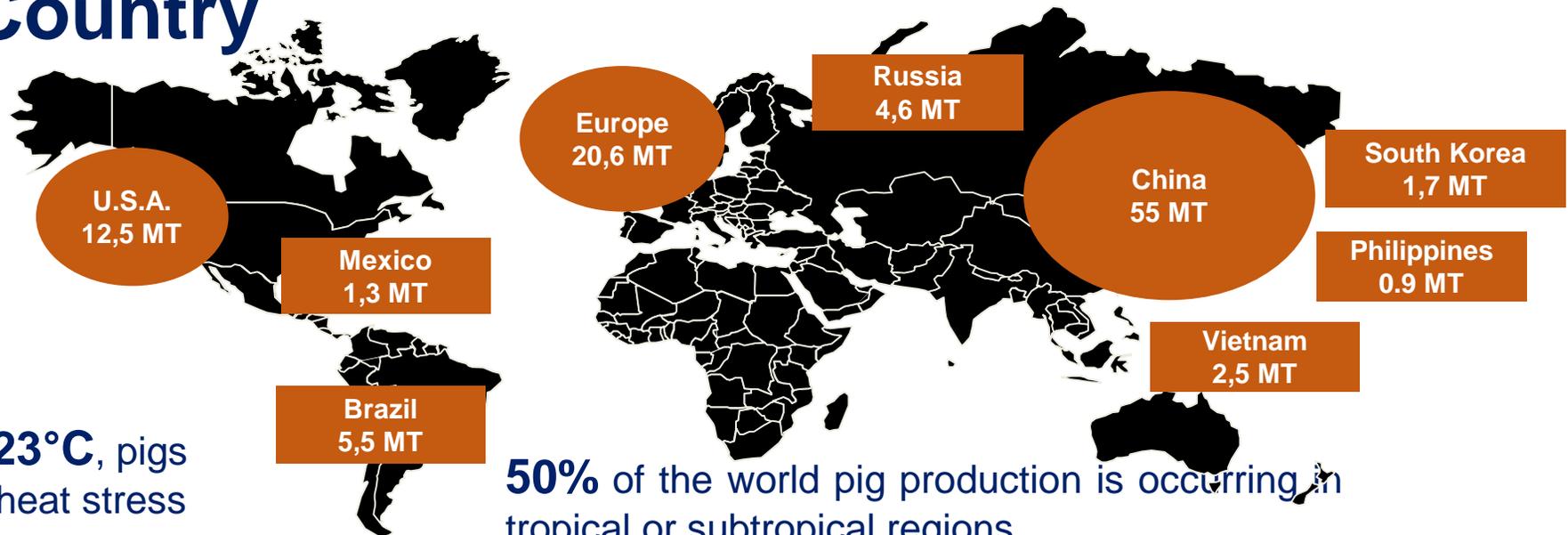


Fresh Up Concept: Strategies in Alleviating Heat Stress

**Ermin G. Magtagnob
ADM Technical Manager Swine - Asia**

Global Pork Production in 2023 by Country

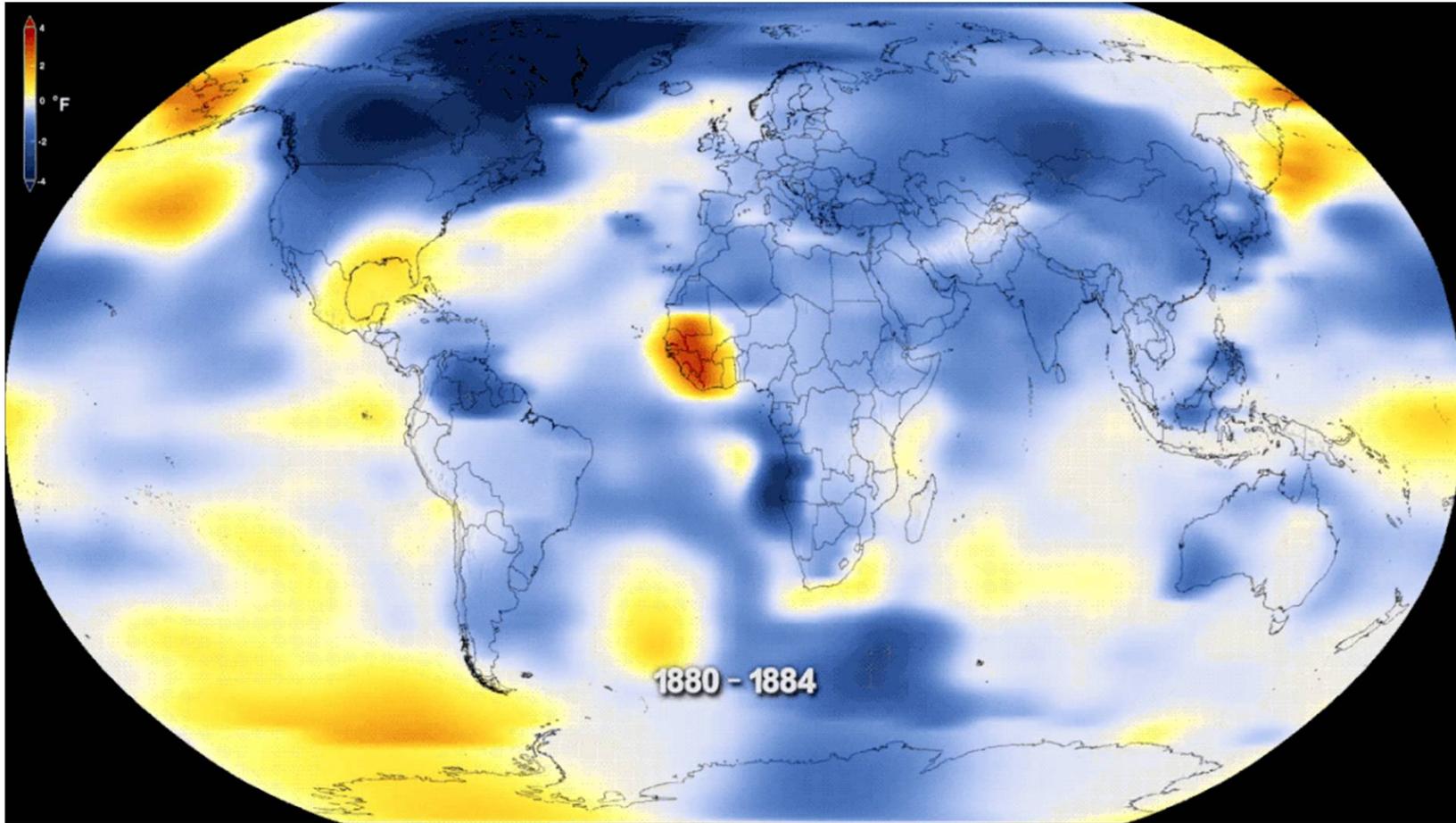


Up to **23°C**, pigs are in heat stress

50% of the world pig production is occurring in tropical or subtropical regions.

