

66th
EAAP
ANNUAL MEETING



INNOVATION IN LIVESTOCK PRODUCTION: FROM IDEAS TO PRACTICE

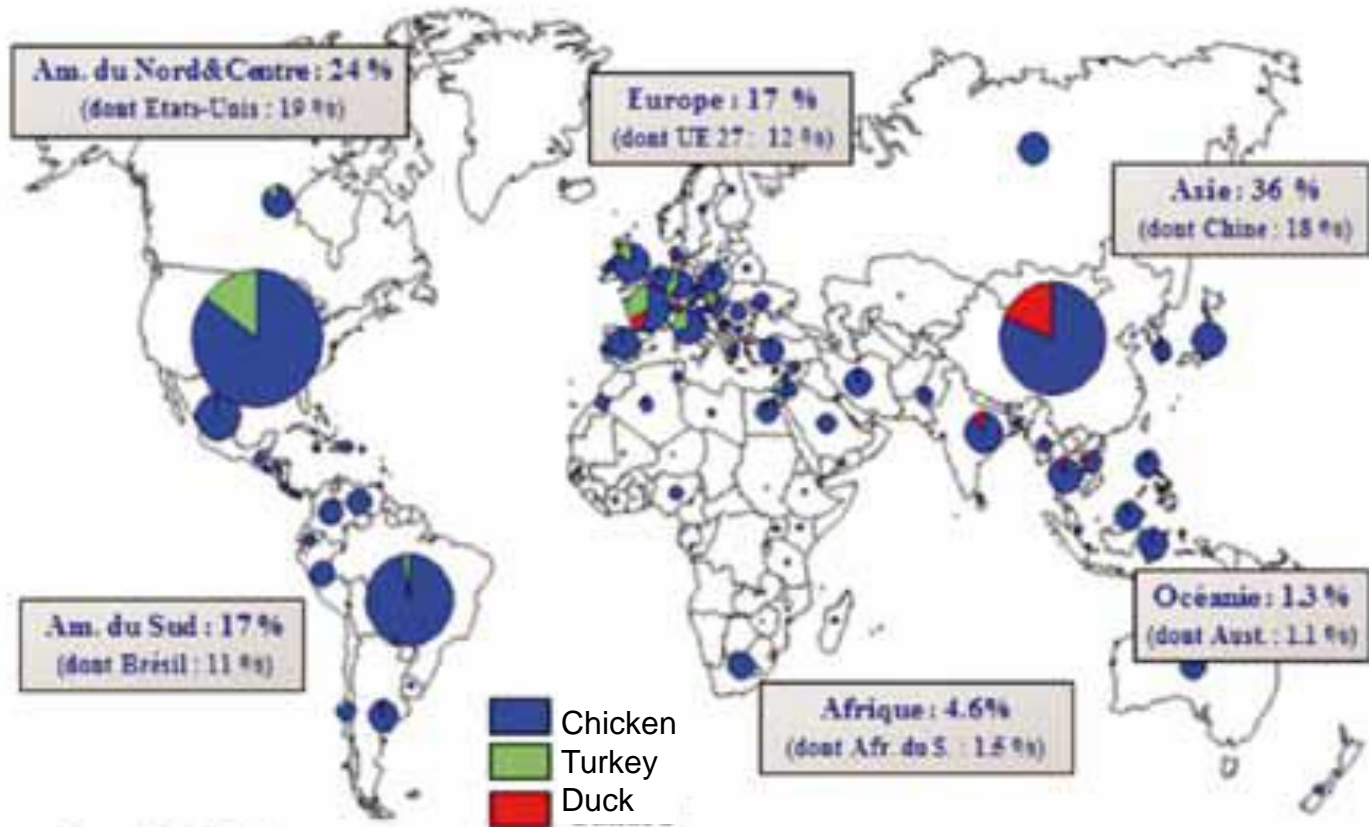
31 AUGUST - 4 SEPTEMBER 2015
WARSAW, POLAND

