69th Annual Meeting of the European Federation of Animal Science

MAPPING FOR SELECTION SIGNATURES ASSOCIATED TO AGGRESSIVE BEHAVIOR IN CATTLE

Paulina G. Eusebi[1], Cortés O. [1], Dunner S.[1], Cañón J.[1]

[1] Departamento de Producción Animal, Facultad de Veterinaria, Universidad Complutense de Madrid, Spain

UNIVERSIDAD COMPLUTENSE MADRID

Dubrovnik, Croatia - 27th to 31st August 2018

MAPPING FOR SELECTION SIGNATURES ASSOCIATED TO AGGRESSIVE BEHAVIOR IN CATTLE

INTRODUCTION

- The Lidia bovine breed has its origins ~500 years ago in the Iberian Peninsula.

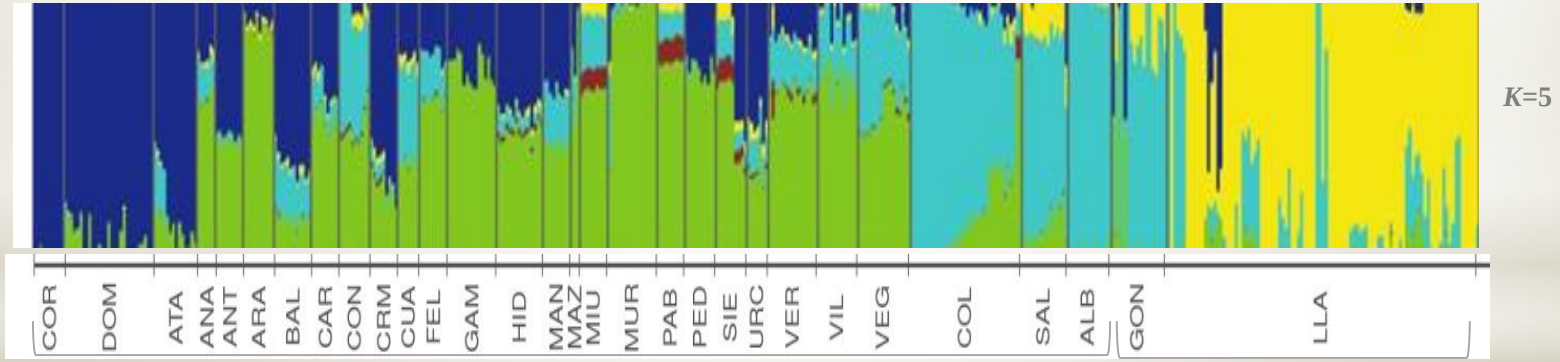
- This breed is selected for **aggressive behavior** to participate in popular festivities as part of the cultural people´s identity.

Different behavior patterns favored a fragmentation of the Spanish racial group into *lineages* with low population size.

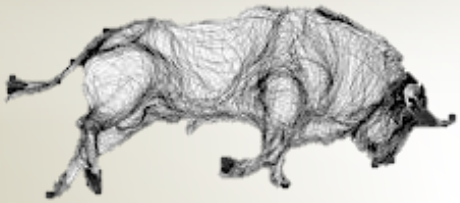
MAPPING FOR SELECTION SIGNATURES ASSOCIATED TO AGGRESSIVE BEHAVIOR IN CATTLE

INTRODUCTION

- Lidia breed bovines were brought to Mexico in 1522. To date, the Mexican Lidia population is genetically differentiated from the Spanish lineages.



Lidia Spain **Lidia Mexico**



MAPPING FOR SELECTION SIGNATURES ASSOCIATED TO AGGRESSIVE BEHAVIOR IN CATTLE

INTRODUCTION

- Genomic changes produced by selection have been studied, mainly in commercial cattle breeds.

- As a consequence, several hard-sweeps belonging to traditional selected morphological traits have been reported.

MAPPING FOR SELECTION SIGNATURES ASSOCIATED TO AGGRESSIVE BEHAVIOR IN CATTLE

OBJECTIVES

- Locate genomic regions associated with agonistic related traits
- A marginal second objective was to identify putative candidate genes mapping within these genomic regions.

Two approaches based on the differences of allele frequencies among populations, were applied.

MAPPING FOR SELECTION SIGNATURES ASSOCIATED TO AGGRESSIVE BEHAVIOR IN CATTLE

MATERIAL

genotypic 50K SNP BeadChip data

- 100 Spanish bovines from the most aggressive lineages.
- 65 Spanish bovines from the less aggressive lineages.
- 45 bovines from the Mexican population






MATERIAL

- 65 bovines from the Asturiana de los Valles breed
- 30 bovines from the Morenas Gallegas breed

MAPPING FOR SELECTION SIGNATURES ASSOCIATED TO AGGRESSIVE BEHAVIOR IN CATTLE

METHODS

Selestim

- Genomic regions were built from window of ~10 MB.
- Containing each of the SNP with KLD >99.99%.

