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Distribution of Swine Leukocyte Antigen (SLA) haplotypes in European farmed pigs

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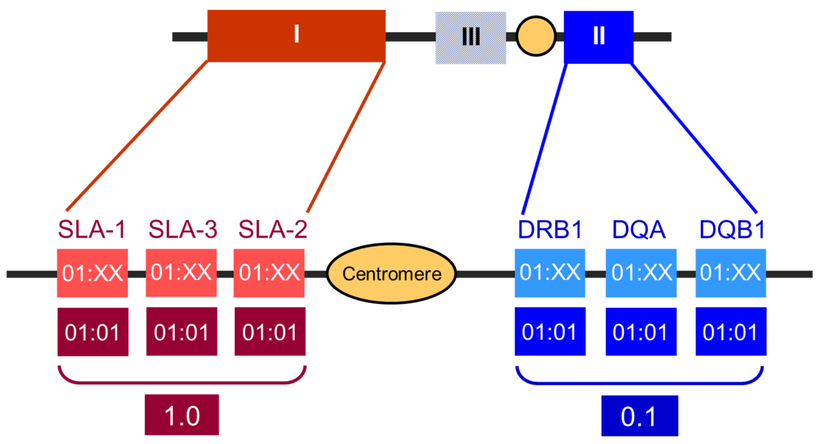
1 Background

Globally, pigs represent economically important farm animals and furthermore have become a preferred preclinical large animal model for biomedical studies, transplantation, and regenerative medicine research. The need for swine leukocyte antigen (SLA) typing is increasing with the expanded use of pigs as models for human diseases and organ-transplantation experiments, their use in infection studies, and for design of veterinary vaccines.

2 Material and Methods

In this study, we characterized SLA class I (*SLA-1, SLA-2, SLA-3*) and class II (*DRB1, DQB1, DQA*) genes of 549 farmed pigs representing six pig lines of global commercial interest (Landrace, Yorkshire, Hampshire, Duroc, Large White, Pietrain) by PCR-based low-resolution (Lr) haplotyping. Criteria and nomenclature used for SLA class I (SLA-I) and class II (SLA-II) haplotyping were proposed by the ISAG/IUIS SLA Nomenclature Committee. Low-resolution SLA-I and SLA-II haplotypes were assigned based on the comparison with already known breed or farm-specific allele group combinations.