Temperatures increase in **heat waves** in temperate climates and **year round** in tropical climates.

Source: Scienceagri.com;
OurWorldData.org;
Eurostat; FAS



You don't see the damage – until you feel the loss.

Mortality.

St-Pierre et al, 2003

1-2/1000

900 mill. \$

Total Losses in Swine production in USA (Pollmann, 2010)

Weight.

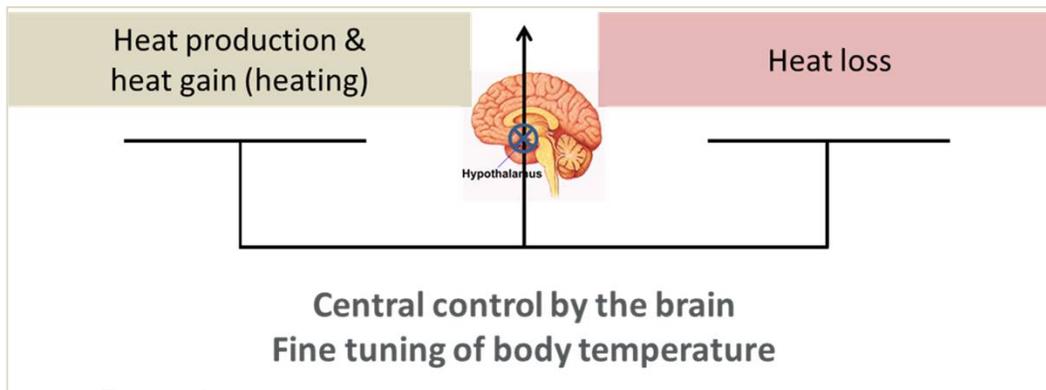
St. Pierre et al, 2003

2-3
kg/pig

>350 mill. \$

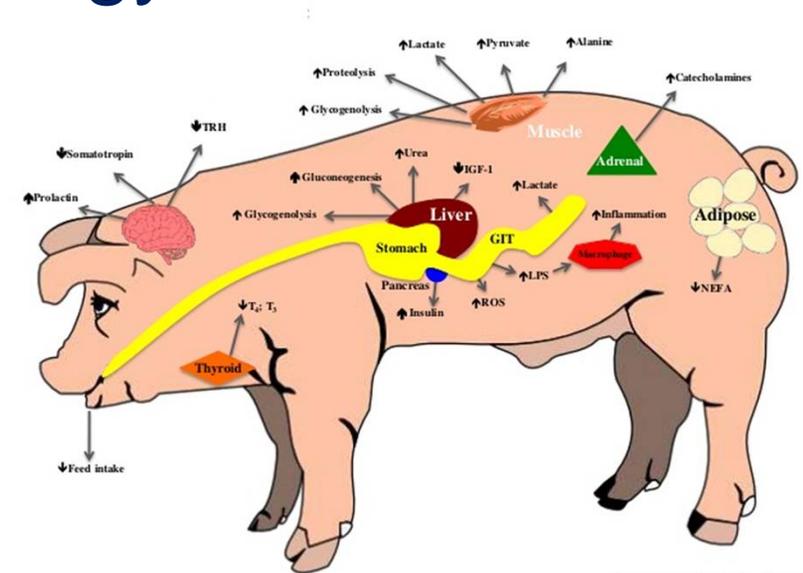
American Swine Industry

Heat stress: effect on physiology



- Basal Metabolism
- Growth and Feed Metabolism
- Activity

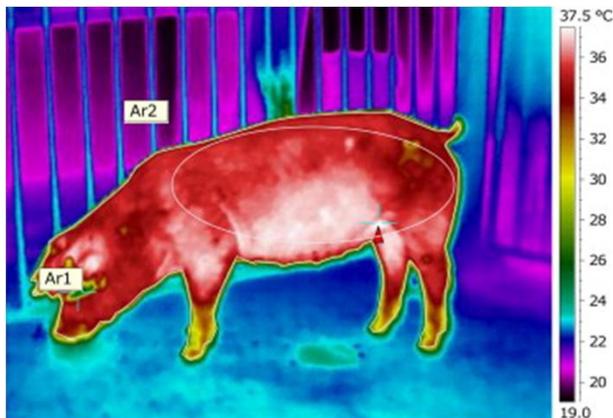
- Convection
- Evaporation
- Radiation
- Conduction