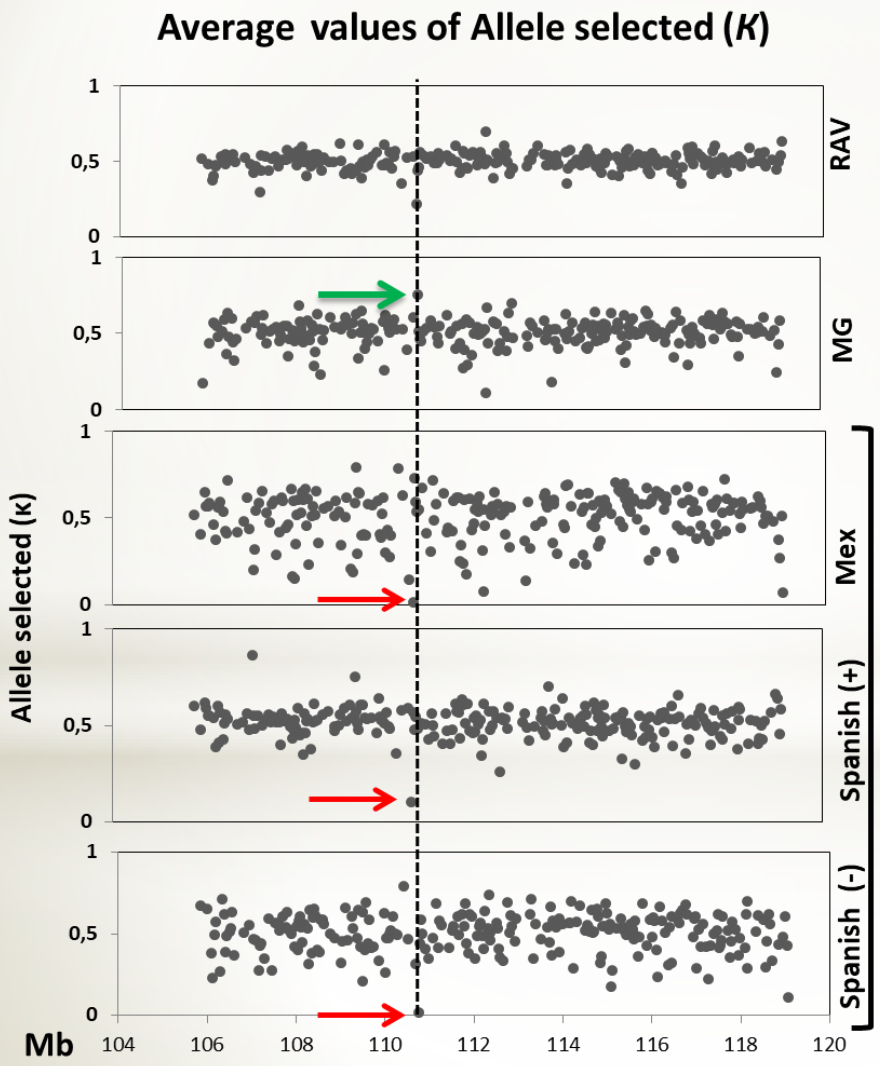
BayeScan

- Splits the F_{ST} : ***population**-specific component* (**β**) and ***locus**-specific component* (**α**) shared by all the populations.
- Selection is detected when α is significantly different to zero.
- Genomic regions were built from a threshold of 5% FDR, and then SNPs with α values >1.

