

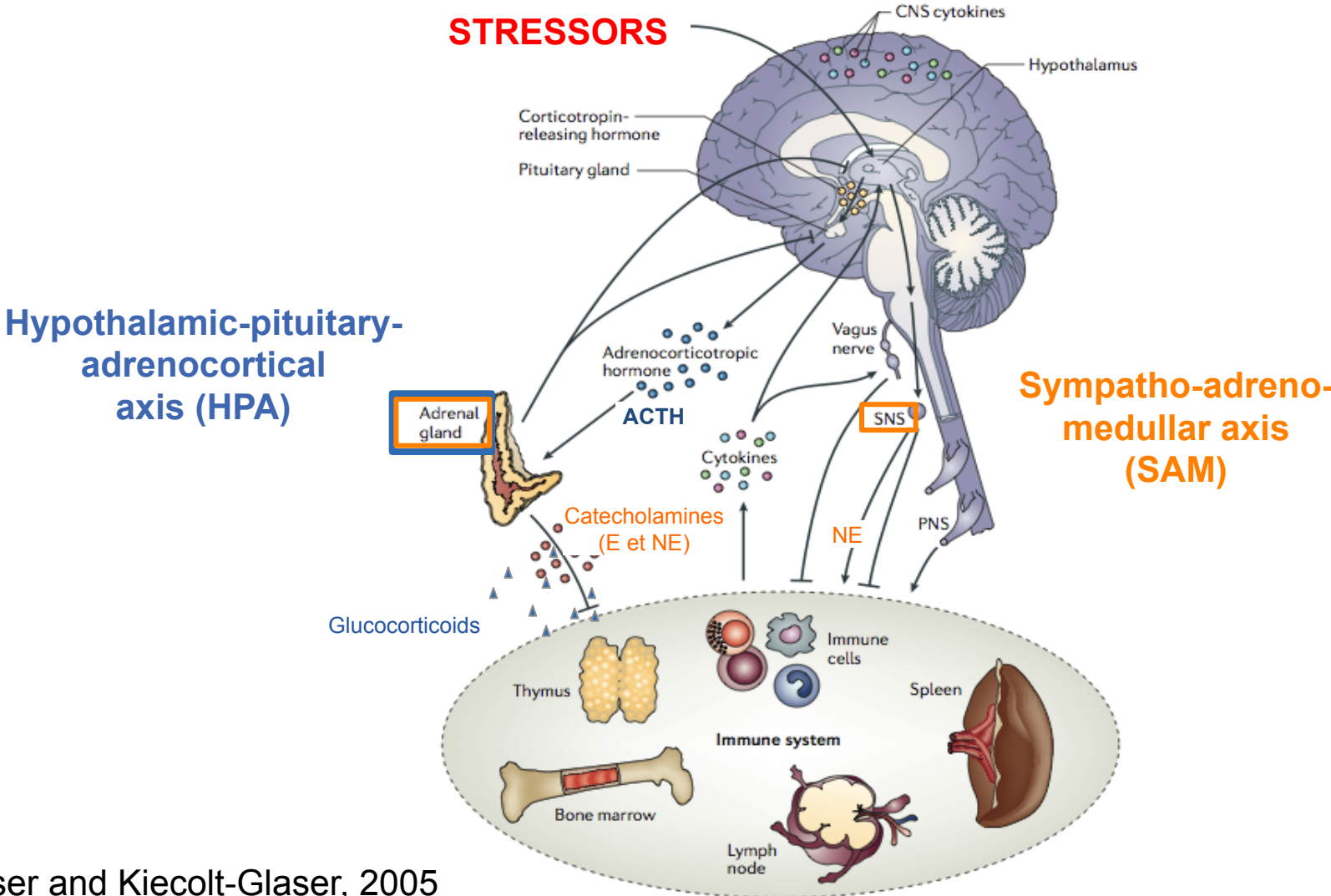
Acute social stress modulates immune traits in pigs high and low responders to ACTH stimulation

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Stress pathways



Glaser and Kiecolt-Glaser, 2005

Context



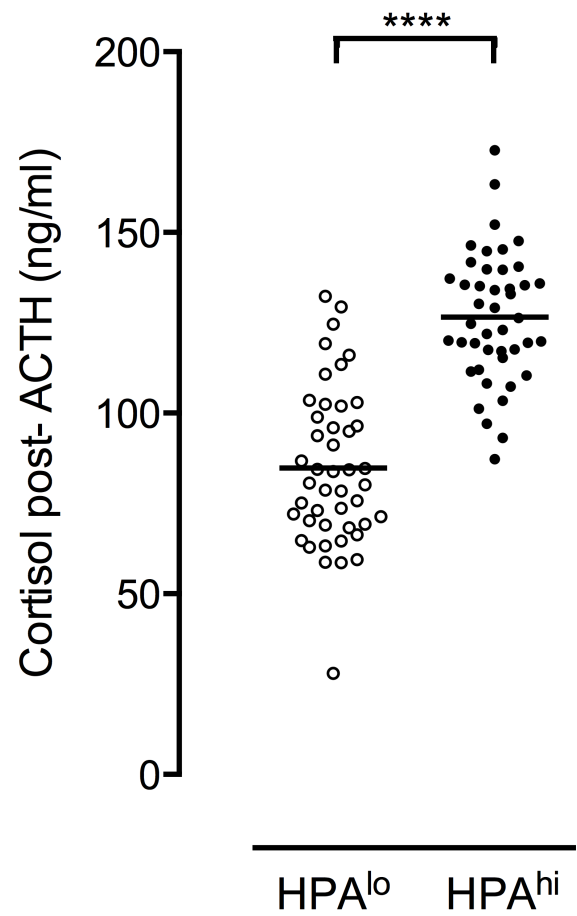
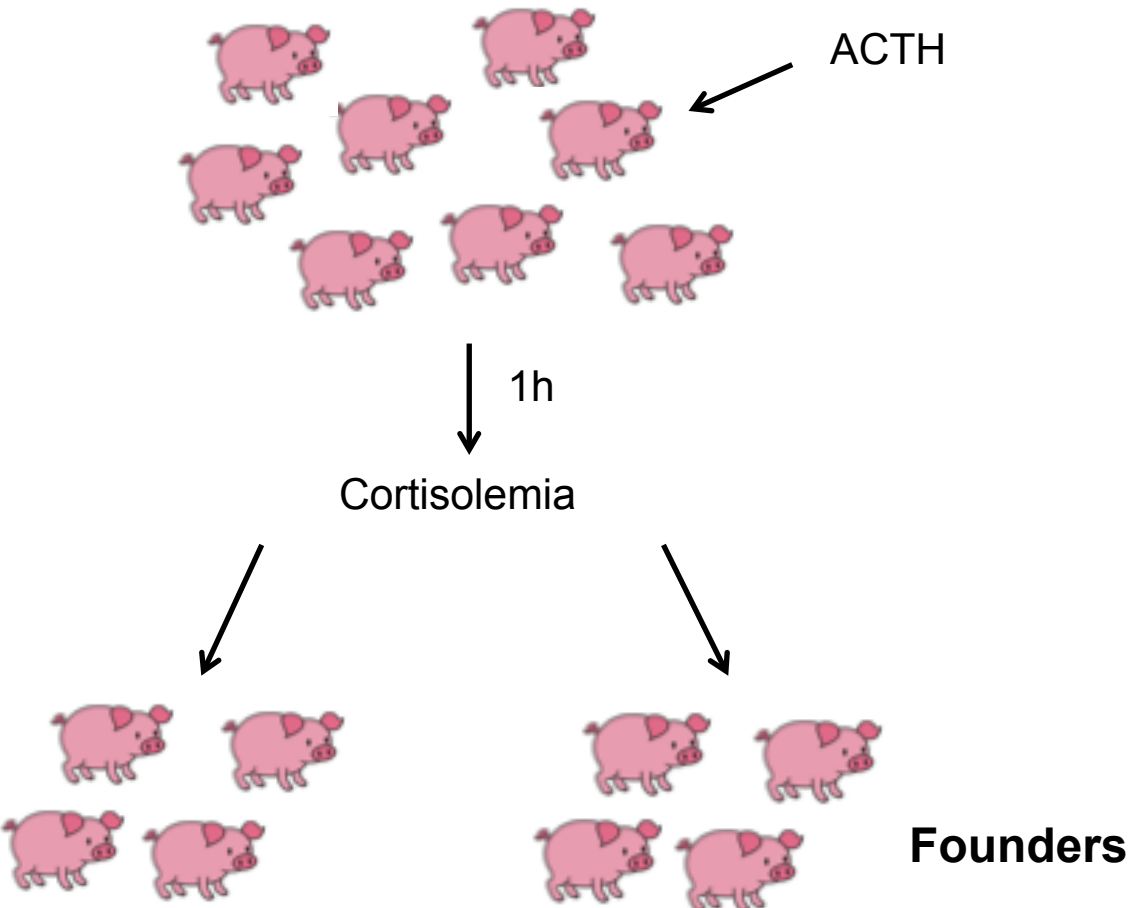
Intensive farming stressful events :

