

“Variations in the mitochondrial D-Loop region sequences among three Strains of the Arabian horse breed”

AgrosNet-Doktorandentag

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Introduction

- **Arabian horses* (*Equus caballus*)** : one of the important horse breeds
- **Features: Beauty, strength, body conformation, durability and endurance**
- **Hot-bloods breed**
- **The legendary founders of the five "strains" of the Arabian horse**



Arabian Horse Strains

Strains are frequently used terms for grouping certain horses according to their various female ancestors.

Saglawi Strain

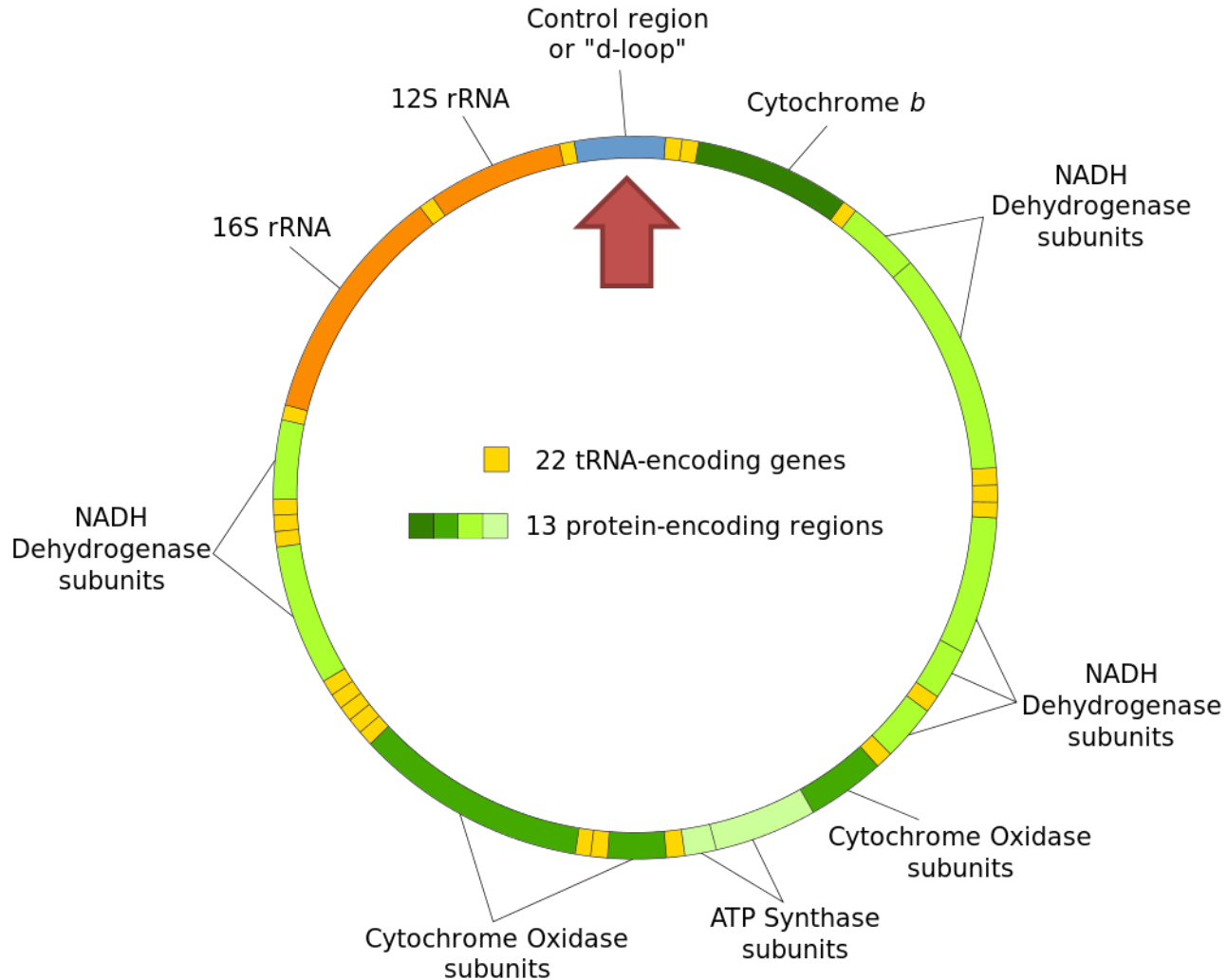
Kahlawi Strain

Hamdani Strain



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Mitochondrial DNA and D-Loop sequencing