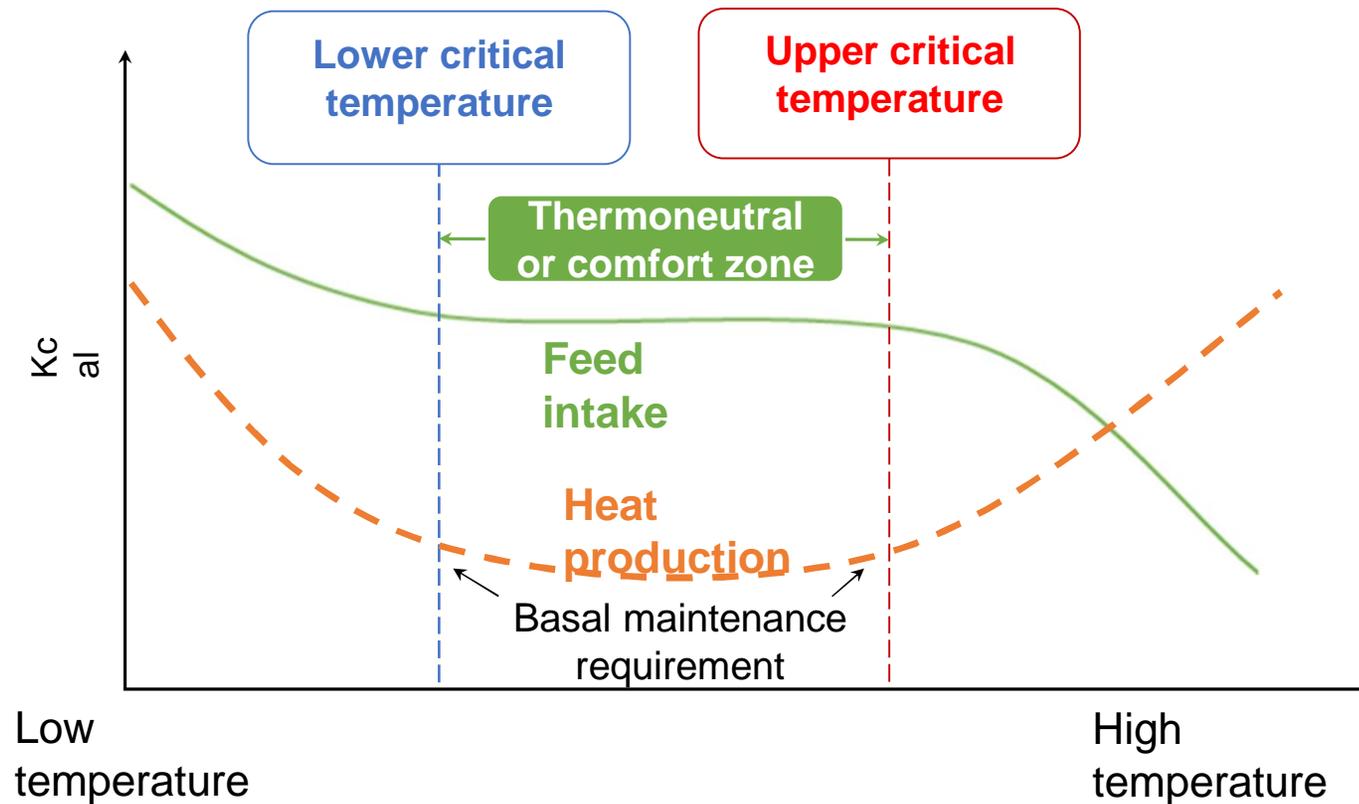
Baumgard et al., 2014

Genetic evolution: Fast-growing pigs have higher metabolic rates

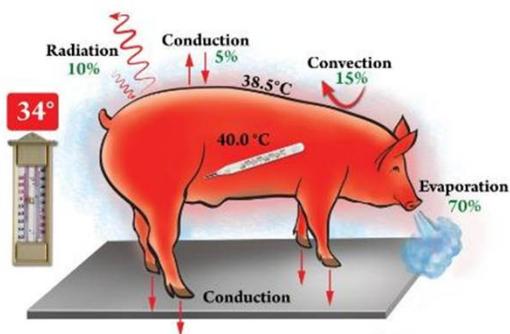
- Leaner lines (basal heat) – more muscle means more metabolic activity
- Higher intake = more digestion = more heat increment



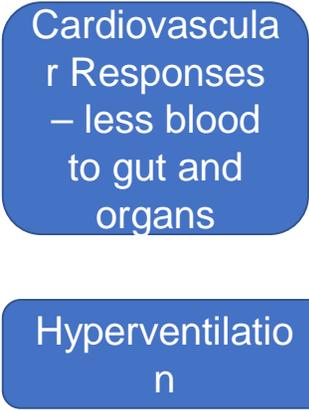
Heat stress: effect on physiology



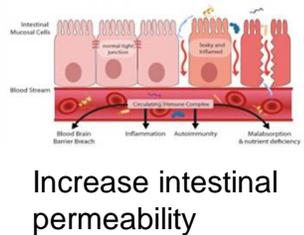
Adaptation of Pigs in Heat Stress



- Reduction of feed intake and activities
- Increase water intake



- Excessive loss of CO₂ and electrolytes - panting
- ↑ Blood pH increases
- ↑ Urinary HCO₃ excretion
- Metabolic acidosis



Adaptation of Pigs in Heat Stress

HS may alter post absorptive metabolism of pigs



Carbohydrate

During **HEAT STRESS**

Use more glucose for energy, instead of fat or protein



Lipids/Fats

Fat metabolism slows down
Lack of fat mobilization



Protein

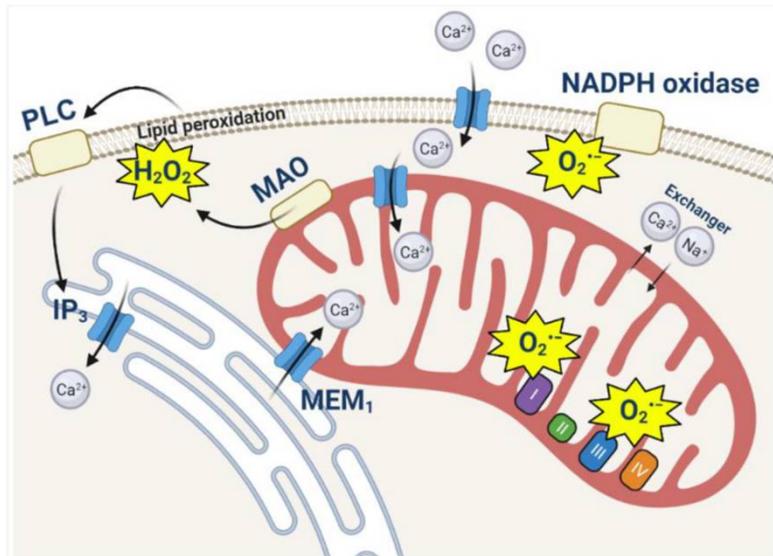
Impair protein synthesis

Pigs avoid generating more heat during HS:

- Decrease carcass value

Adaptation of Pigs in Heat Stress

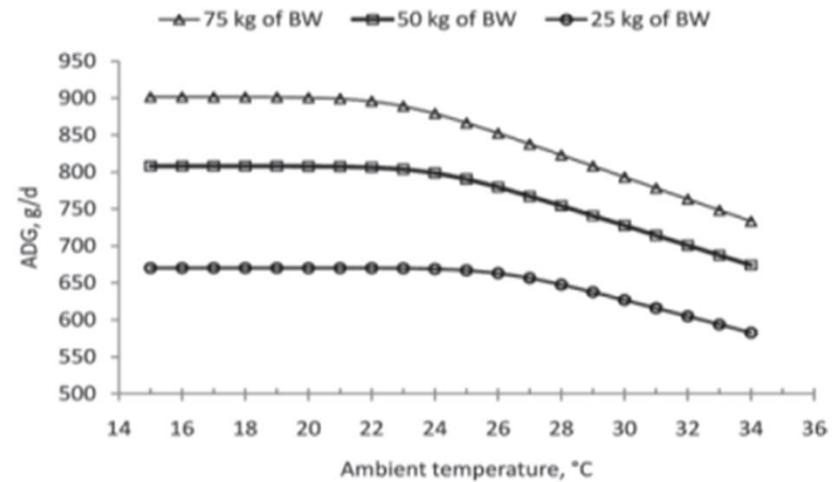
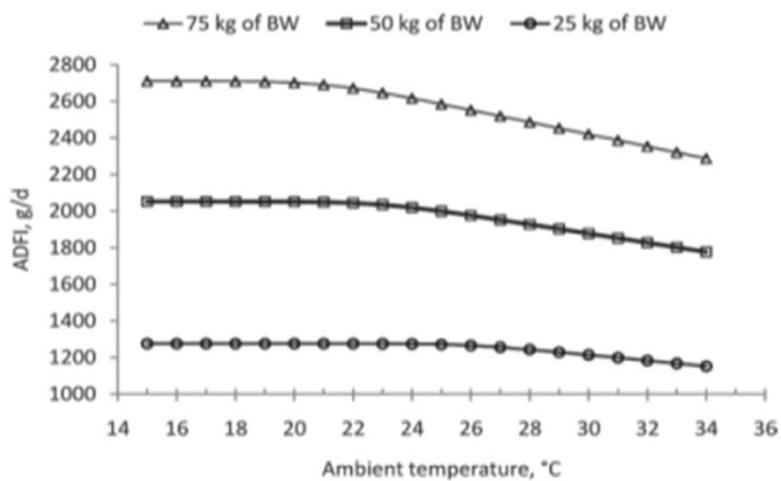
Cellular level – Oxidative stress