- . Early weaning
- . Overcrowding
- . Mutilations
- . Frequent mixing

Robustness : ability of an individual to express a high production potential in different environmental conditions

Knap, 2009

A way to increase robustness



divergent genetic selection experiment

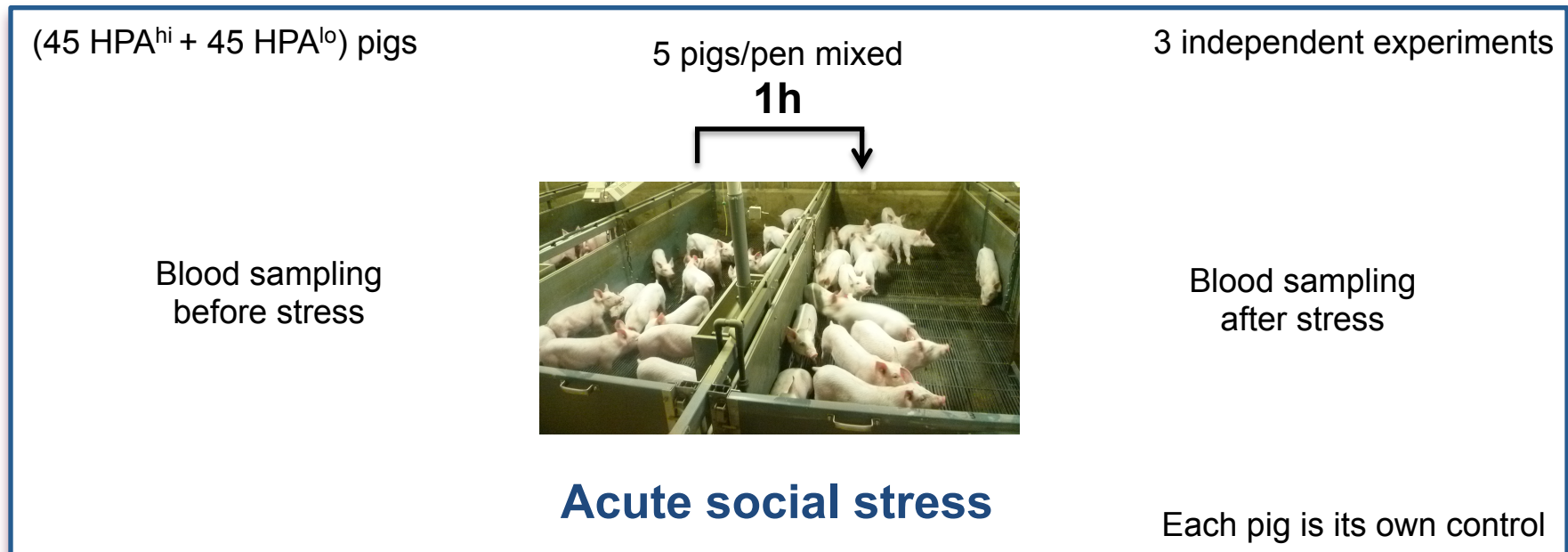
Mormède *et al*, 2011

Objectives

To analyse the consequences of an acute social stress
on immune traits

To analyse the consequences of divergent selection
upon HPA axis strength on resilience to stress

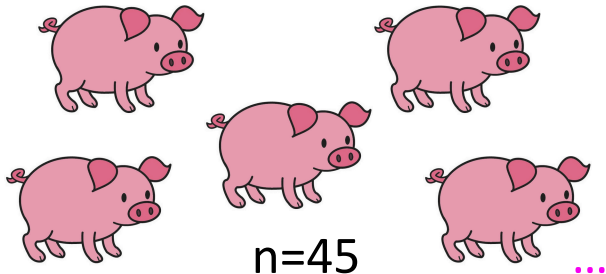
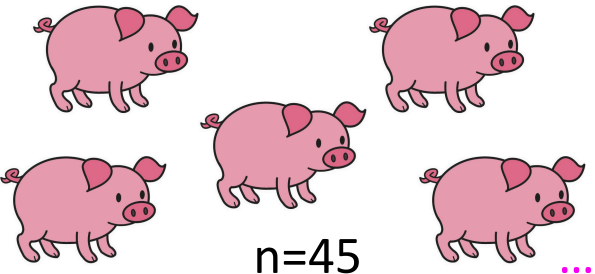
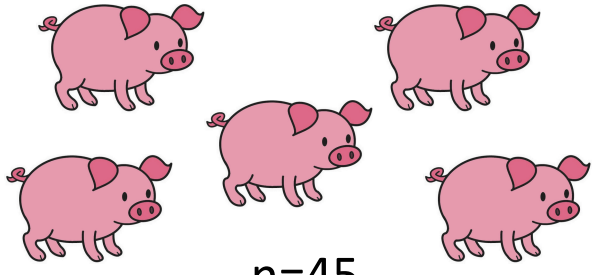
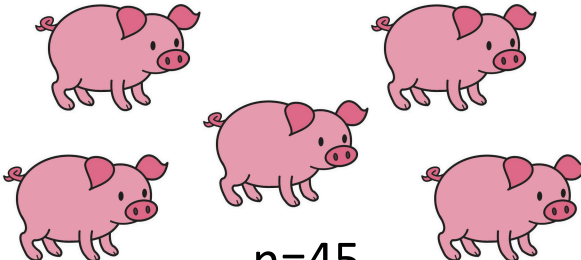
Experimental design



