CaDNAP – Canine DNA Profiling Group

An ISFG Working Group focusing on canine and other non-human DNA Analyses

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The dog is our closest animal companion and most popular pet, therefore, forensically relevant cases involving dogs, such as accidents or dog attacks, are observed regularly. Even more important, canine trace evidence, especially hair, can serve as evidentiary link when they indicate the suspect's or victim's presence at the crime scene. The Canine DNA Profiling (CaDNAP) group was founded in 2003 as a collaborative research project. The core group consisted of the Institute of Legal Medicine, Medical University of Innsbruck (GMI) and the German Federal Criminal Police Office (BKA). The Institute of Veterinary Pathology, Justus-Liebig-University, Giessen joined in 2008 and the Institute of Forensic Medicine, University of Zurich followed in 2015. The CaDNAP members have been striving for the harmonization of forensic canine DNA analysis by developing and validating canine-specific STR panels according to recommendations made by the ISFG. Additionally, the group is going beyond the analysis of canine DNA, and has lend its expertise for the analysis of animal as well as plant DNA in general to support law enforcement investigations. Here, we would like to present some examples of the range of questions the group is working on, to demonstrate why nowadays the analyses of animals and plants are recognized in the forensic field and why this type of forensic examination is considered a valuable addition to conventional DNA typing.
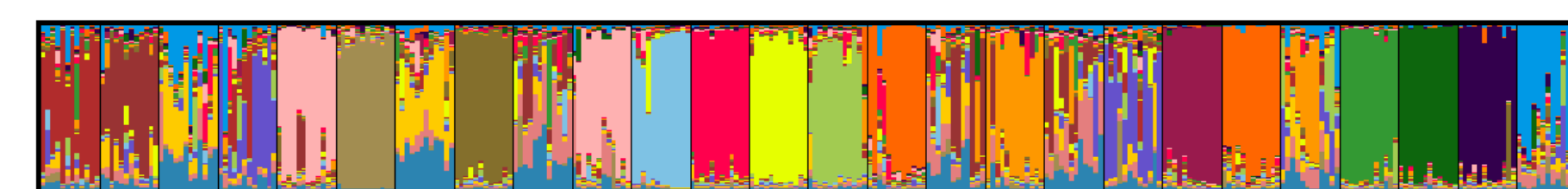
DOGS

Nuclear DNA

STR-Analysis

→ *Individualization*

CaDNAP panel: 13 STR markers and 2 sex-specific markers, amplified in two multiplex reactions and validated according to the ISFG guidelines [1]. The CaDNAP STR panel was applied in a comprehensive population study with 1184 dogs from Germany (D), Austria (A), and Switzerland (CH; DACH countries) [2].
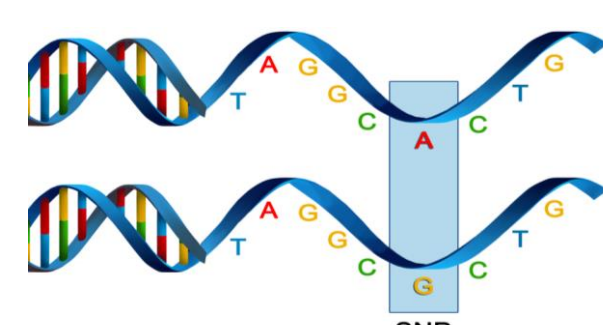
→ *Breed assignment*

