

Response of blood hormones and nutrients to an ACTH challenge and to a physical stressor in pigs

Prunier et al, Le Floc'h N, Leclercq C, Merlot, E

(abstract number 16800)



Biological response to an acute stressor

Mobilization of nutrients for various purposes :

- Fight/flight reaction (behavioural activity)
- Fever
- Synthesis of new peptides/proteins
-

Hormones from the
adrenal axis:
ACTH, cortisol

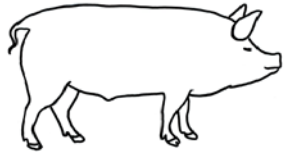
Hormones from the
sympathetic axis axis:
Adrenalin, noradrenalin

Various types of acute stressors

- Immune challenges** (Merlot et al.)
- Psychological stressors** (e.g. isolation...)
- Physical stressors**: e.g. temperature, **pain due to a nose lasso (= snope rope)**....

- Model of a stressor : injection of ACTH**

Material and methods



32 finishing

Aims and measurements

Blood nutrients

- Glucose
 - Lactate
 - Non Esterified Fatty Acids
- } Automated colorimetric assays
- Amino Acids (not all samples)
- UPLC

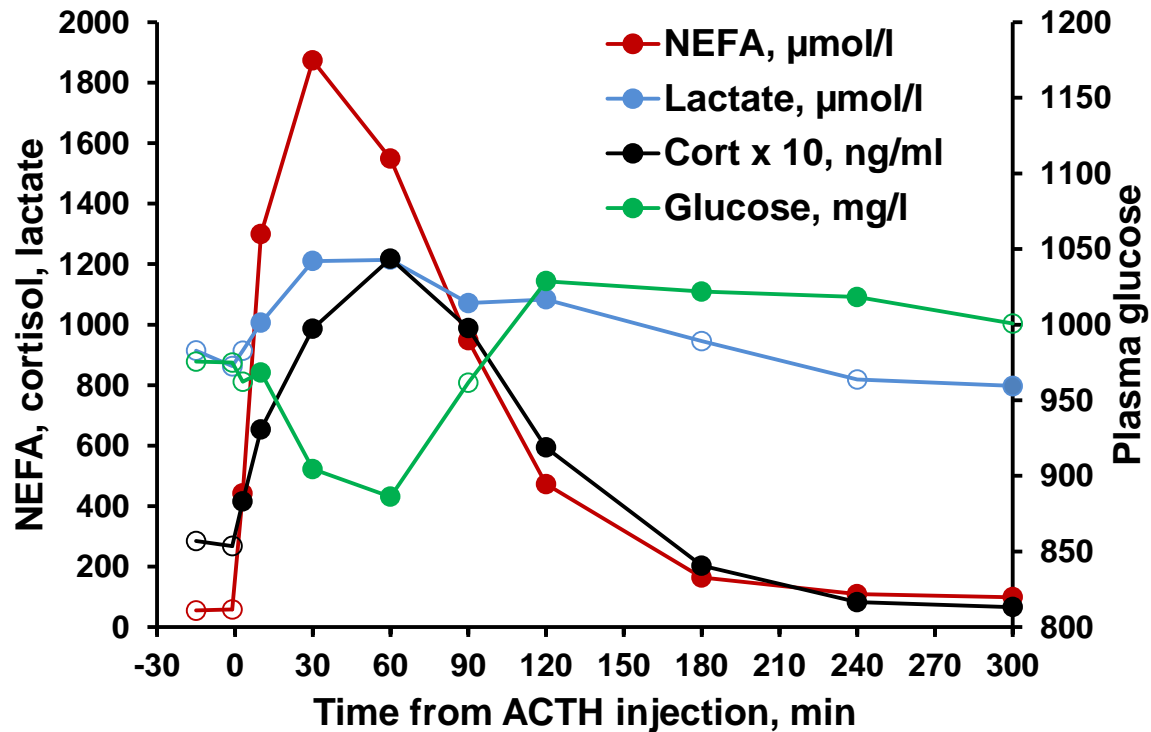
Hormones

- ACTH (after NL), Cortisol
 - Catecholamines (after NL)
- } Immuno-assays

Data analysis by ANOVA using SAS

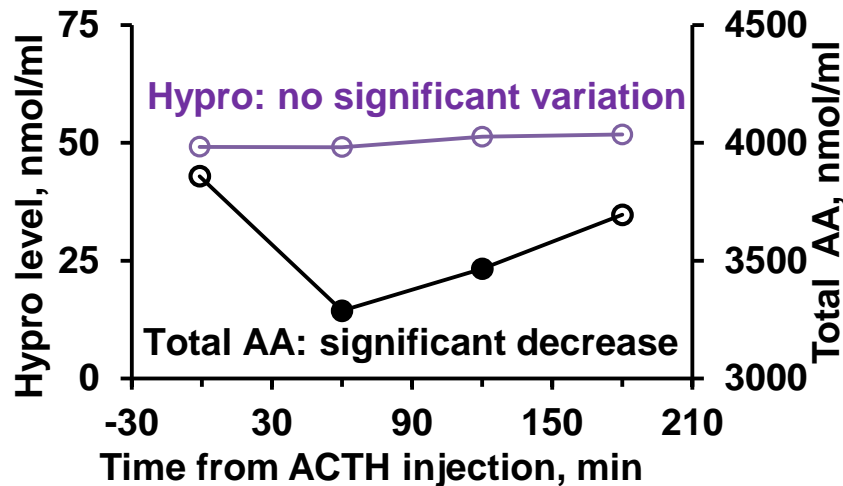
Presentation of raw means in the following graphics

Response to the ACTH challenge



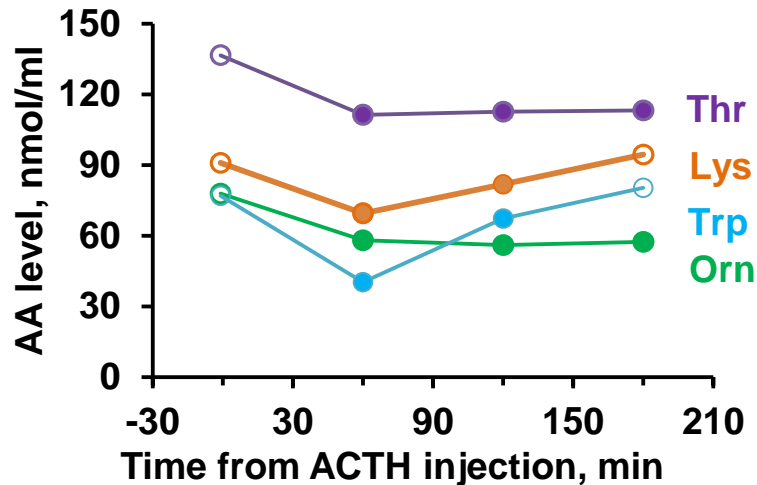
Cort: ' 3-300 min
glucose: " 10-60 min,
' 120-300 min
NEFA: ' 3-300 min
lactate: ' 10-120 min

