rus (440 *vs* 553 g) and fœtuses (34.5 *vs* 40.0 g), and the number of fœtuses (8.2 *vs* 9.3) were lower in the PL than in the P group ($P < 0.001$). Feed intake from day 0 to day 28, and thus digestible energy (DE) intake, was 60% higher in the PL than in the P group (8 964 *vs* 5 661 g; 87.3 *vs* 54.7 MJ). DE requirements were estimated at 99.1 and 42.2 MJ in PL and P groups respectively. Therefore, the energy balance over the 2nd pregnancy (DE intake – DE expense) was positive in the P group (+12.5 MJ DE) and negative in the PL group (–11.8 MJ DE). These results show that there is nutritional competition between energy requirements for milk synthesis and fœtal growth in PL does, leading to a reduced fœtal weight.

Heat-induced changes in glucose metabolism in chickens. JCF Padilha [1], PA Geraert [2], N Rideau [2], H Aïn Baziz [3], S Guillaumin [2] ([1] *CNPq-Universidade Federal Santa Catarina, 88049 Florianópolis, Brazil;* [2] *INRA, Station de Recherches Avicoles, 37380 Nouzilly, France,* [3] *Institut Technique des Petits Élevages, Algiers, Algéria*)

Chronically heat-exposed chickens have a low growth, even when compared to pair-fed control-exposed birds [Geraert (1993) *Proc Nutr Soc* 52, 165 A]. In poultry, the main source of dietary energy comes from carbohydrates (starch). The growth reduction observed under hot conditions might then be explained by changes in carbohydrate metabolism. The present experiment was performed to study the effect of chronic heat exposure upon glucose utilisation and glucose–insulin balance.

A total of 216 birds were distributed in 3 groups according to the following design: TA22 (22°C, *ad libitum* feeding), TA32 (32°C, *ad libitum* feeding) and TR22 (22°C, pair-feeding on the TA32). The ambient temperature was kept constant between 4 and 6 weeks of age.

Sensitivity to exogenous insulin was determined by plasma glucose measurement 90 min after intra-muscular injection of saline or porcine insulin solution (20 µg per kg) (table I).

In fasted birds, sensitivity to exogenous insulin was decreased in hot conditions: the plasma glucose drop reaches 42% for TA32 *versus* 57% in control-exposed pair-fed chickens (TR22). Sensitivity is increased in fed heat-exposed birds: the decrease in plasma glucose was 27% in TA32, 20% in TA22 and only 8% in TR22.

A dose–response curve was also constructed with 0, 2, 4, 10, 20, and 40 µg insulin per kg injection. At the same injection dose, similar results as above were obtained. Moreover, glucose tolerance was investigated after administration of a glucose solution (2 ml per kg). Plasma was collected immediately and 10, 15, 30, 45, 60 and 90 min after glucose administration. Maximum of plasma glucose was reached 60 min after glucose administration in heat-exposed chickens compared to only 30 min in control-exposed birds. Plasma insulin concentrations were also measured.

Chronic heat exposure changes the glucose–insulin balance. Such a modification could account for the growth reduction and enhanced fatness of heat-exposed chickens [Aïn Baziz *et al* (1994) *Reprod Nutr Dev* (in press)].

Table I. (JCF Padilha *et al*)

Nutritional state	*TA22*		*TR22*		*TA32*	
injection	*Mean**	*SE*	*Mean**	*SE*	*Mean**	*SE*
Fed						
Saline	2.29^{b}	0.04	2.25^{b}	0.07	2.45^{b}	0.08
Insulin	1.82^{a}	0.05	2.06^{ab}	0.05	1.77^{a}	0.05
Fasted						
Saline	1.87^{b}	0.03	1.94^{b}	0.04	1.86^{b}	0.04
Insulin	0.90^{a}	0.04	0.84^{a}	0.07	1.08^{a}	0.07

* Within a nutritional state, mean values denoted by the same letter were not significantly different ($P < 0.05$).