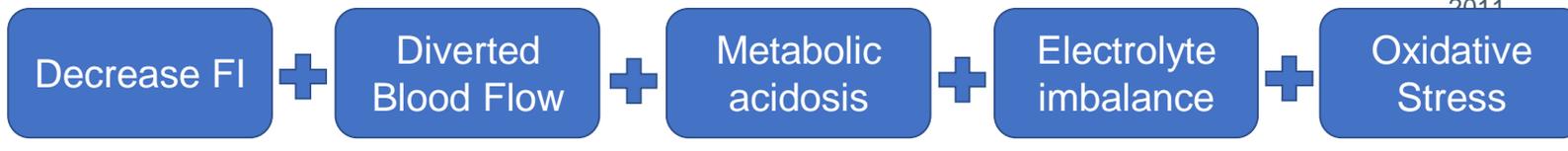
During Heat Stress:

1. Excessive production of superoxides
2. Degradation of mitochondrial metabolic oxidative capacity
3. Excess of ROS and depletion of antioxidant reserves

Impact of Heat Stress on Growing Pigs - Summary

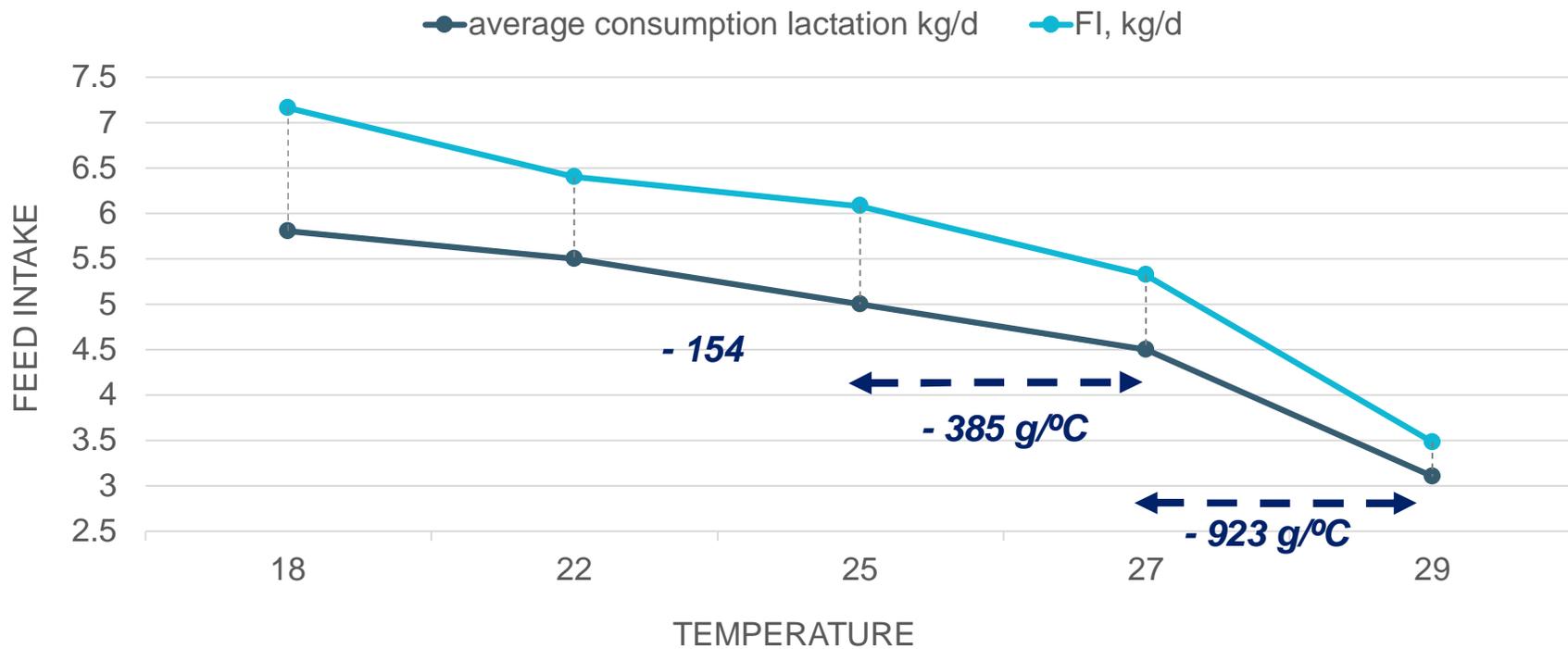


Source: Renaudeau et al., 2011



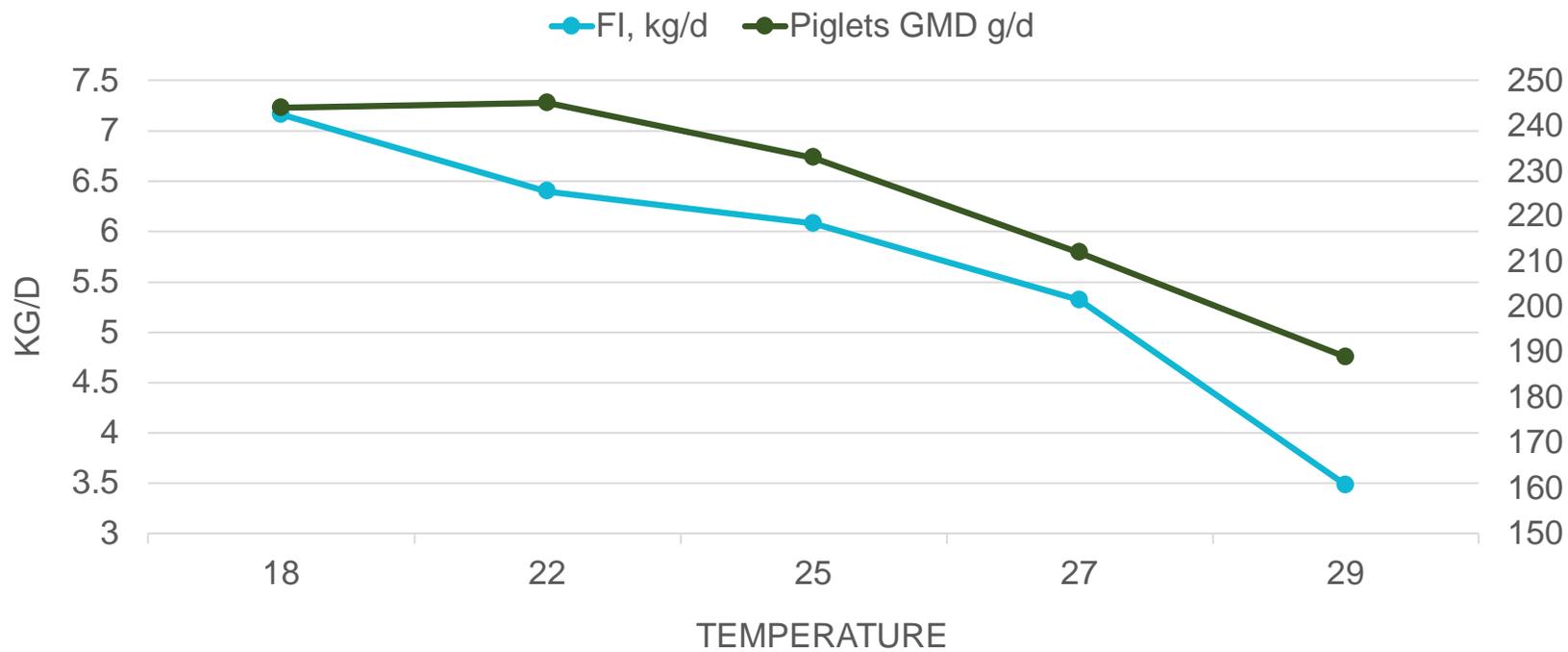
= DECREASE AVERAGE DAILY GAIN

Temperature effect on feed intake of sows



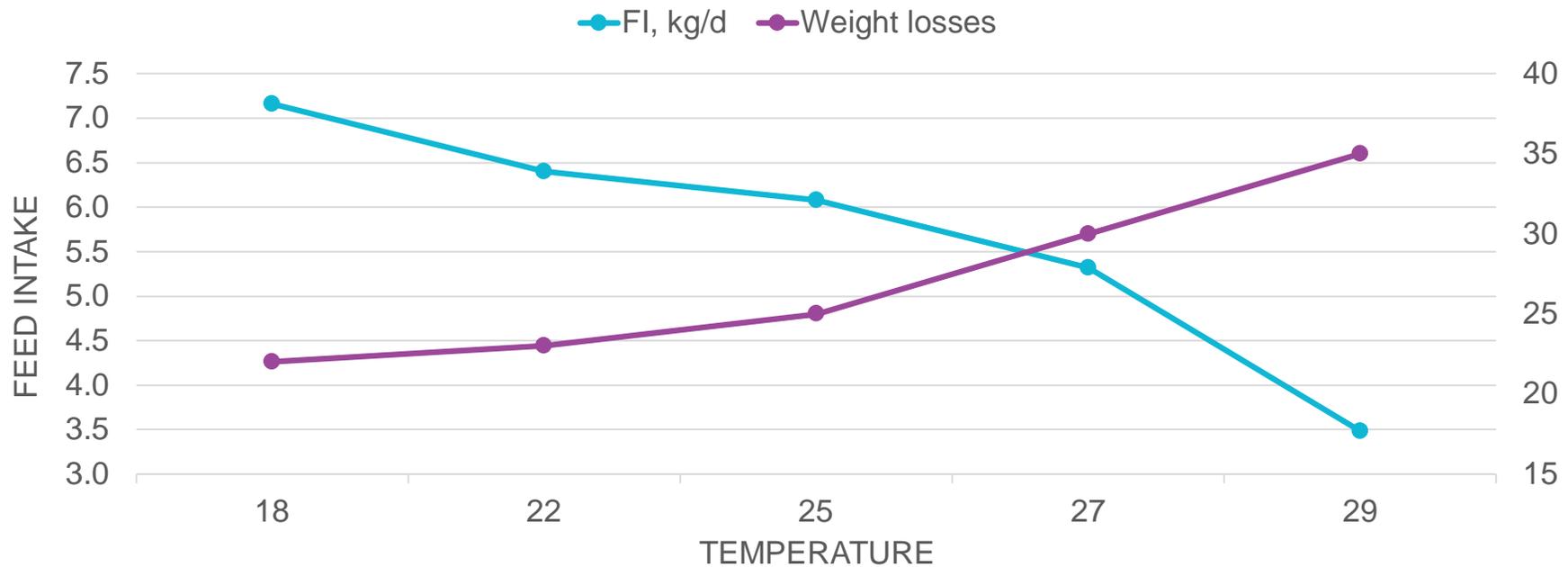
Adapted from Quiniou et al (2000)