Research Objectives

- **Understanding the genetic diversity of the Arabian horse breed**
- **Identifying the three strains genetically based on the haplogroups (HG) identified by Achilli 2012 and identify new haplogroups, if possible**

Material & Methods /1

Hair roots (**121** individuals)

Saglawi	Kahlawi	Hamdani
51	36	34

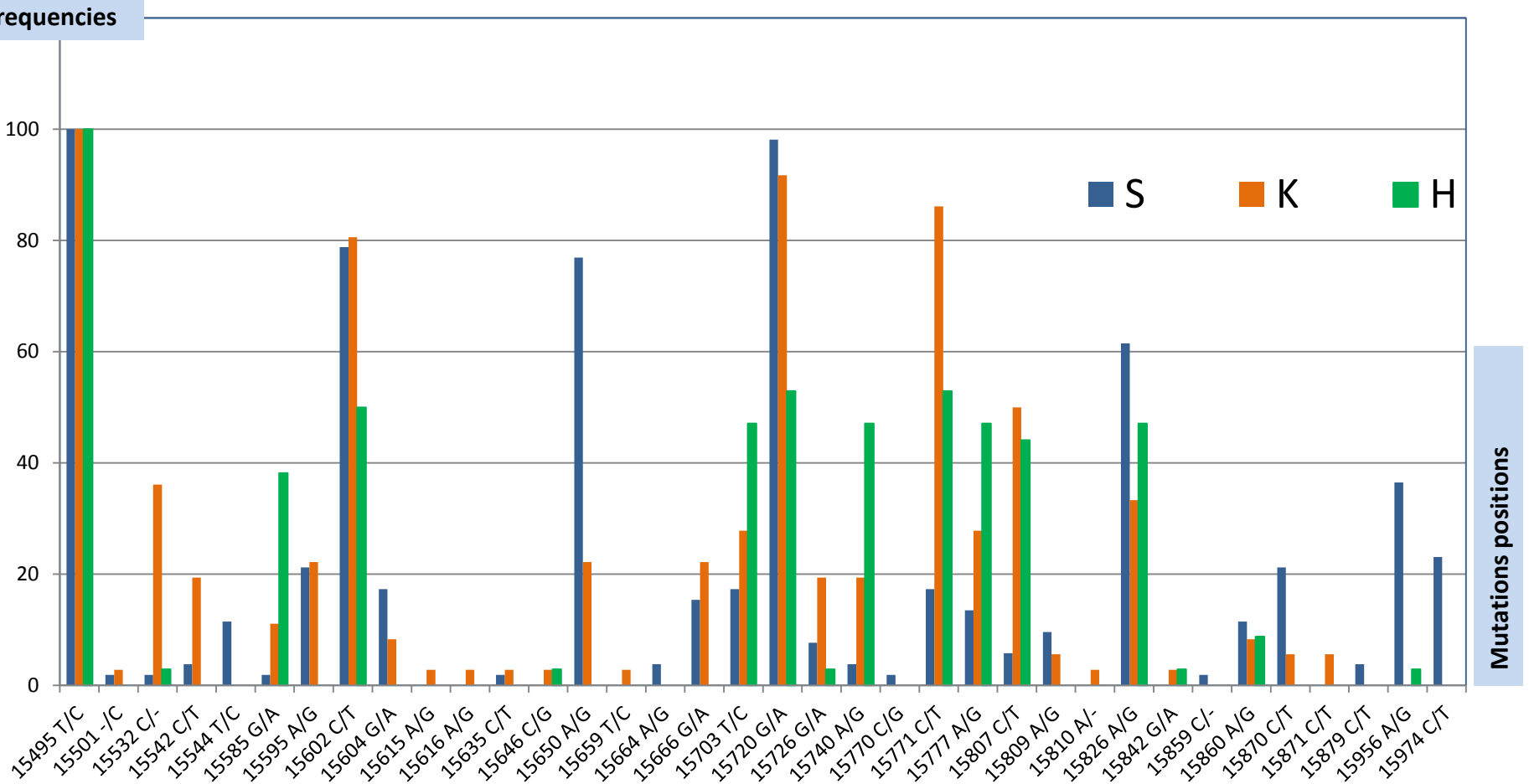
All individuals are registered in the **Syrian Studbook**