19 Immune traits analyzed :

- White blood cell counts
- Lymphocyte subsets
- Phagocytosis
- *Ex-vivo* production of cytokines after LPS stimulation

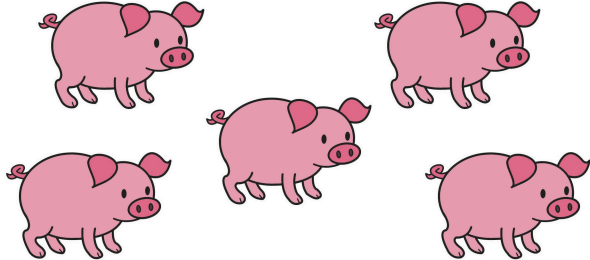
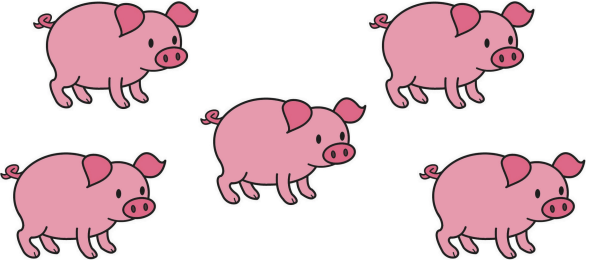
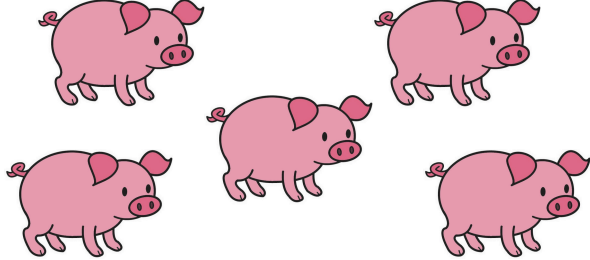
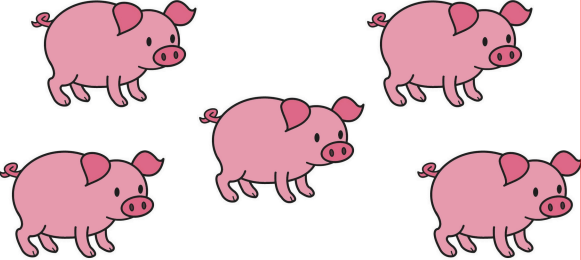
Statistical analysis

	Before	After
HPA ^{hi}	 n=45 ...	 n=45 ...
HPA ^{lo}	 n=45 ...	 n=45 ...

Fitting linear mixed effect model

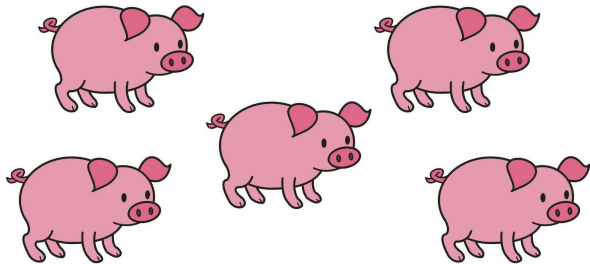
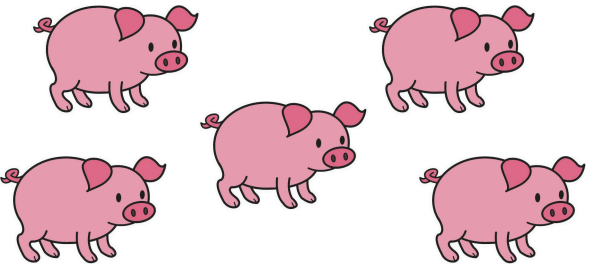
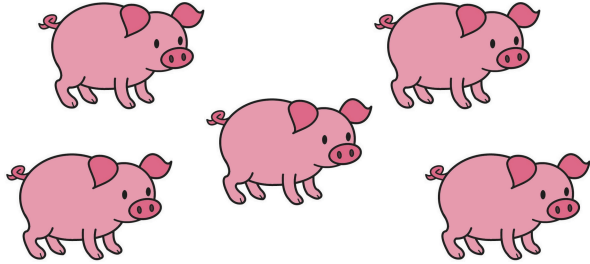
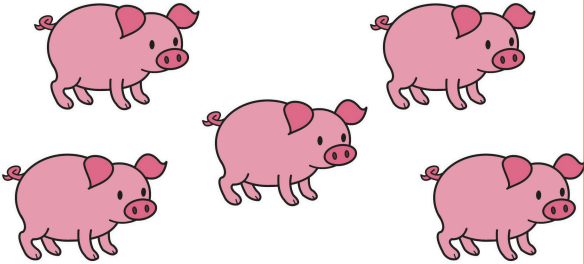
Lmer : Stress + Phenotype + (1|Batch) + (1|BSR) + (1|Id)