Effect of temperature on feed intake & piglets growth in multiparous sows



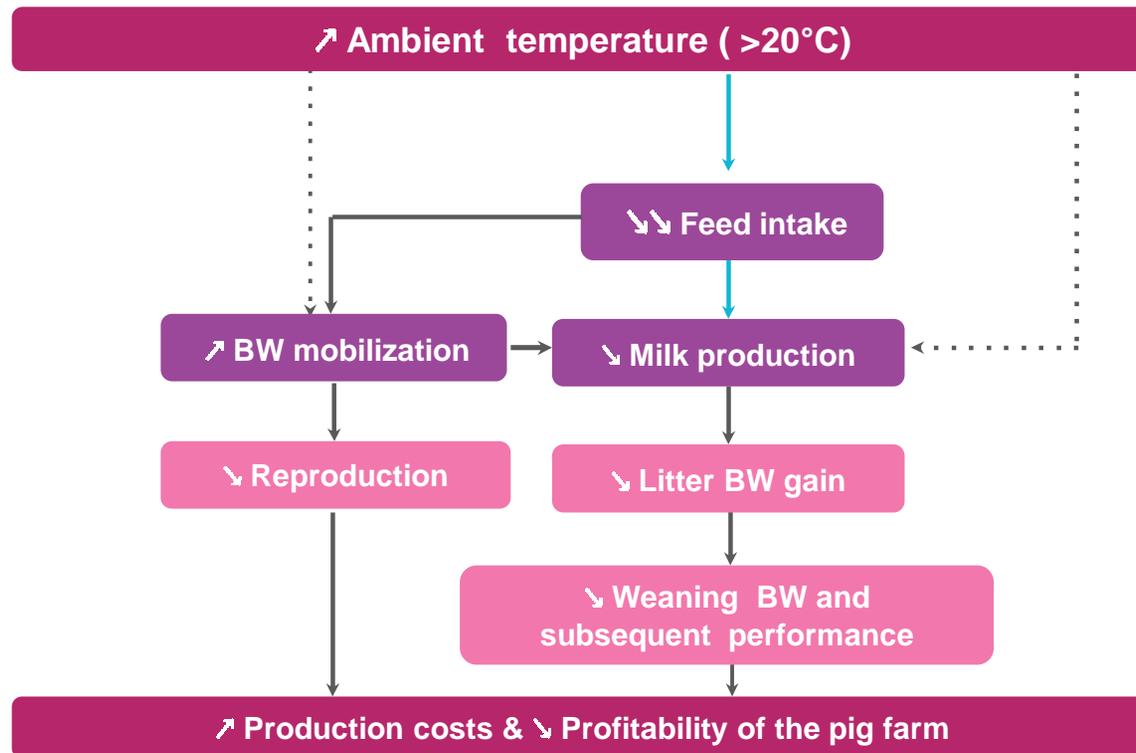
Adapted from Quiniou et al (2001)

Effect of t° on feed intake & body weight loss in multiparous SOWS



Adapted from Quiniou et Noblet (1999)

High temperature and sow performance



Fresh UP Concept

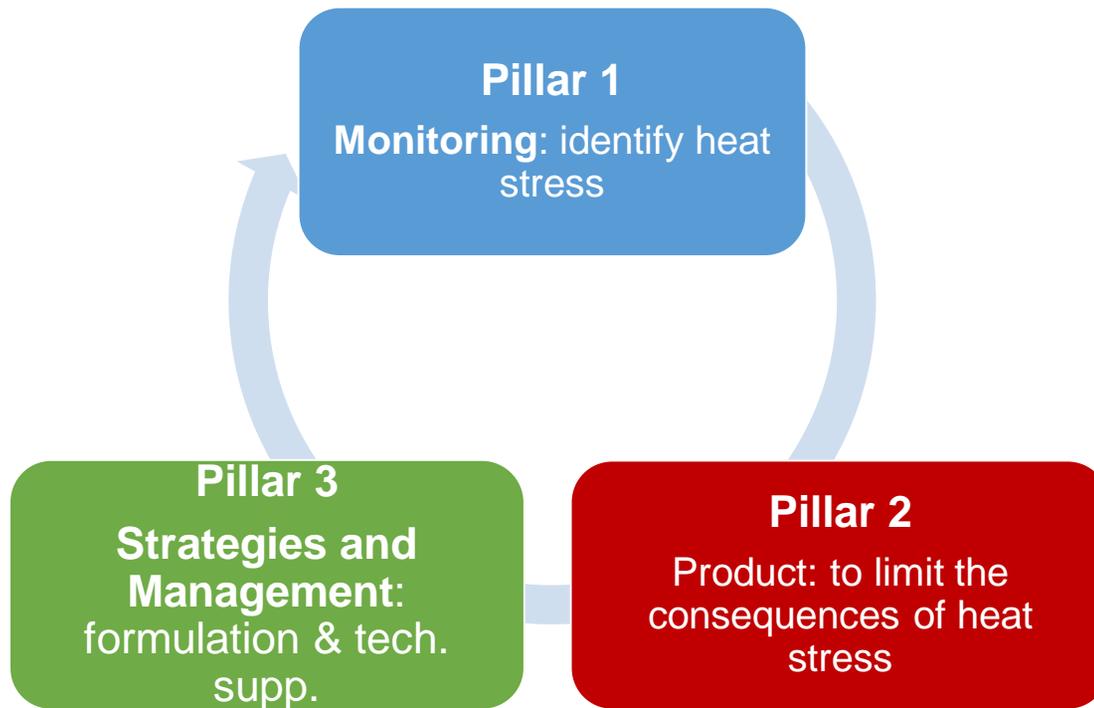
GOALS:

- 1| Recover average daily weight gain
- 2| Secure slaughter weight when price and demand are high: summer time
- 3| Anticipating heat stress effects

Keep it **cool** !



HOW TO REACH THE GOALS? 3 PILLARS



Pillar 1: Monitoring – What You Miss Will Hurt You

We are what we breathe

Monitoring of environmental parameters to improve animals' health.



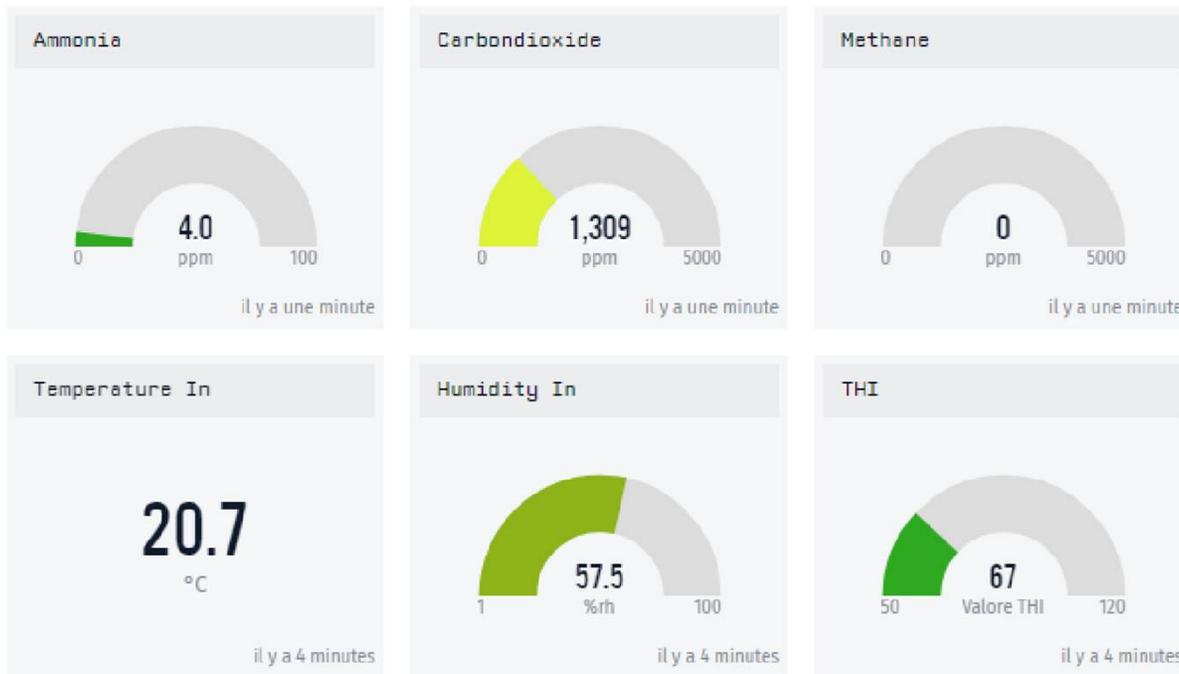
Patented IOT solution to keep everything under control and increase productivity, wherever you are.

