

Summary of doctoral dissertation of MSc Małgorzata Miszczak entitled:

**„The development of methods for individual and species identification of dogs  
(*Canis familiaris*) based on mtDNA and microsatellite DNA analysis“**

dissertation advisor: Anna Radko, Ph.D, D. Sc., Professor of NRIAP

DNA microsatellite analysis in pets is commonly used among others for parentage verification and identification of individuals. Especially for dogs which are companion animals strongly associated with humans, correctly conducted DNA-profiling is of high importance for both breeding and crime investigation.

The aim of the study was to determine the usefulness of total of 22 microsatellite markers recommended by the International Society for Animal Genetics (ISAG) for dog identification. Moreover, the species specific sequence of mitochondrial ribosomal protein 12Sp was used to determine the DNA of dogs. The microsatellite markers were combined into two multiplexes. The basic STR panel comprises 18 markers: AHTk211, CXX279, REN169O18, INU055, REN54P11, INRA21, AHT137, REN169D01, AHTh260, AHTk253, INU005, INU030, FH2848, AHT121, FH2054, REN162C04, AHTh171, REN247M23 and sex *locus*. The basic microsatellite panel was tested on 612 randomly selected individuals of nine dog breeds: Labrador Retriever, Golden Retriever, Polish Tatra Sheepdog, German Shepherd, Irish Wolfhound, Yorkshire Terrier, Yorkshire Terrier Biewer, French Bulldog and Maltese. The second panel has been extended with three additional *loci*: AHTh130, REN64E19, REN247M23 and has been validated and tested on 87 individuals of Irish Wolfhound breed.

A total of 196 alleles, including 35 private alleles, were identified at 18 microsatellite *loci* comprising the basic panel, which were used in further statistical analyses.

To compare the efficiency of the panels for individual identification and paternity testing, there has been estimated for each panels the probabilities of parentage exclusion, when one parent is known ( $CPE_1$ ) and two parents are known ( $CPE_2$ ) and the combined power of discrimination –  $PD_C$ .

For Irish Wolfhound the probabilities of parentage exclusion  $CPE_1$  and  $CPE_2$  for 18 *loci* were 0.937982 and 0.996598, respectively and for 21 *loci* were 0.948824

and 0.997740, respectively. The results for combined power of discrimination were near 1 for both of panels.

Practical application of extended STR panel has been employed to the police case regarding a dog bite. There was conducted the comparative analysis of DNA from biological material and reference material provided by the police. The first step of the analysis was to species identification of DNA from analysed biological sample. There has been calculated the random match probability – RMP i.e. the probability that a dog selected randomly from the population would have the same profile as the evidence sample. The RMP was  $7,24 \times 10^{-21}$  and  $1.47 \times 10^{-26}$  for 18 STRs and 21 STRs, respectively.

According to the results, it was found that a panel of 21 STR *loci* can be successfully used in routine analysis of individual identification and paternity testing of dogs.

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