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Temperate and tropical conditions impact on production and thermoregulatory traits in growing pigs

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Introduction

Heat stress effects on livestock have been studied for years but little have been made on related pigs reared in two different climatic conditions.

Objectives

- Evaluate the effects of climatic environmental conditions on pig performance and thermoregulatory responses
- Test the effect of the sire family X environment on these responses

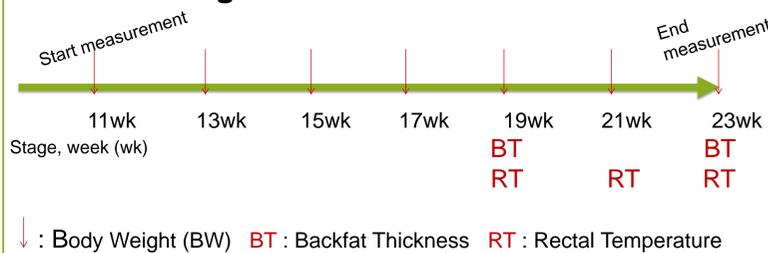
Materials and methods

Animals



1,253 half-sibs backcross issued from 10 boars (Creole x Large White (LW) breed) and 130 LW sows born and housed in temperate (n=601) and tropical (n=652) conditions.

Protocol design and measurements



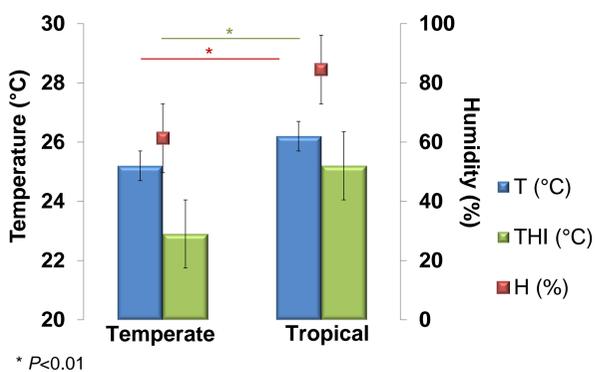
Statistical analysis

- ADG was calculated from live BW between 11 and 23 wk of age.
- Backfat thickness gain (BTG) was estimated with BT measurement at 19wk and at 23wk of age.
- Thermal Humidity Index (THI) was calculated with the records of the average daily ambient temperature (T) and the relative humidity (HR) from the 11wk of the first batch to the 23 wk of the last batch using the following equation :

$$THI = T - [0.55 - 0.0055 \times HR] \times [T - 14.5]$$
- Linear models (SAS®) were used
 - Fixed effects : environment, batches (intra environment), sire family, sex, stage and their interactions
 - Random effect : the animal (for MIXED models)
 - Covariate: BW at weaning (for GLM models for ADG and BT)

Results

Figure 1. Temperate and tropical conditions



TWO DISTINCT CLIMATIC CONDITIONS

Table 1. Lsmeans and standard errors of the effect of the environment on production traits

Traits	Temperate	Tropical
BW at 11wk (kg)	29.0±0.3 ^a	23.9±0.3 ^b
BW at 23wk (kg)	101.1±0.3 ^a	87.1±0.3 ^b
BT at 19wk (mm)	16.3±0.1 ^a	12.2±0.1 ^b
BT at 23wk (mm)	20.4±0.1 ^a	15.8±0.1 ^b

sire effect P<0.001 ; environment effect P<0.001 ;
 sire X environment interaction P<0.01 ; stage X environment P<0.001 ;
 a and b within rows means without a common superscript letter differ (P<0.05, Turkey-Kramer test)