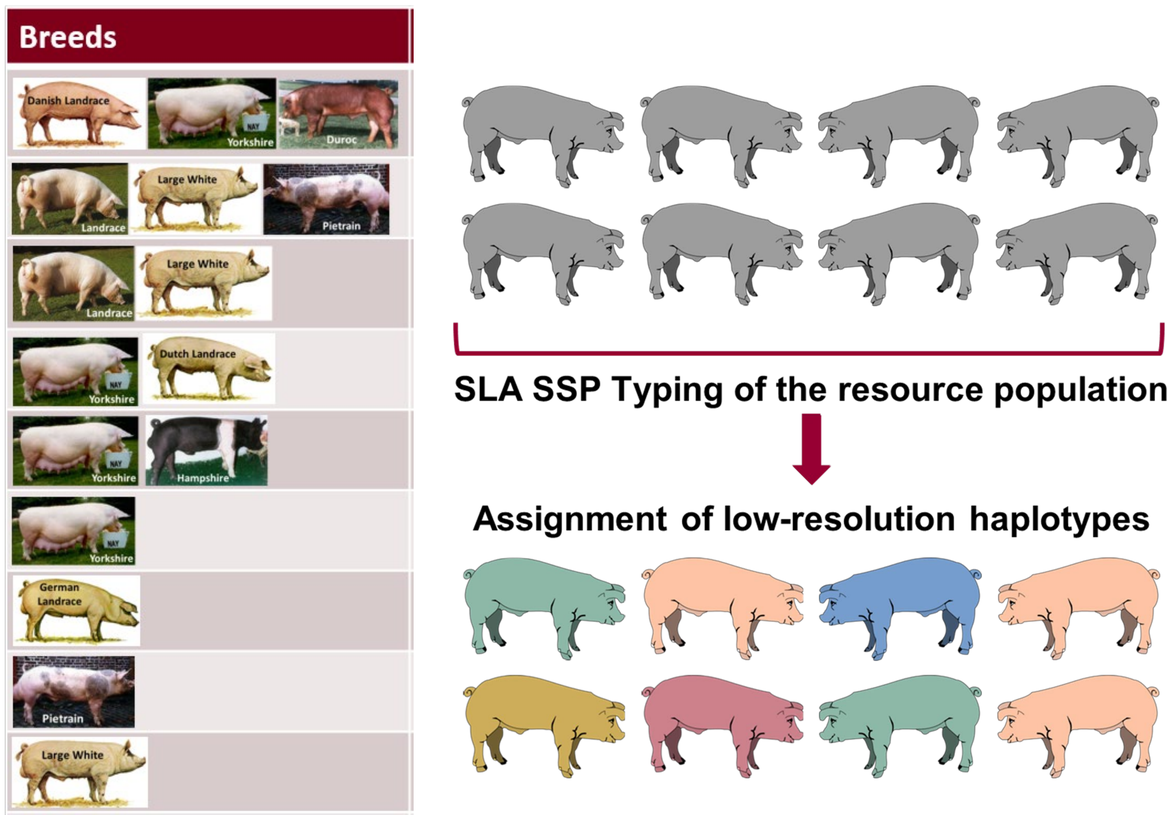
3 Definition of SLA Haplotypes



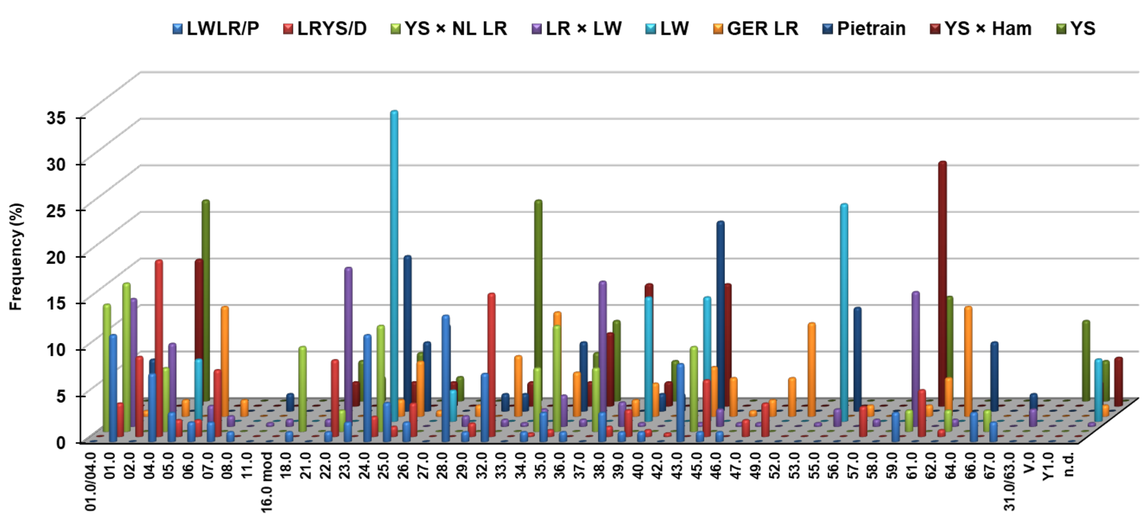
Low-resolution (Lr) haplotypes are identified by a PCR-based typing assay and define the MHC background of an animal on allele-group level → e.g., SLA-1*01:XX; DRB1*01:XX.