Statistical analysis

	Before	After
HPA ^{hi}		
HPA ^{lo}		

No effect of phenotype

Statistical analysis

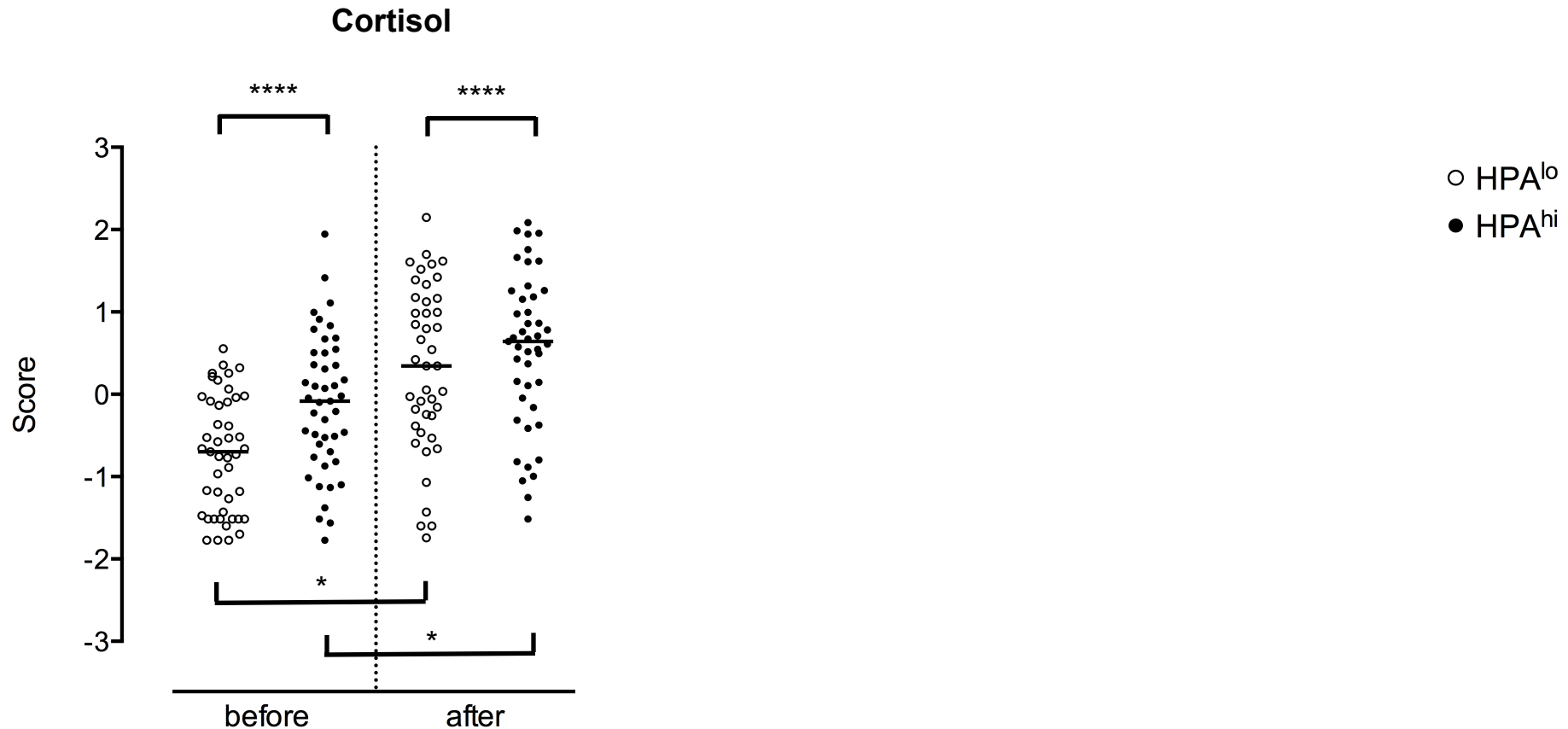
	Before	After
HPA ^{hi}		
HPA ^{lo}		

Phenotype influence

Cortisol, CD4 T cells and LPS-induced TNF- α secretion

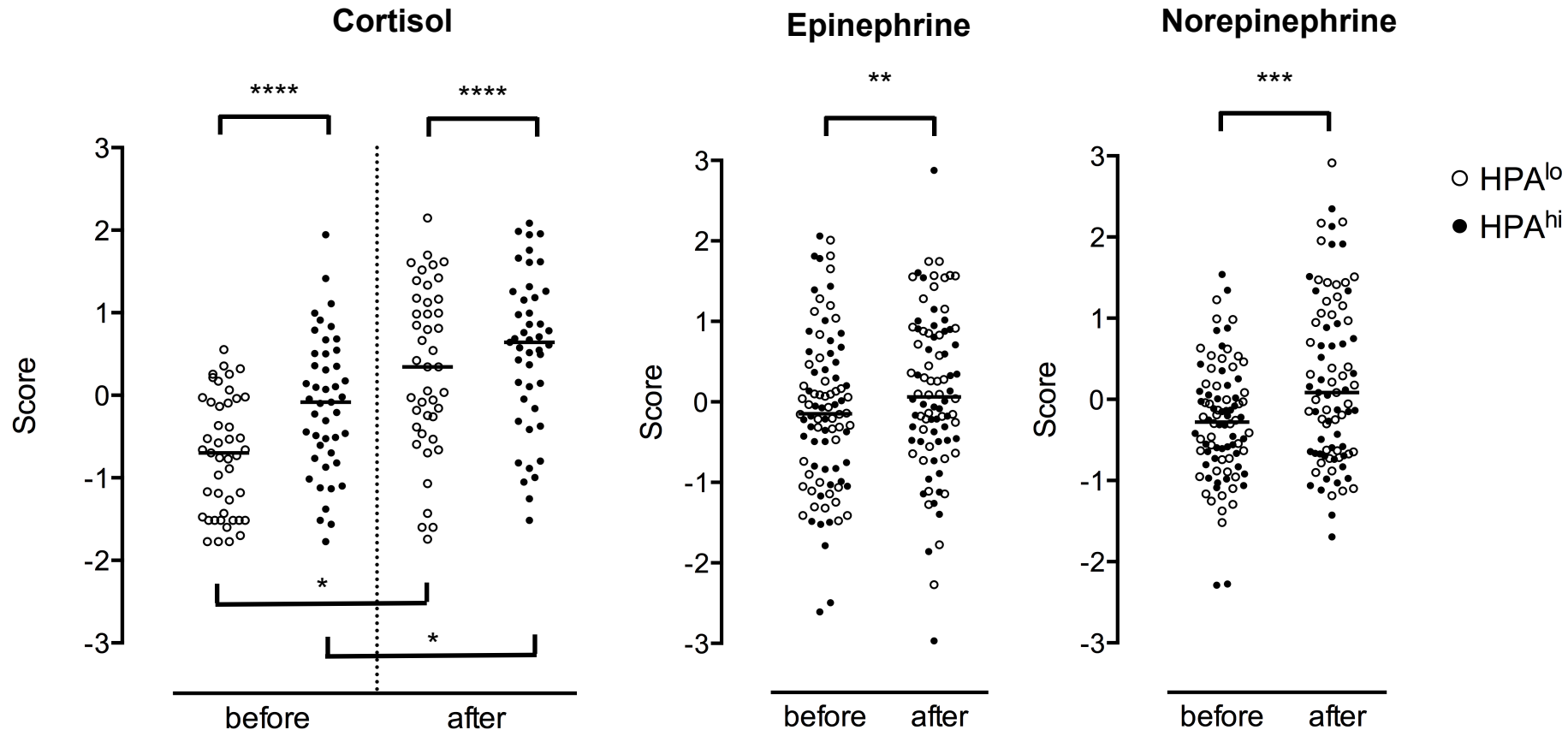
4 groups : before and after acute social stress in HPA^{hi} and HPA^{lo} pigs