Long-lasting effects of thermal manipulations during embryogenesis in broiler chicken

T. Loyau, S. Métayer-Coustard, C. Berri, S. Mignon-Grasteau, C. Hennequet-Antier, M.J. Duclos, S. Tesseraud, C. Praud, N. Everaert, M. Moroldo, J. Lecarbonnel, P. Martin, V. Coustham, S. Lagarrigue, S. Yahav, A. Collin



Context



Source : FAO, 2013

Poultry: efficient protein source
Huge global development



Broiler chicken

Climate change



- Avian selection in temperate conditions
- Industrial egg incubation in controlled conditions

**Efficient in controlled conditions but...
Sensitive to temperature variations**



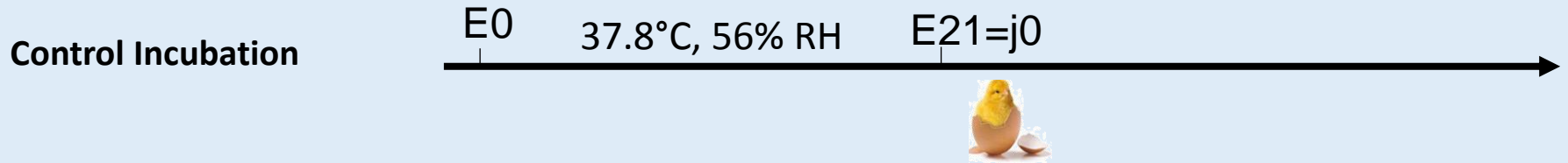
C. Nyuiadzi, Togo



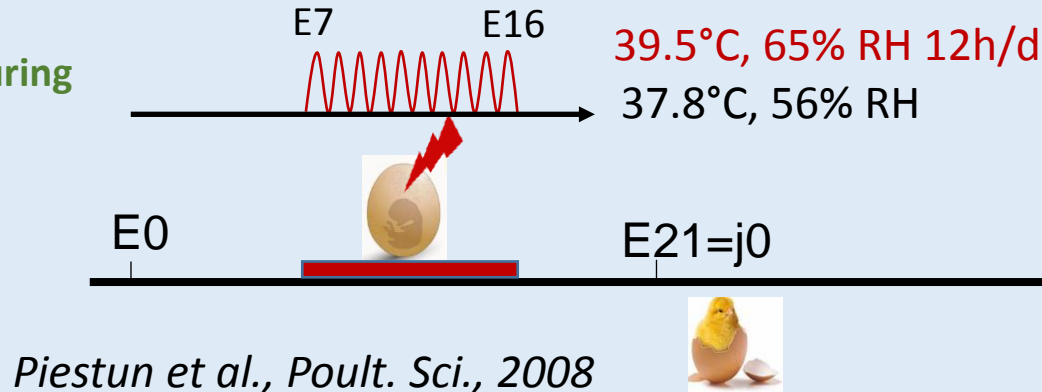
Cressensac. La Dépêche du Midi

2003, France

Strategy to improve robustness?