MAJOR EFFECTS OF ENVIRONMENT ON PRODUCTION TRAITS

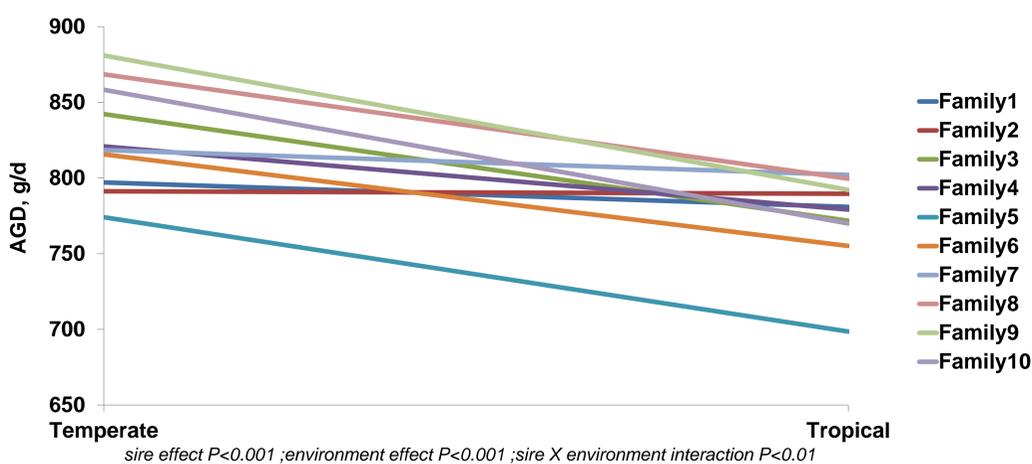
Table 2. Lsmeans and standard errors of the stage X environment interaction on RT

Stage, (wk)	Temperate	Tropical
19wk (°C)	39.5±0.01 ^a	39.7±0.01 ^b
21wk (°C)	39.4±0.01 ^c	39.5±0.01 ^a
23wk (°C)	39.3±0.01 ^d	39.4±0.01 ^{ac}

sire effect P<0.001 ; environment effect P<0.001 ;
 sire X environment interaction P<0.01 ; stage X environment P<0.001 ;
 a, b, c and d means without a common superscript letter differ (P<0.05, Turkey-Kramer test)

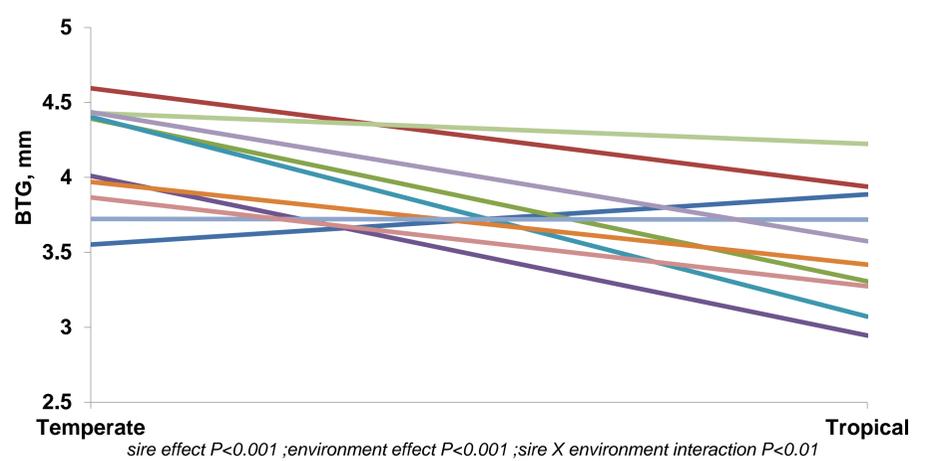
SIGNIFICANT STAGE X ENVIRONMENT INTERACTIONS ON THERMOREGULATORY TRAITS

Figure 2. Lsmeans of sire family X environment interactions on ADG



**SIGNIFICANT SIRE FAMILY EFFECT FOR ALL STUDIED TRAITS
 STRONG G X E INTERACTIONS**

Figure 3. Lsmeans of sire family X environment interactions on BTG



Conclusion

- Decreased BW and backfat thickness in the tropical compared to temperate conditions.
- Increased rectal temperature in the tropical compared to temperate conditions.
- Strong sire family X environment interactions on the studied phenotypes.

Perspectives : Feed intake, feeding behaviour and the study of the genetic component are coming ...

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