Effects of stress on HPA and SAM axis



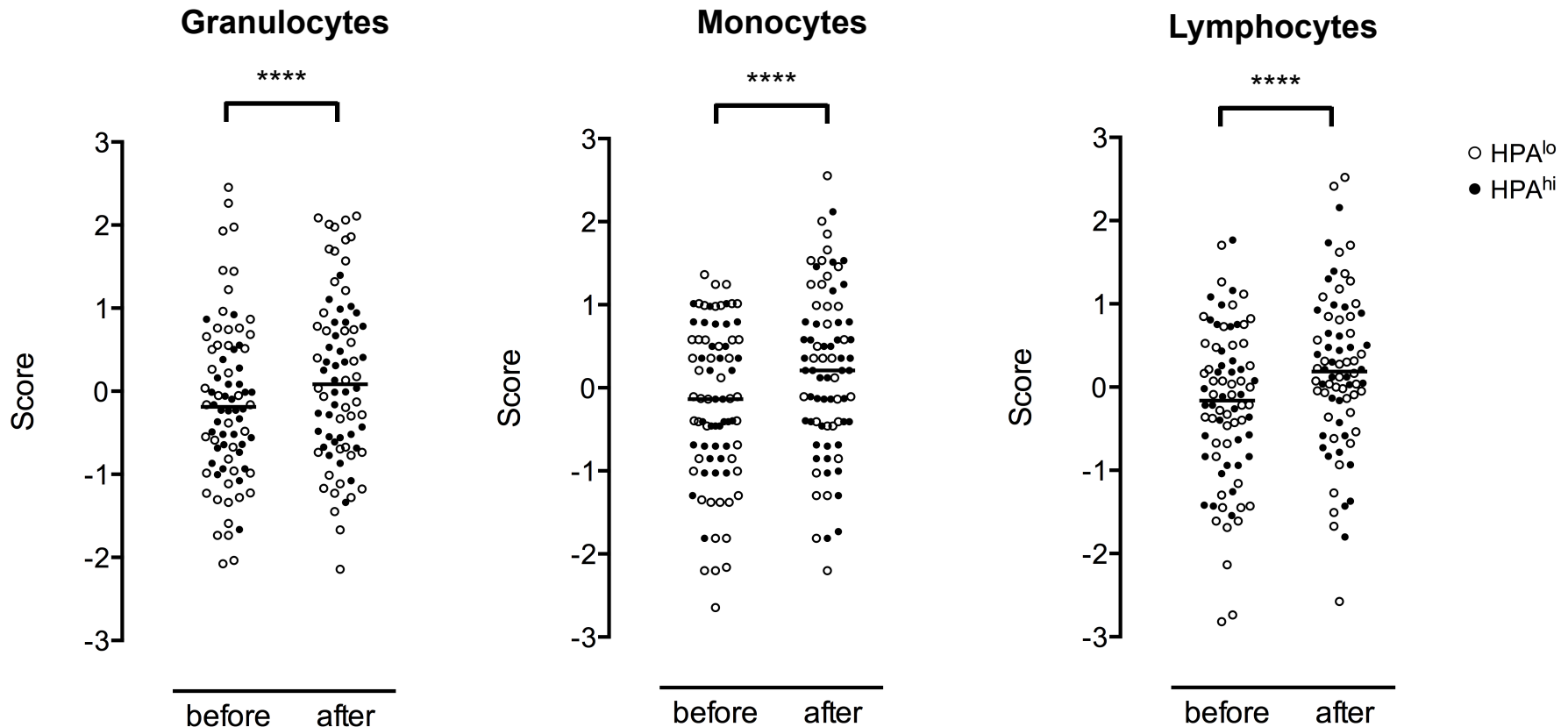
- Higher basal plasma cortisol in HPA^{hi} than HPA^{lo} pigs
 - Acute social stress increases plasma cortisol

Effects of stress on HPA and SAM axis



- Selection does not alter SAM axis hormone levels
- Acute social stress increases catecholamine levels

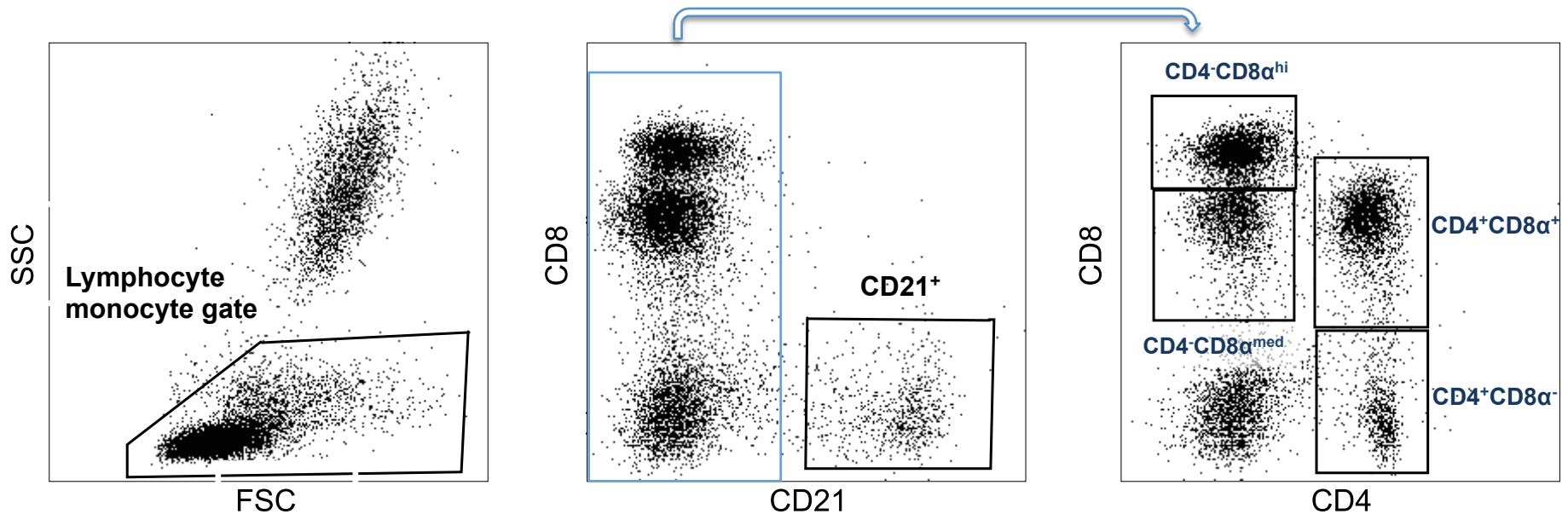
Effects of stress on circulating leucocytes