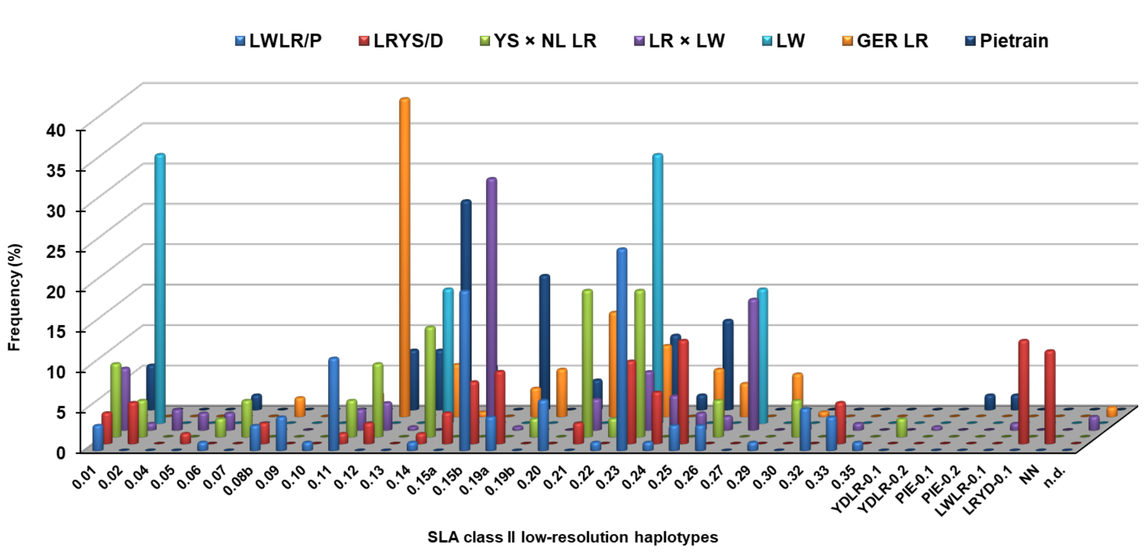
High-resolution (Hr) haplotypes are defined on allele level by sequence-based typing methods → e.g., SLA-1*01:01; DRB1*01:01.

4 Pig lines and work flow of the presented project



5 SLA haplotype diversity in European farmed pigs





SLA class I and class II low-resolution haplotype diversity in nine European commercial pig populations. LWLR/P, Animals were 25% Large White (LW), 25% Landrace (LR), and 50% Pietrain (P); LRYS/D, Animals were 25% Landrace (LR), 25% Yorkshire (YS), and 50% Duroc (D); YS × NL LR, Yorkshire/ Dutch Landrace crosses; LR × LW, Large White/Landrace crosses; GER LR, German Landrace; YS × Ham, Yorkshire/Hampshire crosses.

6 Results

In total, 50 SLA-I and 37 SLA-II haplotypes were identified in the studied cohort. The most common SLA-I haplotypes Lr-04.0 (SLA-1*04XX-SLA-3*04XX(04:04)-SLA-2*04XX) and Lr-32.0 (SLA-1*07XX-SLA-3*04XX(04:04)-SLA-2*02XX) occurred at frequencies of 11.02 and 8.20%, respectively. For SLA-II, the most prevalent haplotypes Lr-0.15b (DRB1*04XX(04:05/04:06)-DQB1*02XX(02:02)-DQA*02XX) and Lr-0.12 (DRB1*06XX-DQB1*07XX-DQA*01XX) occurred at frequencies of 14.37 and 12.46%, respectively.

7 Conclusions

Meanwhile, our lab contributed to several vaccine correlation studies (e.g., PRRSV, CSFV, ASFV, FMDV, swine influenza A virus, human HPV) elucidating the immunodominance in the T-cell response with antigen-specificity dependent on certain SLA-I and SLA-II haplotypes. Moreover, these SLA-immune response correlations could facilitate tailored vaccine development, as SLA-I Lr-04.0 and Lr-32.0 as well as SLA-II Lr-0.15b and Lr-0.12 are highly abundant haplotypes in European farmed pigs.

References: Comparative analysis of swine leukocyte antigen gene diversity in European farmed pigs. Hammer SE, Duckova T, Groiss S, Stadler M, Jensen-Waern M, Golde WT, Gimsa U, Saalmueller A. Anim Genet. 2021 Aug;52(4):523-531. doi: 10.1111/age.13090. Epub 2021 May 24.