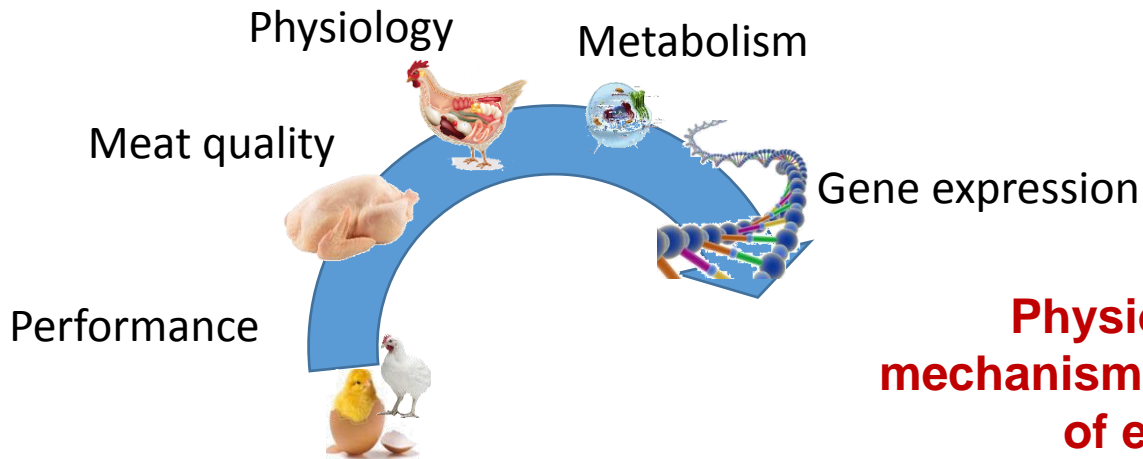
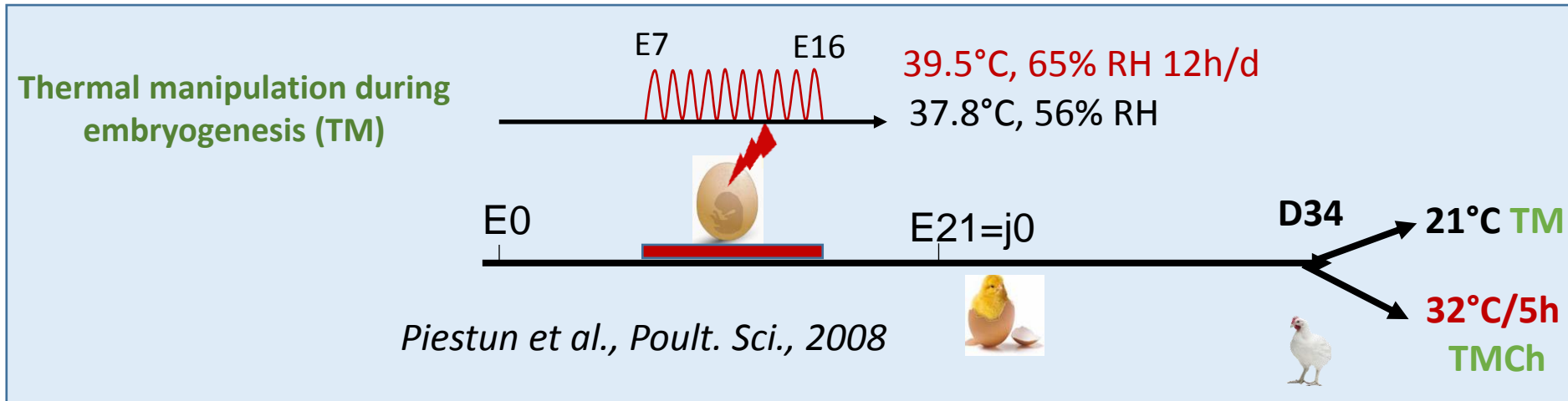
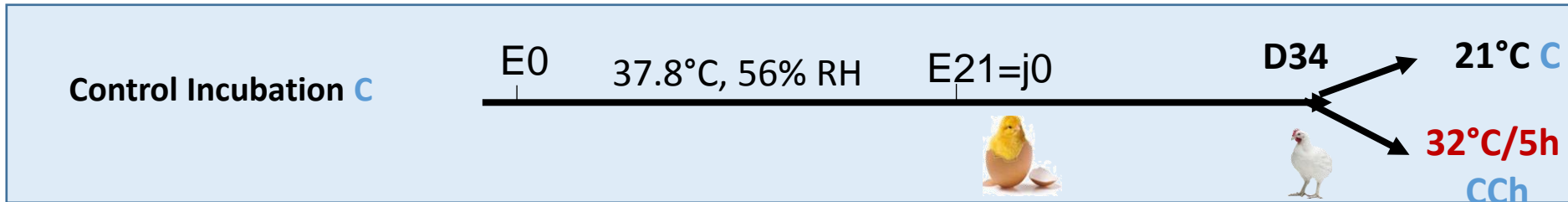
Thermal manipulation during embryogenesis (TM)



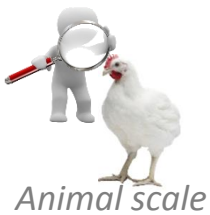
- Lower body temperature from hatching to slaughter age
- 50% lower mortality in males submitted to 35°C during 5h at slaughter age

Physiological and metabolic mechanisms involved in the acquisition of embryo acclimation?