- Selection does not alter numbers of circulating leucocytes
 - Acute social stress induces leucocyte mobilization

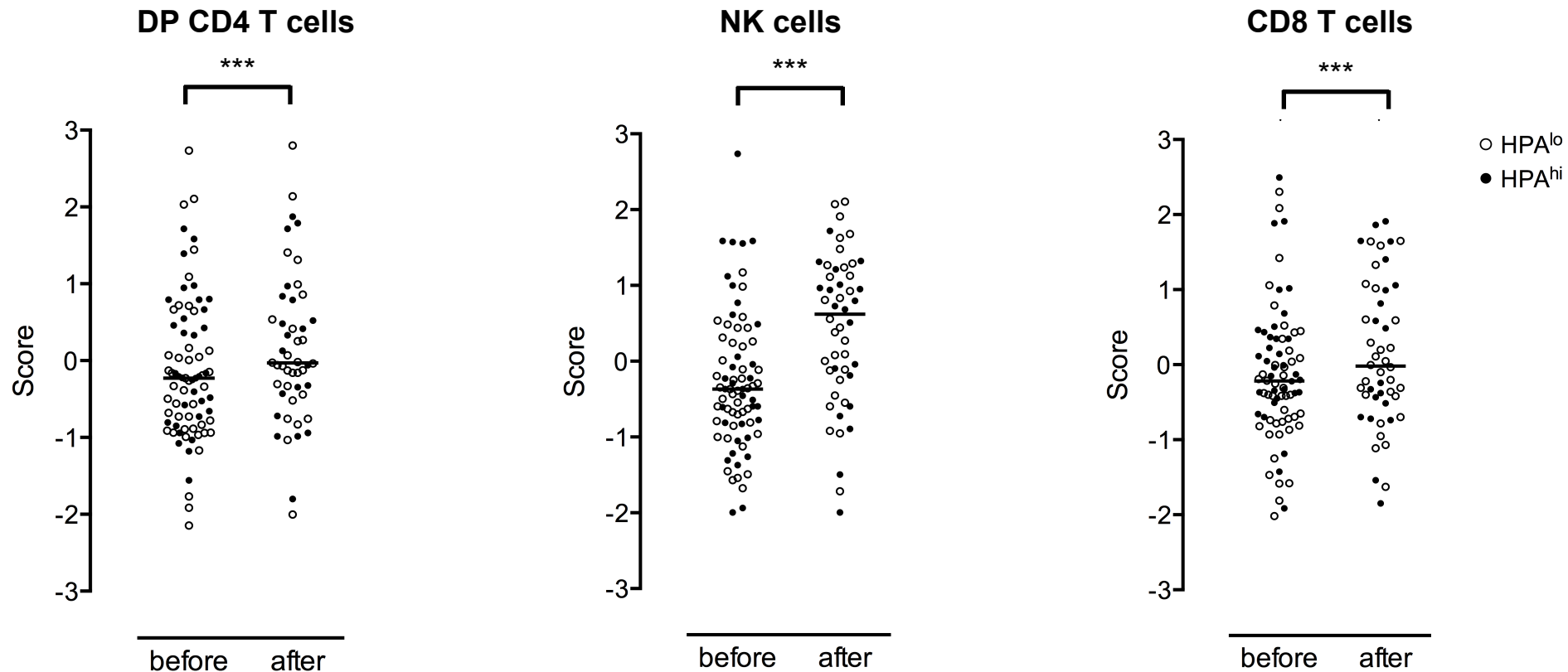
Effects of stress on lymphocyte subsets

Flow cytometry analysis



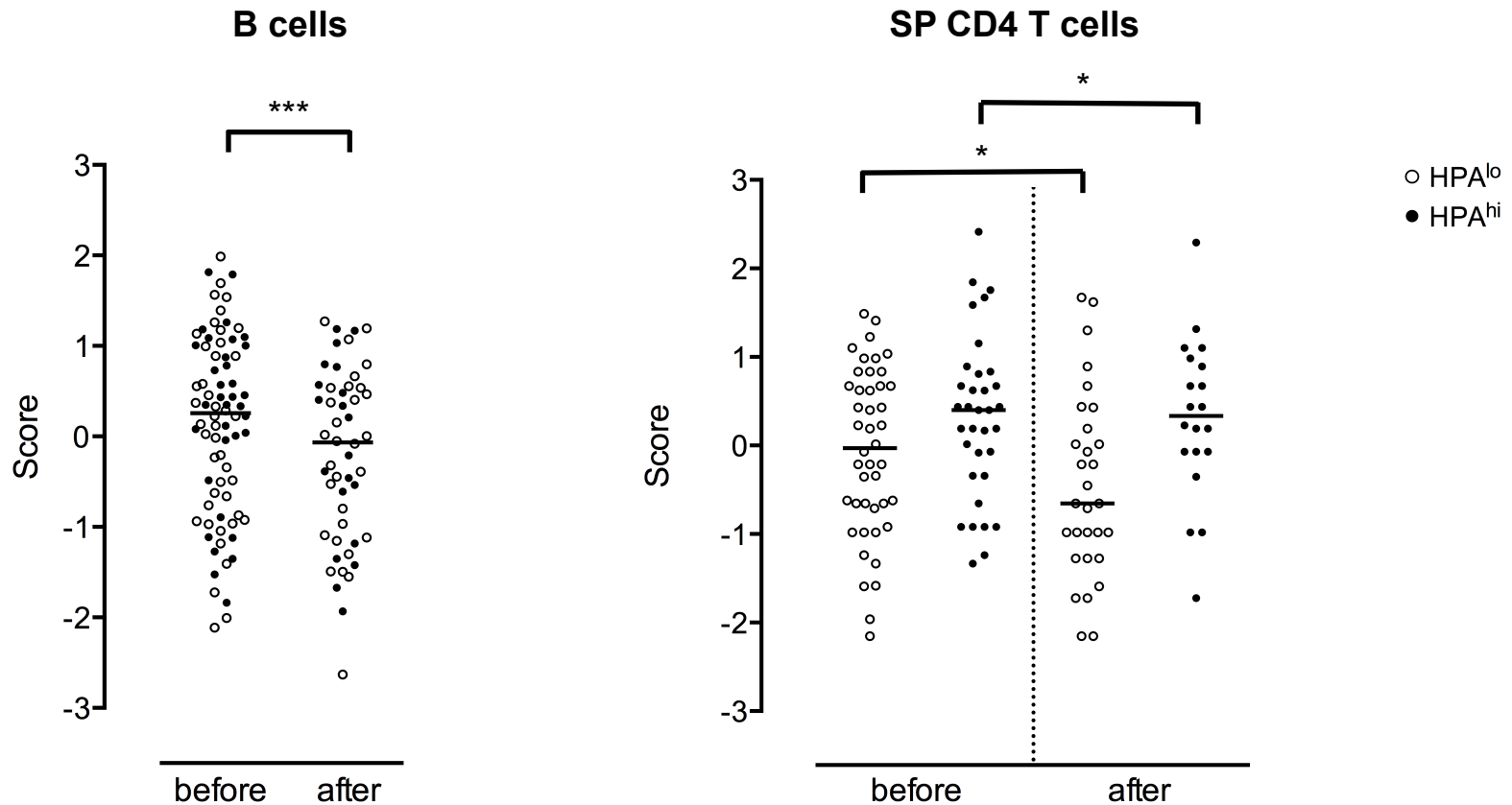
B cells : CD21⁺
 CD8 T cells : CD4-CD8 α^{hi}
 mainly NK cells : CD4-CD8 α^{med}
 DP CD4 T cells : CD4⁺CD8 α^{+}
 SP CD4 T cells : CD4⁺CD8 α^{-}

