Global robustness and disease resistance have emerged as key concepts for a sustainable resilience in animal production systems. Including health criteria in selection schemes is one of the challenging objectives of the current decade. We have launched a project that combines genetics, genomics and functional studies in a cohort of French Large White pigs with the aim to characterize immune response levels as a measure of individual’s immunocompetence. A wide range of both innate and adaptive immunity traits are heritable, confirming that many parameters are under genetic control and susceptible of being included in selection protocols. Genome-wide association studies allowed us to detect significant associations for traits that quantify white blood cell subpopulations, specific antibody levels after vaccination, phagocytosis, and cytokines produced by blood cells after in vitro stimulation. Transcriptome analyses have revealed differentially expressed genes in peripheral blood of animals with contrasted levels of various parameters (white blood or CD4-CD8+ cell counts, phagocytosis, in vitro production of IL2 and IL10). Genetic and genomic data will be integrated to identify biologically relevant candidate genes that underlie the phenotypic variability of the heritable studied immune traits. A next challenge will be to investigate the value of immunocompetence traits to predict resistance of animals facing various pathogens.

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