Material and methods



Physiological and metabolic mechanisms involved in the acquisition of embryo acclimation?

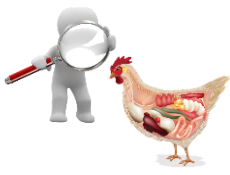


Performance and physiological parameters

	C	TM	
Hatching rate (% fertile eggs)	86,13	83,19	NS
Body weight 28d	1525 ± 14	1534 ± 14	NS
Feed conversion ratio d0-d28 (g/g)	1.49 ± 0.02	1.47 ± 0.02	NS
Body weight 35d (g)	2185 ± 19	2156 ± 19	$P < 0.05$

Loyau et al., 2013

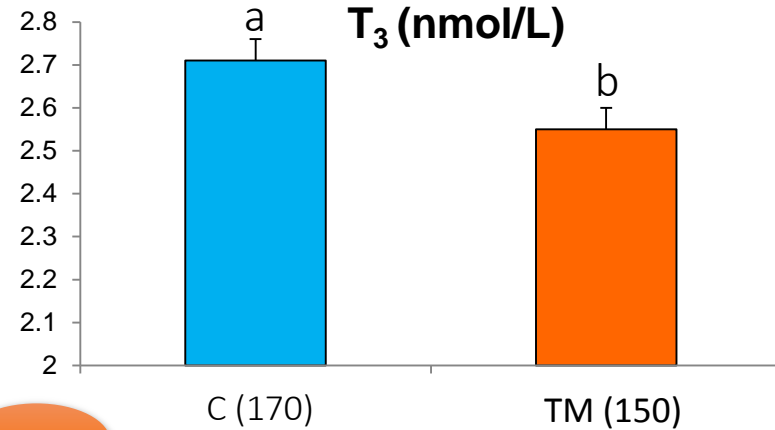
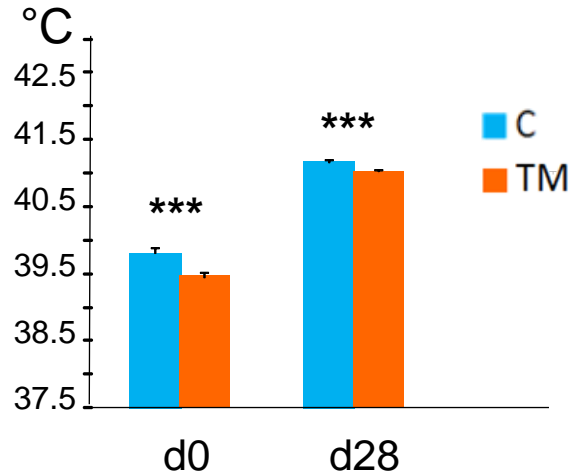
**Performance: No modification in hatchability, slightly lighter (-1,4%) but less fat
No alteration in meat processing quality by TM**



Performance and physiological parameters

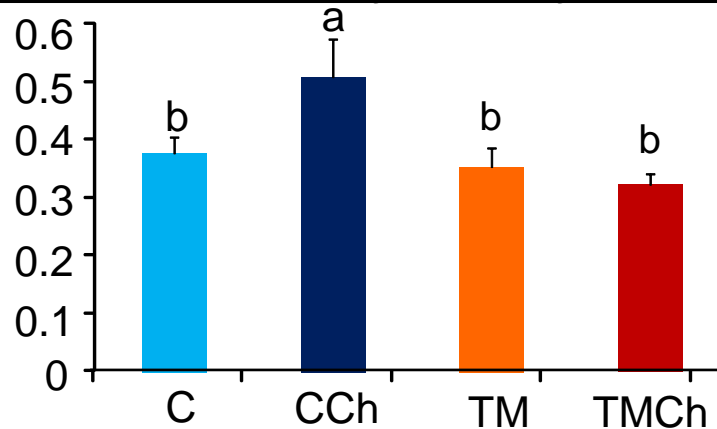
Physiology scale

Body temperature (T_b):