Effects of stress on lymphocyte subsets



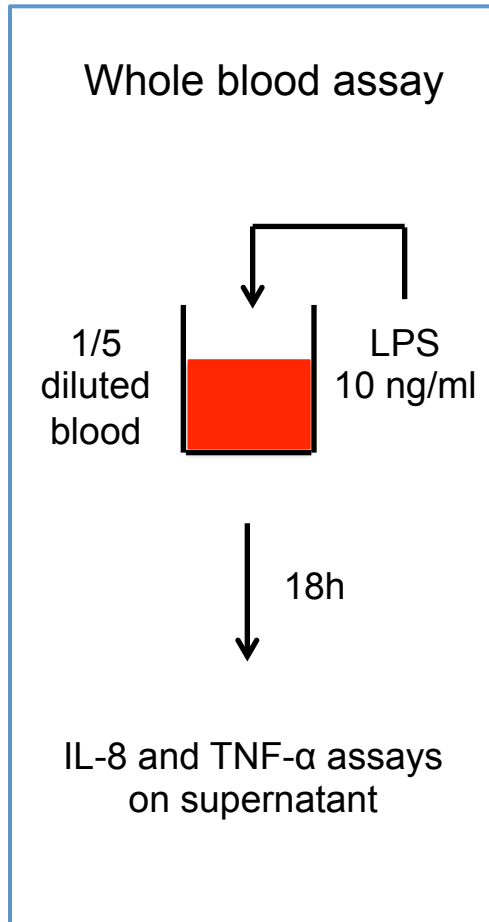
- Selection does not alter DP T CD4, NK and CD8 T cell numbers
- Acute social stress increases DP T CD4, NK and CD8 T cell numbers

Effects of stress on lymphocyte subsets

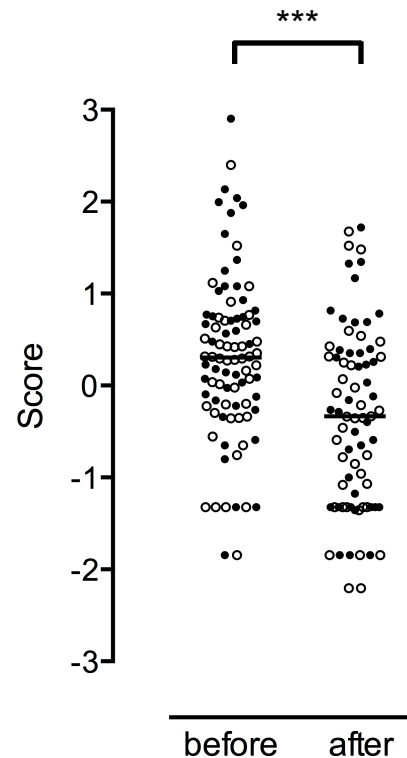


- Acute social stress decreases B and SP CD4 T cell numbers

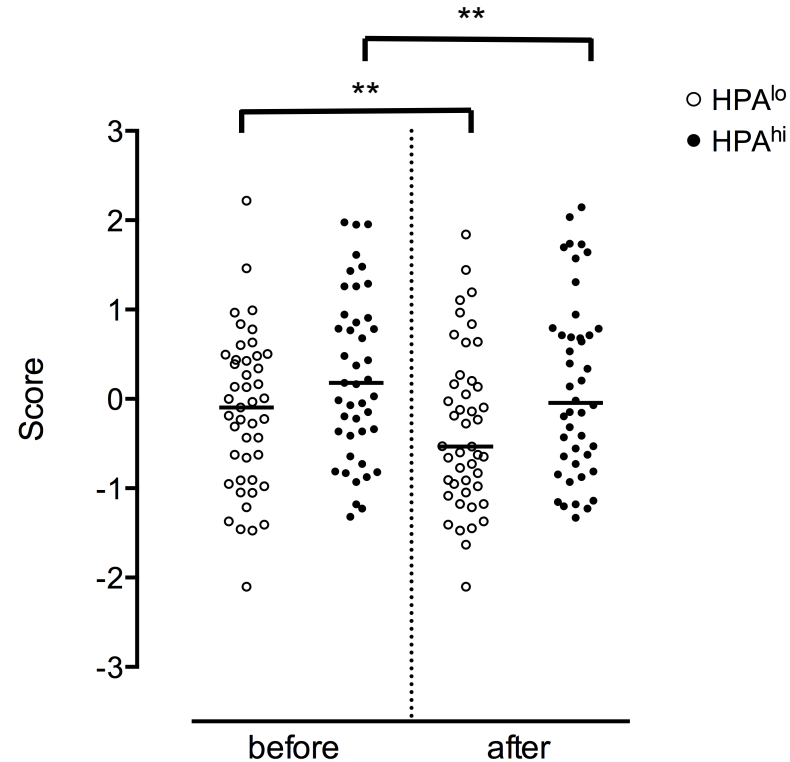
Effects of stress on cytokine secretions