**Air quality
monitoring**

**Water quality
monitoring**

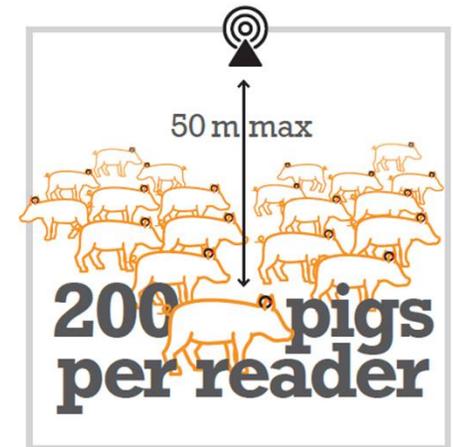
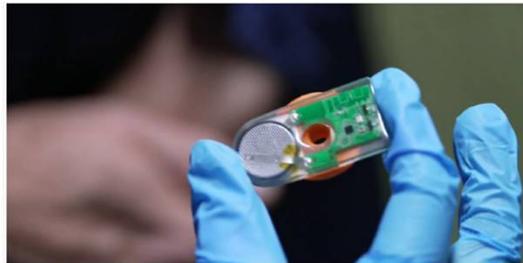
**Energy and water
consumption**

Availability of the data: data storage on the cloud



Are you monitoring the Right Danger Signs?

- Panting
- Drinking Behavior
- Drop on Feed Intake

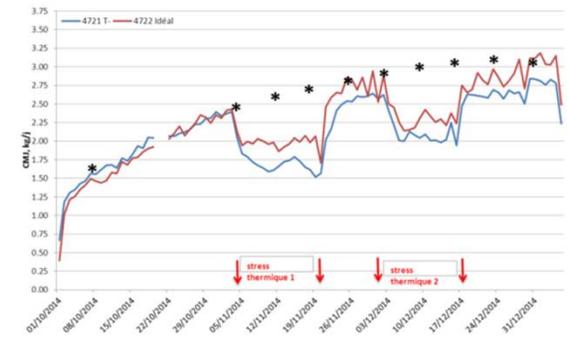
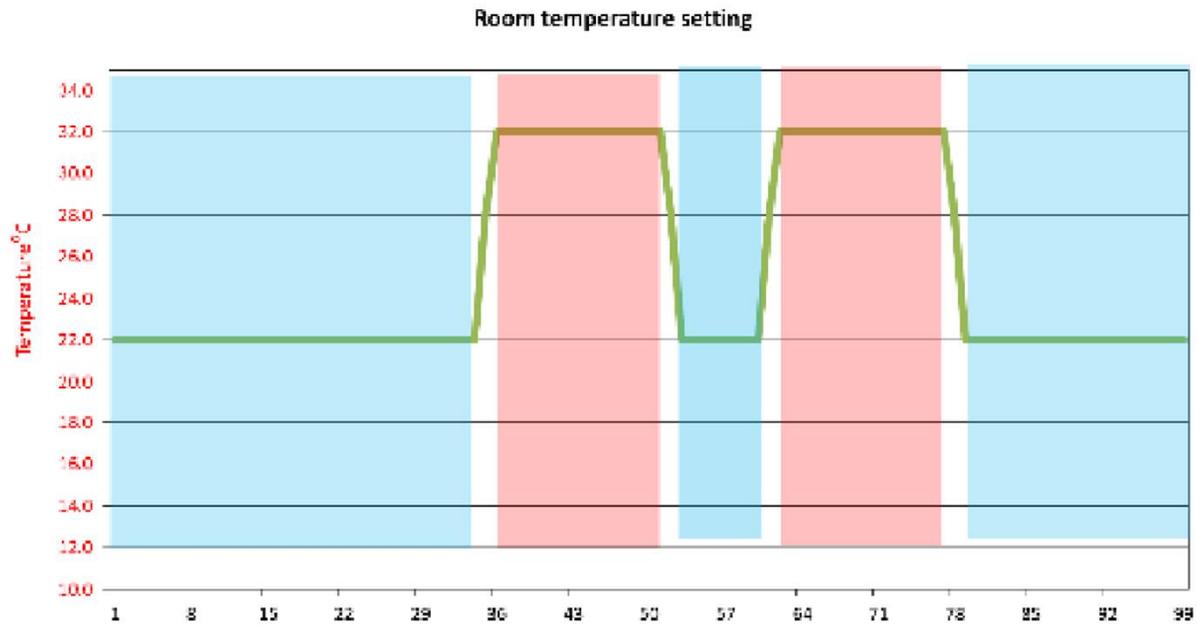


Pillar 2: Product Support

“A Heat Wave is Not a Surprise Anymore”



Model of Testing Heat Stress



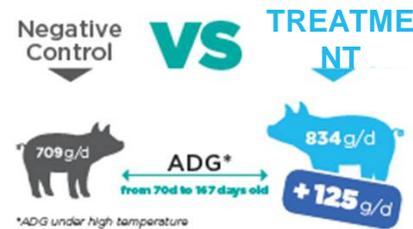
Products that Alleviate Heat Stress

Nature/ Characteristics	Objectives
Sweetener	<ul style="list-style-type: none">• Sweet perception improves feed intake• Impacts on gut health
Sanguinarine + Honokiol Magnolol	<ul style="list-style-type: none">• Anti-inflammatory properties• Anti-oxidant properties
Capsaicin	<ul style="list-style-type: none">• Improves digestion by increasing secretions in the gut• Improves gut structure• Anti-oxidant and anti-inflammatory properties
Organic Trace Minerals	<ul style="list-style-type: none">• Improves gut permeability and integrity• Restore impaired immune function
Sodium Bicarbonate	<ul style="list-style-type: none">• Controls the blood acid-base balance

► Daily feed intake



► Average daily gain



Key benefits of the nutritional solution

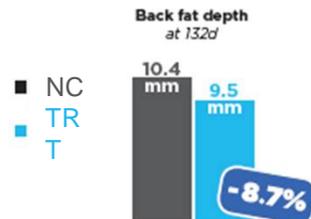
- Modulates inflammatory response
- Preserves intestinal integrity
- Reinforces nutrient absorption
- Avoids electrolytes imbalances

References: WISIUM R&D 2015, FRANCE

Trial Duration: d70 to d167

Challenge: 2 periods of HS d105-d120 and d131-d146, pigs are exposed to high temperature of 32°C day and night.