Material & Methods /2

- gDNA isolation (Hair roots/Salt Method)
- Polymerase Chain Reaction (PCR)
- D-loop Sequencing
- Editing Sequences: Sequence Scanner, DNA Baser
- Alignment: CLUSTAL w2
- Blast: NCBI , Ensembl genome browser 78
- Phylogenetic trees: R 3.1.1 software

Results 1: Mutation Positions



The mitochondrial DNA D-Loop segment 15495-15970. This histogram includes 36 mutations, X axis is showing the positions of the mutations and their motifs. Y axis is representing the frequencies of the substitutions in each strain.

Results 2: Haplogroups

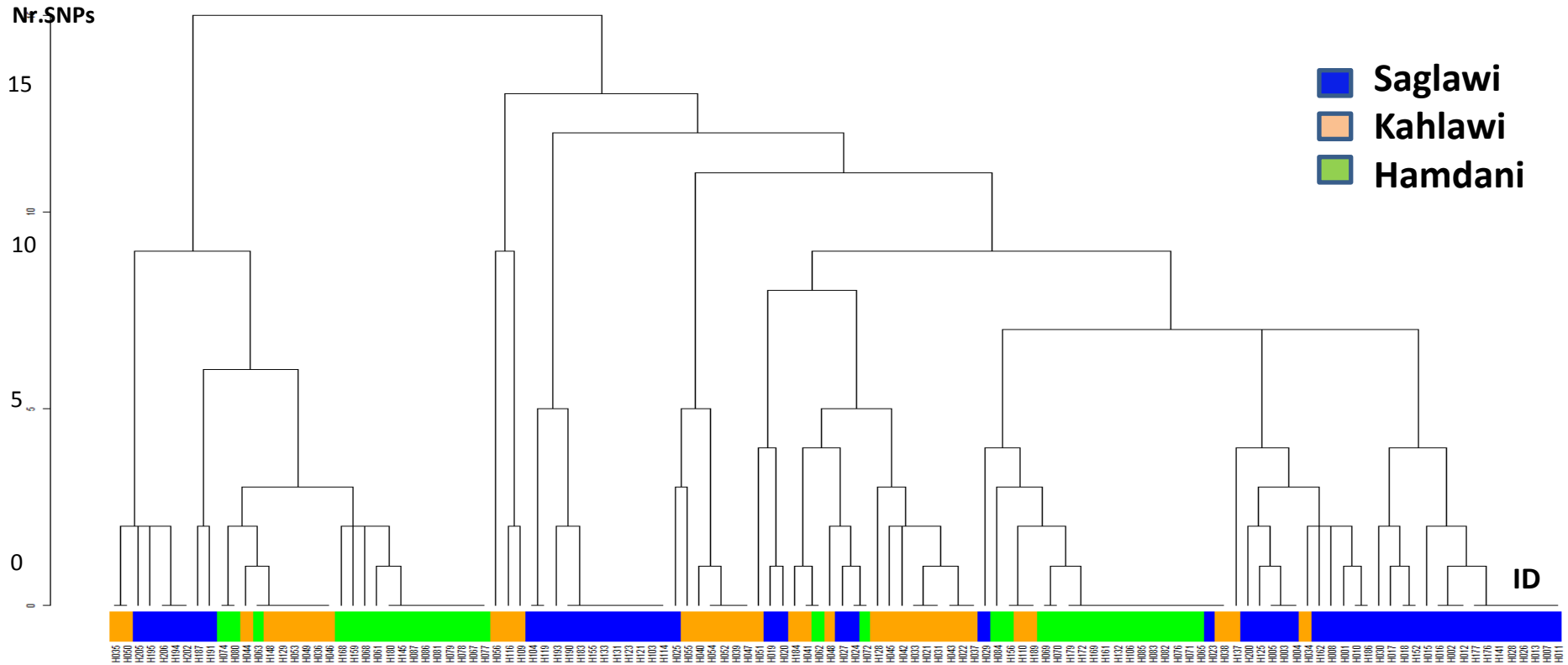
62 Haplogroups	
5 Novel*	45 Individuals
57 Unknown HG	67 Individuals