LPS-induced IL-8 secretion

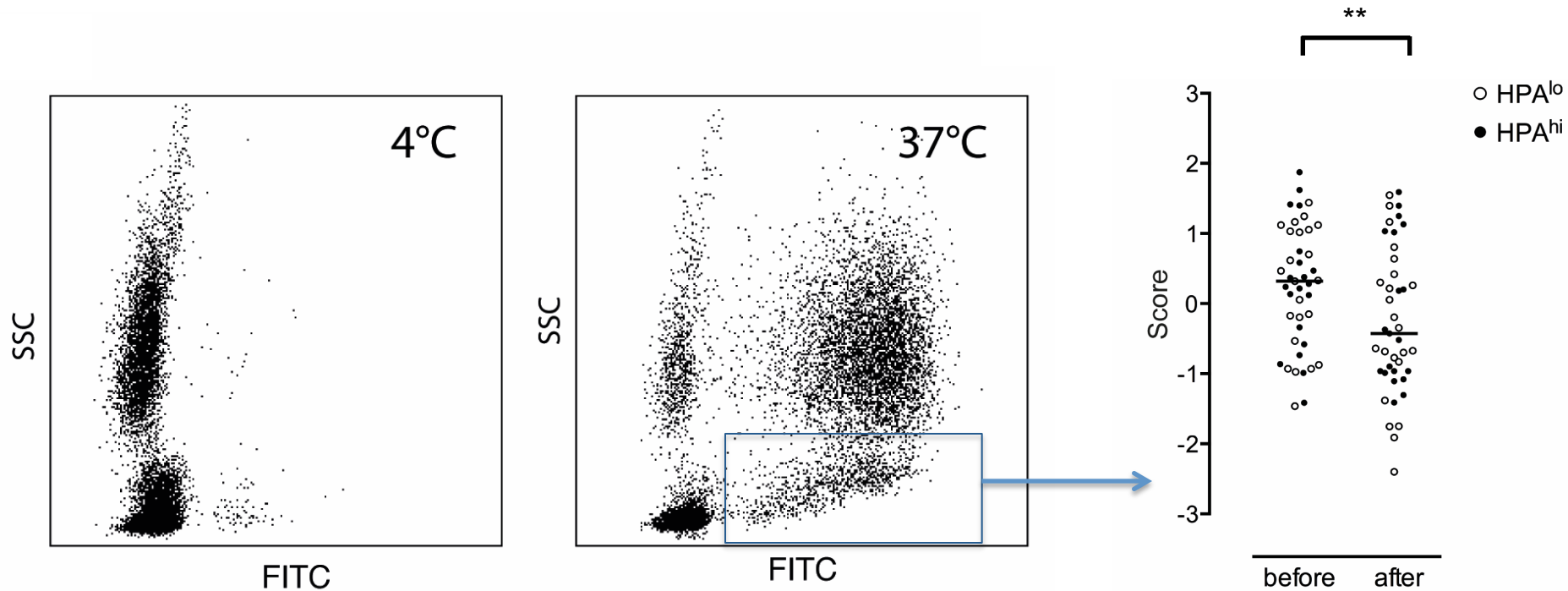


LPS-induced TNF- α secretion



- Acute social stress decreases LPS-induced IL-8 and TNF- α secretions

Effects of stress on phagocytosis



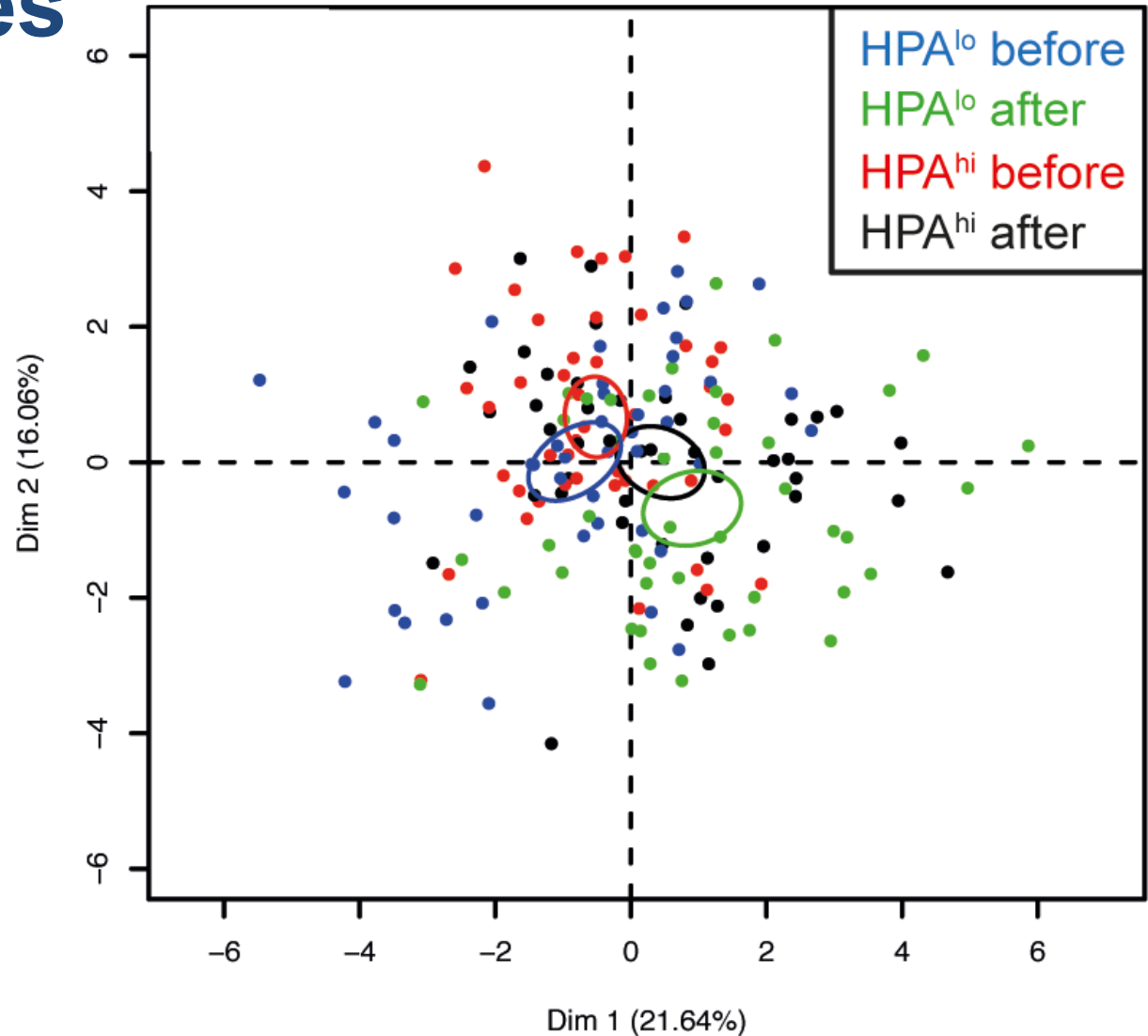
- Acute social stress decreases mononuclear cell phagocytosis

Conclusion

Acute social stress :

- Increases stress hormone levels
 - Induces cell type specific leucocyte mobilization
- Reduces LPS-induced cytokine concentrations and phagocytosis

Perspectives



- HPA^{hi} pigs seems to be more resilient to stressors than HPA^{lo} pigs

Thank you for your attention

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