Loyau et al., J. Anim. Sci., 2013

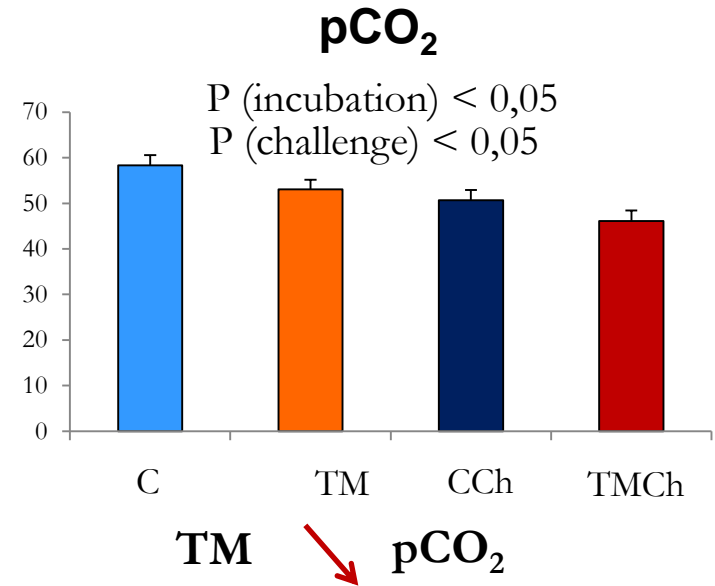
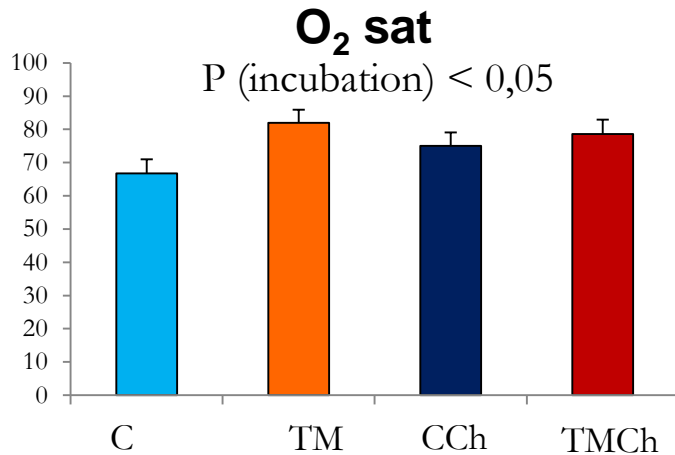
Stress: Heterophil/Lymphocyte ratio:



d34



Respiratory physiology



TM ↗ O₂ Sat

TM ↘ pCO₂

d34

**Modification of respiratory physiology by
TM during embryogenesis?**



Candidate markers of thermotolerance?