GB acc.Nr	Haplogroup	Strain	N.Ind	15495 T/C	15602 C/T	15650 A/G	15720 G/A	15826 A/G	15870 C/T	15956 A/G	15974 C/T				
JN398393	C1	Saglawi	3	C	T	G	A				Iranian
JN398394	C2	Saglawi	8	C	T	G	A	G	.	.	.				Syrian
JN398395	C3	Saglawi	8	C	T	G	A	G	T	G	T				Akhal Teke
GB acc.Nr	Haplogroup	Strain	N.Ind	15495 T/C	15602 C/T	15703 T/C	15720 G/A	15726 G/A	15740 A/G	15770 C/G	15771 C/T	15777 A/G	15807 C/T	15809 A/G	Akhal-Teke
JN398450	Q1	Kahlawi	1	C	T	C	A	A	G		T	G	T	G	
JN398450	Q2	Kahlawi	3	C	T	C	A	A	G		T	G	T	.	Syrian
		Hamdani	1												
JN398450	Q3	Hamdani	8	C	T	C	A	.	G		T	G	T	.	
GB acc.Nr	Haplogroup	Strain	N.Ind	15495 T/C	15585 G/A	15826 A/G	Caspian Pony								
JN398378	A	Kahlawi	1	C	A	G									
		Hamdani	10												
GB acc.Nr	Haplogroup	Strain	N.Ind	15495 T/C	15595 A/G	15602 C/T	15605 G/A	15664 A/G	15703 T/C	15720 G/A	15771 C/T	15777 A/G	15809 A/G	15956 A/G	Arabian
JN398448	P	Saglawi	1	C	G	T	A	G	C	A	T	G	G	G	
GB acc.Nr	Haplogroup	Strain	N.Ind	15495 T/C	15585 G/A	15650 A/G	15666 G/A	15720 G/A	15826 A/G	Syrian					
JN398389	B	Kahlawi	1	C	A	G	A	A	G						

The three strains (121 individuals) presented 36 recurrent mutations, pinpointed 62 haplotypes reflected the diversity among the three strains using the D-Loop HVS1 as a genetic marker to verify the maternal lines. Five major haplogroups were identified after Achilli *et al* , 2012. the table is showing also the subdivisions of the C and Q haplogroups.

*A. Achilli *et al* , 2012. Mitochondrial genomes from modern horses reveal the major haplogroups that underwent domestication, GENETICS.

Results 3: Manhattan Distances Plot (R[®])



Cluster dendrogram generated by Manhattan distances method (R analyzing program). X axis is representing the total of 121 individuals divided into three strains (Saglawi, Kahlawi, Hamdani) showed in different colors, while the Y axis is providing the estimating numbers of SNPs. The figure showed as in the N.J tree some gathering of the individuals belonging to different strains on one hand, and showed some scattering reflect possible mixing between the three groups on the other.

Conclusion

- Sequences variations showed 36 different mutations
- 36 mutations coincided 62 haplogroups (HG)
- No clustering shows three strains
- The three strains have different founder mares



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Thank you for attention