MAPPING FOR SELECTION SIGNATURES ASSOCIATED TO AGGRESSIVE BEHAVIOR IN CATTLE

RESULTS

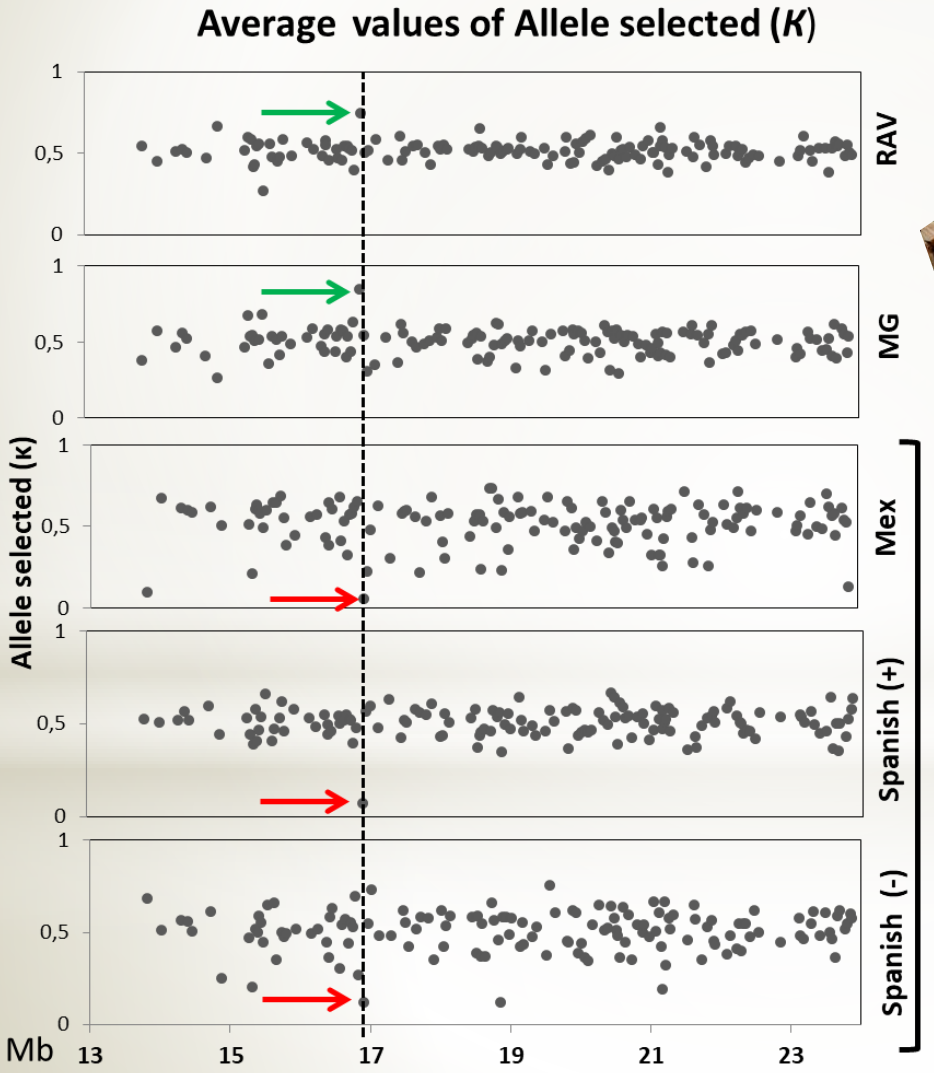
BTA 3: 119.49 -119.08 Mbp



MAPPING FOR SELECTION SIGNATURES ASSOCIATED TO AGGRESSIVE BEHAVIOR IN CATTLE

RESULTS

BTA 8: 14.89 -27.98 Mbp



MAPPING FOR SELECTION SIGNATURES ASSOCIATED TO AGGRESSIVE BEHAVIOR IN CATTLE

GENES IDENTIFIED

BTA 3

Position (Mbp)	Gene	Function
109.29	GRIK3	Learning process
111.38	DLGAP3	Circadian cycles and neuronal signaling
110.17	THRAP3	Circadian cycles and behavior
111.14	SFPQ	Circadian cycles and behavior
110.78	NCDN	Learning and pigmentation
111.52	GJB4	Olfactory Neurophysiology
113.64	SAG	Visual stimulus Neurophysiology

BTA 8

Position (Mbp)	Gene	Function
15.68	LINGO2	Neuronal disorders
17.29	PLAA	Neuro-degenerative diseases

MAPPING FOR SELECTION SIGNATURES ASSOCIATED TO AGGRESSIVE BEHAVIOR IN CATTLE

LIMITING FACTORS

- The difficulty to detect selective sweeps with statistical significance in polygenic traits, in which many loci shift their frequency moderately.

- Expected false positives due to the divergence in allelic frequencies between breeds.

- 50K chip and the sample size of the analysis

MAPPING FOR SELECTION SIGNATURES ASSOCIATED TO AGGRESSIVE BEHAVIOR IN CATTLE

CONCLUSIONS

- Two genomic regions associated with agonistic related traits in cattle.
- Direction of selection of both regions differed: The “aggressive” Lidia breed and the “tamed” Asturiana de los Valles and Morenas gallegas breeds.

Thank you for your attention!

69th Annual Meeting of the European Federation of Animal Science

MAPPING FOR SELECTION SIGNATURES ASSOCIATED TO AGGRESSIVE BEHAVIOR IN CATTLE

Paulina G. Eusebi[1], Cortés O. [1], Dunner S.[1], Cañón J.[1]

[1] Departamento de Producción Animal, Facultad de Veterinaria, Universidad Complutense de Madrid, Spain

UNIVERSIDAD COMPLUTENSE MADRID

Dubrovnik, Croatia - 27th to 31st August 2018