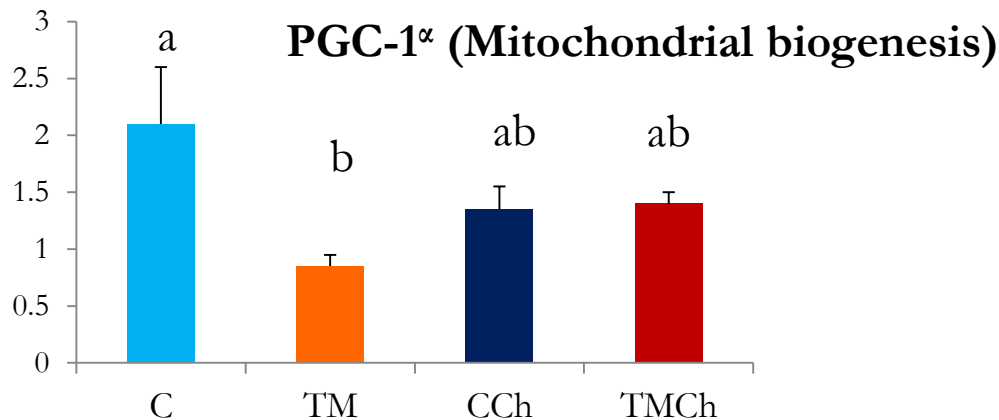
Thermal Manipulation during Embryogenesis Has Long-Term Effects on Muscle and Liver Metabolism in Fast-Growing Chickens

Thomas Loyau¹, Sonia Métayer-Coustard¹, Cécile Berri¹, Sabine Crochet¹, Estelle Cailleau-Audouin¹, Mélanie Sannier¹, Pascal Chartrin¹, Christophe Praud¹, Christelle Hennequet-Antier¹, Nicole Rideau¹,

- Long-lasting effects of TM during embryogenesis on genes expression
- Regulation of metabolic heat production?

Example:

J34

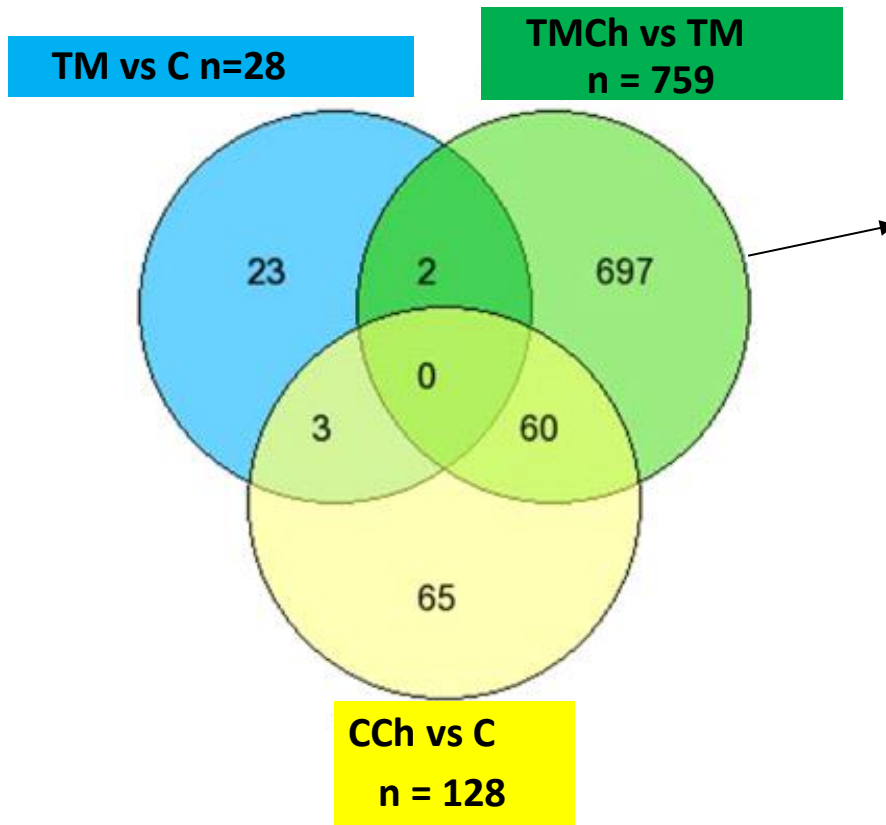




Gene scale

New markers of thermotolerance?

