Variations in egg incubation temperature enable chicken acclimation through long-lasting changes in energy metabolism

Thomas Loyau, Sonia Metayer-Coustard, Cécile Berri, Sandrine Mignon-Grasteau, Christelle Hennequet-Antier, Christophe Praud, Michel Jacques M.J. Duclos, Sophie Tesseraud, Vincent Coustham, Dzidzo Nyuiadzi, et al.

Le Corum, Montpellier, France

16-18 March 2015

CLIMATE-SMART Agriculture 2015

Full programme

CLIMATE SMART Agriculture 2015

Third Global Science Conference

#CSA15

http://csa2015.cirad.fr

09:00 Livestock and climate change: combining mitigation and adaptation options and projecting sustainable futures

Soussana Jean-François[1] and the EC FP7 'AnimalChange' consortium (see www.animalchange.eu)
[1]*INRA, Paris, France*

CONTRIBUTED ORAL PRESENTATIONS

11:00 Differential climate change impacts on crop and grasslands and the relative livestock production systems competitiveness

Havlík Petr[1], Leclere David[1], Valin Hugo[1], Herrero Mario[2], Schmid Erwin[3], Obersteiner Michael[1]
[1]*International Institute for Applied Systems Analysis, Schlossplatz 1, A-2361 Laxenburg, Austria*
[2]*Commonwealth Scientific and Industrial Research Organisation 306 Carmody Road, St Lucia, 4067 QLD, Australia*
[3]*University of Natural Resources and Life Sciences, Feistmantelstraße 4, A-1180 Vienna, Austria*

11:15 Efficiency gains for enteric methane mitigation and productivity: contribution to CSA and investment opportunities.

Gerber Pierre[1], Opio Carolyn[1], Mottet Anne[1], Steinfeld Henning[1], Hatton Victoria[2], Clark Harry[2]
[1]*Food and Agriculture Organization of the United Nations, Rome, Italy*
[2]*New Zealand Agricultural Greenhouse Gas Research Centre, Palmerston North, New Zealand*

11:30 Variations in egg incubation temperature enable chicken acclimation through long-lasting changes in energy metabolism

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[1]*INRA, UR83 Recherches Avicoles, F-37380, Nouzilly, France*
[2]*Institut Togolais de Recherche Agronomique (ITRA), BP 1163, Lomé, Togo*
[3]*KU Leuven, Department of Biosystems, B-3001 Leuven, Belgium*
[4]*University of Liège, Gembloux Agro-Bio Tech, Animal Science Unit, B-5030 Gembloux, Belgium*
[5]*Virginia Polytechnic Institute and State University, Department of Animal and Poultry Sciences, Blacksburg, Virginia 24061-0306, USA*
[6]*Ege University, Faculty of Agriculture, Department of Animal Science, 35100 Izmir, Turkey*
[7]*Institute of Animal Science, The Volcani Center, Bet Dagan P.O. Box 6, 50250, Israel*

11:45 Impact of feeding strategies on GHG emissions, income over feed cost and economic efficiency on milk production

Inamagua-Uyaguari Juan Pablo[1], Jenet Andreas[1], Wattiaux Michel[3], Guerra Leonardo[2], Vilchez Sergio[1], Chacón-Cascante Adriana[1], Posada Karla[1], Barrantes Luz[2], Casasola Francisco[1], Villanueva Cristobal[1], Leon Hector[4], Lapidus Daniel[5]
[1]*Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), 30501 Turrialba, Costa Rica*
[2]*Universidad de Costa Rica, Centro de Investigación en Economía Agrícola y Desarrollo Agroempresarial (CIEDA) 141-2400 Costa Rica*
[3]*University of Wisconsin-Madison, USA*
[4]*Cooperativa Dos Pinos; 179-4060 Alajuela, Costa Rica*
[5]*U.S. Department of Agriculture, 1400 Independence Ave., S.W.; Washington, DC 20250 USA*

PARALLEL SESSION L3.4 CLIMATE-SMART LANDSCAPES, WATERSHEDS AND TERRITORIES

ROOM RONDELET

KEYNOTE PRESENTATIONS

08:30 Climate Smart Territories; what are they and how do we evaluate progress towards this goal?

Beer John[1], Louman Bastiaan[1], Mercado Leida[1], Scherr Sara[2], Van Etten Jacob[3]
[1]*CATIE, Costa Rica*
[2]*EcoAgriculture Partners, USA*
[3]*Bioversity International*

09:00 Towards climate smart landscapes and watersheds

Oswald-Spring Úrsula
CRIM-UNAM, Mexico

CONTRIBUTED ORAL PRESENTATIONS

11:00 Prototyping climate-smart agricultural landscapes: a generic modelling framework and application in a tropical island

Blazy Jean-Marc[1], Chopin Pierre[1], Doré Thierry[2,3], Guindé Loïc[1], Paul Jacky[1], Sierra Jorge[1]

CLIMATE-SMART Agriculture 2015

Global Science Conference

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Parallel Session L3

Towards Climate-smart Solutions

Wednesday, 18 March 2015

8:30–12:30

11:30 Variations in egg incubation temperature enable chicken acclimation through long-lasting changes in energy metabolism

Loyau Thomas[1], Métayer-Coustard Sonia[1], Berri Cécile[1], Mignon-Grasteau Sandrine[1], Hennequet-Antier Christelle[1], Praud Christophe[1], Duclos Michel J.[1], Tesseraud Sophie[1], Coustham Vincent[1], Nyuiadzi Dzidzo[1,2], David Sarah-Anne[1], Everaert Nadia[3,4], Siegel Paul B.[5], Yalçin Servet[6], Yahav Shlomo[7], Collin Anne[1]

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PARALLEL SESSION L3.4 CLIMATE-SMART LANDSCAPES, WATERSHEDS AND TERRITORIES

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[1]*INRA, UR1321 ASTRO Agrosystèmes tropicaux, F-97170 Petit-Bourg (Guadeloupe), France*

[2]*AgroParisTech, UMR 211 Agronomie, F-78850 Thiverval-Grignon, France*

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Poultry production has increased during recent decades in hot climates where extreme temperatures are predicted to occur more frequently than in Europe. To limit the negative effects of temperature fluctuations on performance and welfare of chickens, an innovative strategy inducing hot or cold acclimation of embryos was established. The long-term effects of changes in chicken egg incubation temperature were studied to understand the physiological and metabolic mechanisms involved in early acclimation, according to the objectives of INRA Metaprogramme ACCAF. Cyclic increases in egg incubation temperature had little effect on hatchability and performance but caused a decline in body temperature of males from hatching to 28 days. They affected plasma thyroid hormones concentrations that regulate heat production, and changed respiratory physiology and stress markers in the long term. Heritabilities were moderate for comb temperature during a heat challenge and the ratio of thyroid hormone concentrations T_3/T_4, suggesting traits relevant to consider in selecting for heat-tolerance in chickens. Chickens having experienced heat during incubation exhibited a lower stimulation of energy metabolism in the liver and breast muscle. Conversely, the use of cyclically cooler incubation temperatures triggered mechanisms limiting oxidative stress at hatching and had long-term effects on mechanisms promoting heat production. These regulations could involve epigenetic mechanisms, such as changes in the methylation status of DNA or histones modifications. Innovative strategies of egg incubation should now be evaluated according to criteria defining sustainability, including not only the effects of these practices on performances of poultry production systems, but also their environmental and social impacts in temperate and hot countries.

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