymorphism (AFLP), Random Amplified Polymorphic DNA (RAPD), and Short Sequence Repeats (SSRs) or Microsatellites. Microsatellites are the most widely used nuclear DNA markers.

Key Findings:

The field of wildlife forensic science is confronted with distinct difficulties, particularly data scarcity and species diversity, which pose significant hurdles in applying forensic principles to wildlife cases. An interdisciplinary approach, bringing together forensic experts, anatomists, pathologists, microbiologists, and other professionals, can significantly strengthen the discipline and foster innovative solutions.

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