Gene expression analysis on microarray in breast muscle at d34



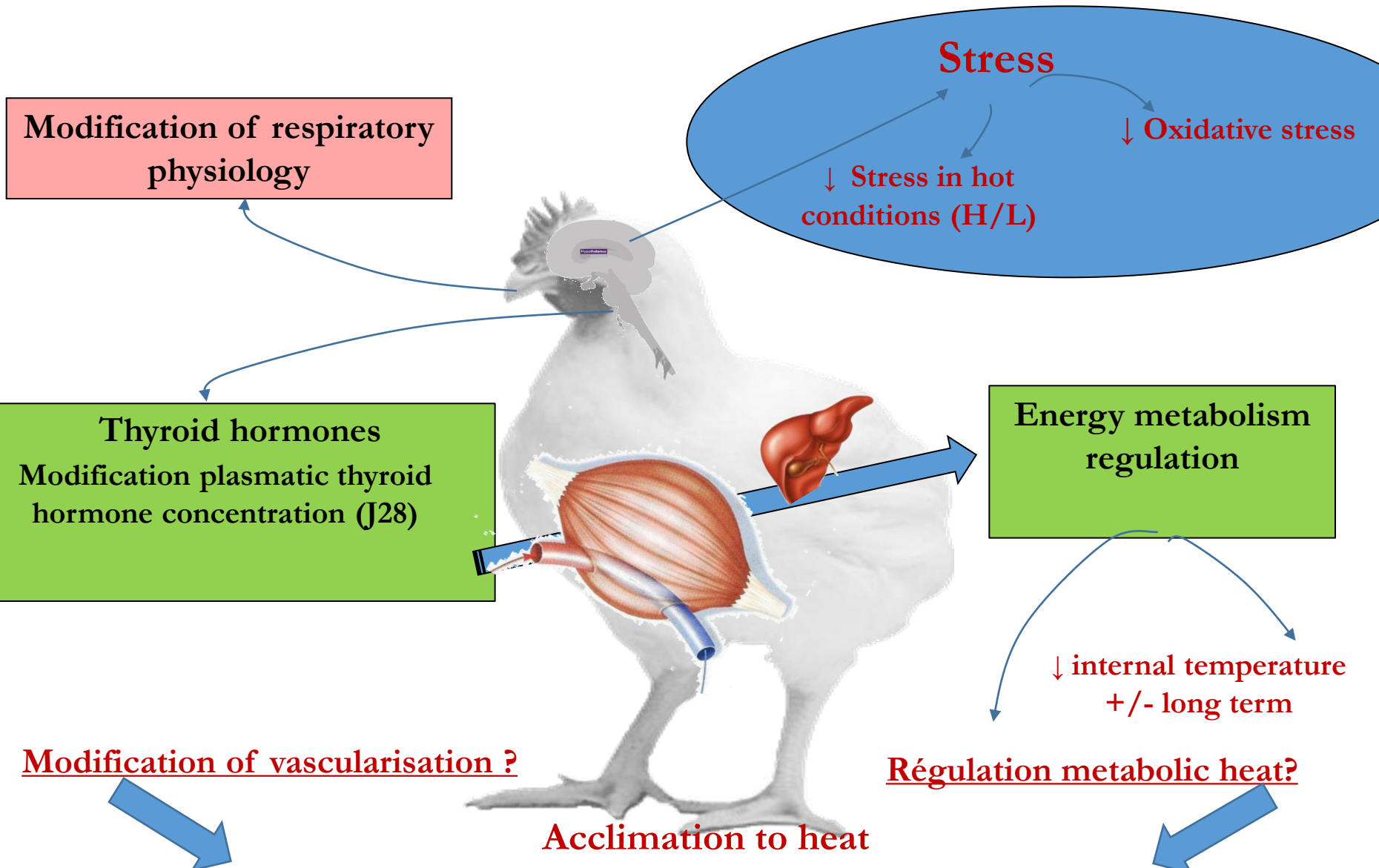
= earlier or more responsive!

- Metabolic regulations
- Chromatine modifications
- Vascularization
- Stress response

Limitation of mitochondrial energy metabolism and heat production

Take home message

Physiological and metabolic mechanisms involved in the acquisition of embryo acclimation?



Thank you for your attention and thanks to

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