The CaDNAP STR panel was successfully tested for breed assignment on 392 dog samples from the 23 most popular breeds in the DACH countries [3].
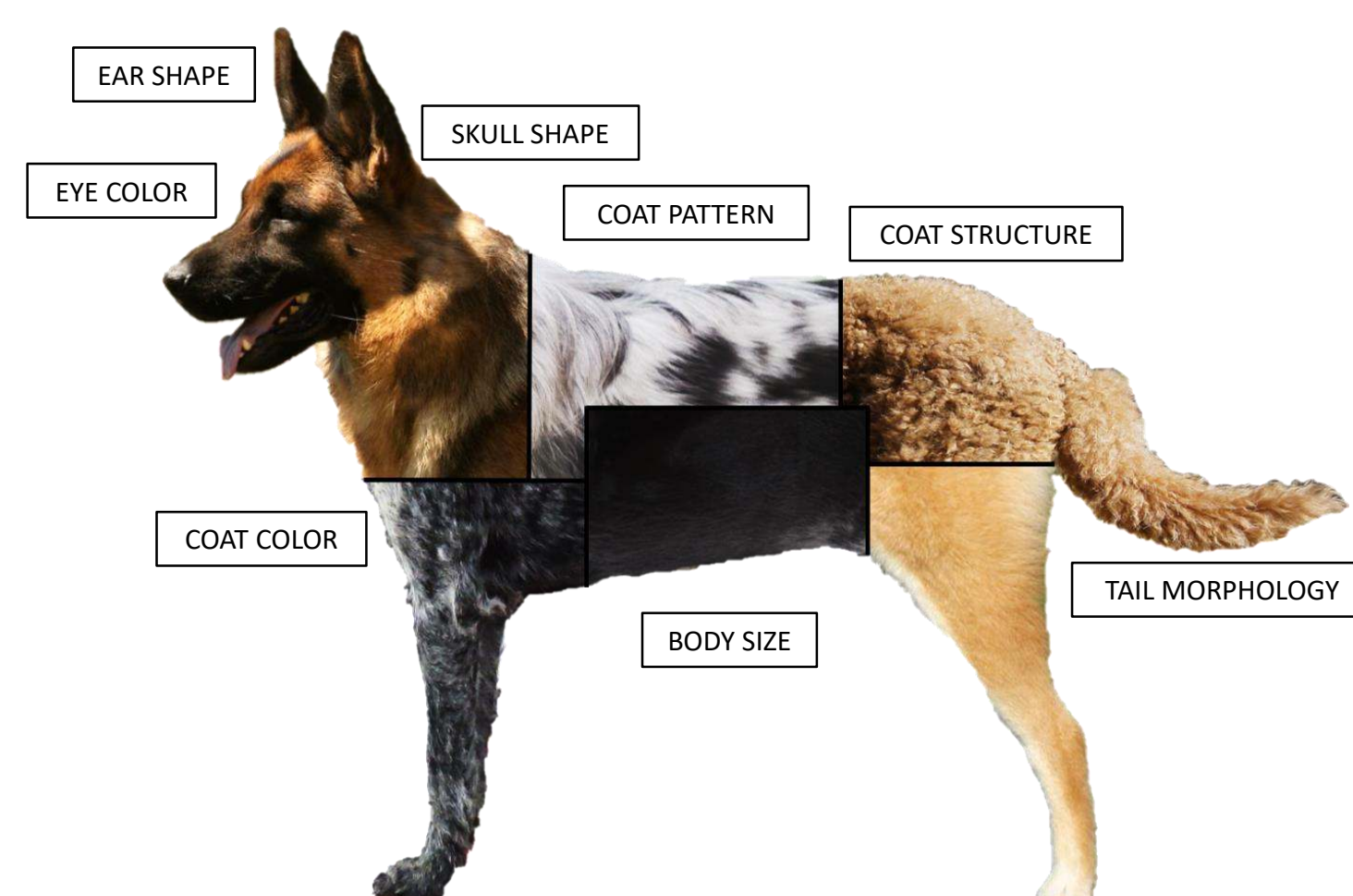
SNP Analysis

→ *DNA Phenotyping*

Externally visible traits of a dog, such as coat color, coat structure, body size, etc. can be characterized analyzing Single Nucleotide Polymorphisms (SNPs) as well as Insertion and Deletions (INDELS) that are known to be (highly) associated or even causative for externally visible characteristics [4].

Mitochondrial DNA

→ *Haplotype identification*
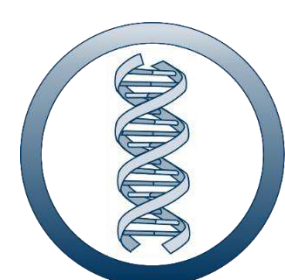
The mtDNA control region is of primary interest, as it is known to display the largest degree of variation among unrelated individuals. As mtDNA is maternally inherited it can only be used to identify a maternal lineage [5].

CaDNAP is offering a proficiency test for canine profiling. For details visite the

CaDNAP – HOMEPAGE

CATS

Nuclear DNA

STR-Analysis

→ *Individualization*

15 STR markers, amplified in four multiplex reactions [6] have been very helpful in criminal investigations ranging from homicide to burglar cases, where cat hair was left behind.

ROE DEER

Nuclear DNA

STR-Analysis

→ *Individualization*

STRoe deer: 13 STR markers and 2 sex-specific markers, amplified in one multiplex reaction [7] can identify roe deer individuals in poaching incidents or hit and run cases.

PRECIOUS CORALS

Mitochondrial DNA

→ *Species identification*

Coral-ID: Sequencing of a fragment of the mtMutS gene [8] can be used to help law enforcement authorities, traders and jewelry owners to conform to the legal requirements in the precious coral trade.

CANNABIS

Nuclear DNA

STR-Analysis

→ *Individualization*

19 STR markers, amplified in two multiplex reactions make it possible to link buds to plantations, to identify medicinal cannabis, or to distinguish between drug- and fiber-cultivars.

VARIOUS ANIMALS

Mitochondrial DNA

→ *Species identification*

Analyzing different mitochondrial gens e.g.: cyt b, COI or 16S rRNA [e.g. 9, 10, 11] to identify animal species in different criminal contexts like poaching incidents, cruelty against animals, burglaries, illegal meat imports (bushmeat) or car accidents.
In a case of suspected illegal trapping of a protected raptor, it was possible to identify raptor DNA on the trap of a suspect.

BBC NEWS

Germany: Fifteen flamingos found dead at Frankfurt zoo

→ It was a fox.

OAK

Nuclear DNA

STR-Analysis

→ *Individualization*

10 STR markers, amplified in two multiplex reactions [12]. The method was successfully applied in a cold case murder investigation to link a few old leaves, which were found in the trunk of a suspects vehicle, to their tree at the crime scene and therefore, the suspect could be connected to the crime scene as well.

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