► Carcass quality



► Weight at slaughter



References: WISIUM R&D 2018, FRANCE

Trial Duration: d70 to d166

Diet: NC Conventional diet vs Heat Stress Solution d111-d166

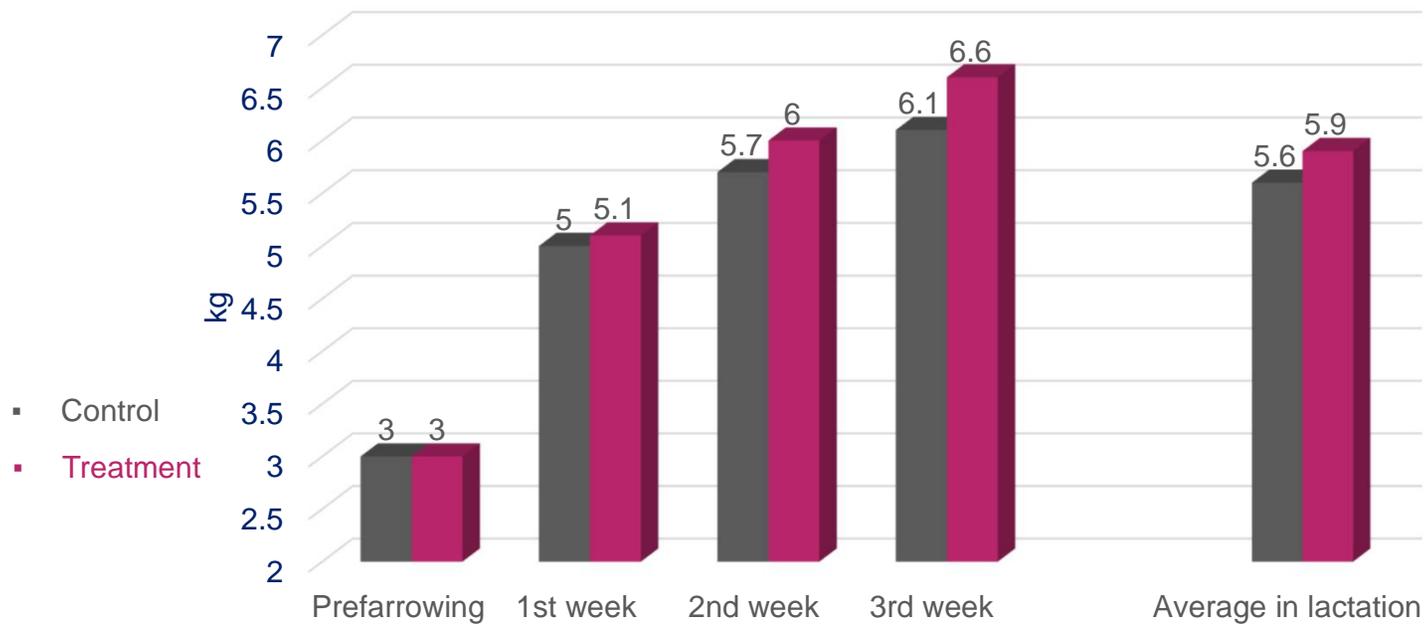
Challenge: d111-d166 animals are exposed to high temperature; day 32°C and night 26°C

Measurement of back fat at day 132 days old

SOW TRIAL

CRZA France – Results

FEED INTAKE, kg/d



Body weight loss for sows after weaning:
Control – 11%
Treatment – 10%

Pillar 3: Heat Stress Strategies

Nutritional Strategies

- **Increase net energy content of feed**
 - Reduce heat increment (less protein, more AA, more starch)
- **Adapt nutrient concentration to compensate the reduction of feed intake**
- **Increase some specific micro-nutrient supplies which requirements could be changed in situation of heat stress**
 - Adapt electrolytic balance (altered due to hyperventilation, ↙ loss of CO₂)
- **Add additives to improve the intestinal integrity**

Pillar 3: Heat Stress Strategies

Feed management recommendations:

- **Feed distribution during the cool period:** early in the morning and late in the afternoon, when temperatures are cooler.
- **Increase the number of meal/day:** instead of 2 meals, try to distribute 3 or 4 meals per day
- **Fresh water:** Pigs will prefer fresh than warm water, permanent access to drinker, pigs drink between 4 to 12 lts/day (+/- 10% of their life weight) consequently check the water flow at the drinker

Physiological stage	Drinker type	Water flow (l/min)	Height (cm)	Max animal nb/drinker
Fattener	bowl	0.8 – 1.0	20	18
	nipple	0.8 – 1.0	50	10

Pillar 3: Heat Stress Strategies

Housing and equipment strategies

- Fan ventilation (increase heat dissipation)

	Ventilation, cfm/hd		
	Cold Weather Rate	Mild Weather Rate	Hot Weather Rate
Sow & litter	20	80	500
Prenursery pig	2	10	25
Nursery pig	3	15	35
Growing pig	7	24	75
Finishing pig	10	35	120
Gestating sow	12	40	150*
Boar	14	50	300

*300 cfm for gestating sow in a breeding facility

Source: Midwest Plan Service, MWPS-8

Pillar 3: Heat Stress Strategies

- Snout cooling
- Floor cooling
- Drip/spray cooling
- Fogging/pad cooling



Pillar 3: Heat Stress Strategies

Pig management recommendations - Decrease the density and increase floor space

Weight of the animals	Mini area (m ² /animal)
30 to 50 kg	0,40 m ²
50 to 85 kg	0,55 m ²
85 to 110 kg	0,65 m ²
More than 110 kg	1,00 m ²
Straw	1,20 to 1,30 m ²

Take Home Message



Anticipate heat stress



Manage heat stress risk with a nutritional solution



Optimizes formulation and farm management to heat stress

Contact information



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