Response to the ACTH challenge

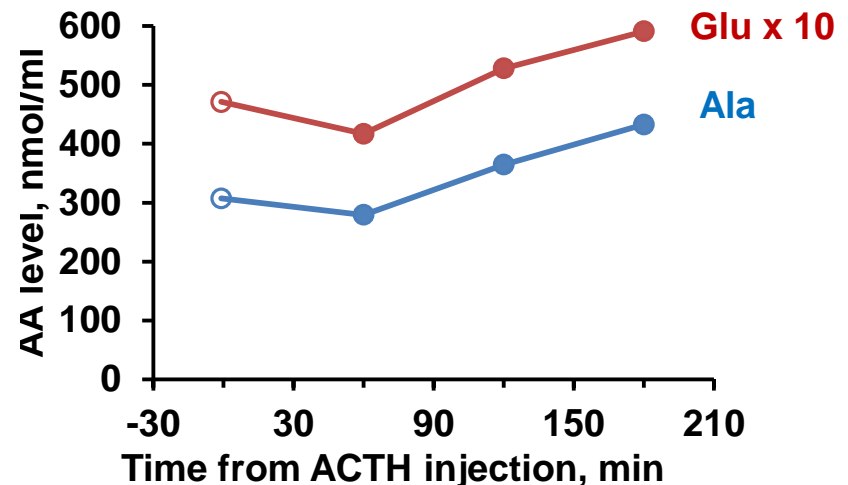


all AA except Hypro: " at 1, 2 and/or 3 hours
 some AA: ' at 2 and/or or 3 hours

Significant decrease for 120 or 180 min



Significant decrease and increase

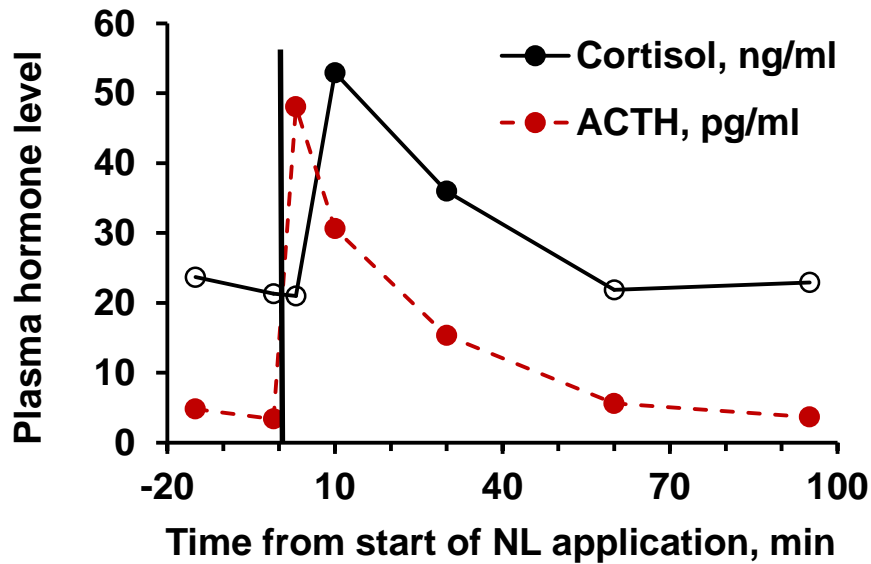


Response to the ACTH challenge

Firstly: high utilization of glucose and amino acids (glucose and most AA “), mobilization of fat and glycogen reserves (NEFA, lactate ‘) to meet the demand in energy

Secondly: plasma glucose is restored and even increased by mobilization of glycogen reserves and/or neoglucogenesis using glycerol, lactate and AA (?) as precursors

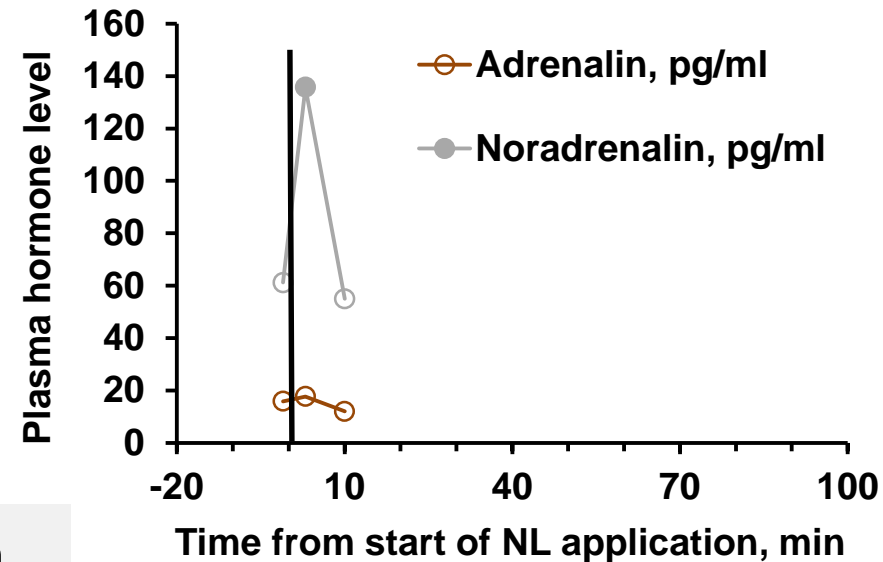
Endocrine response to Nose Lasso



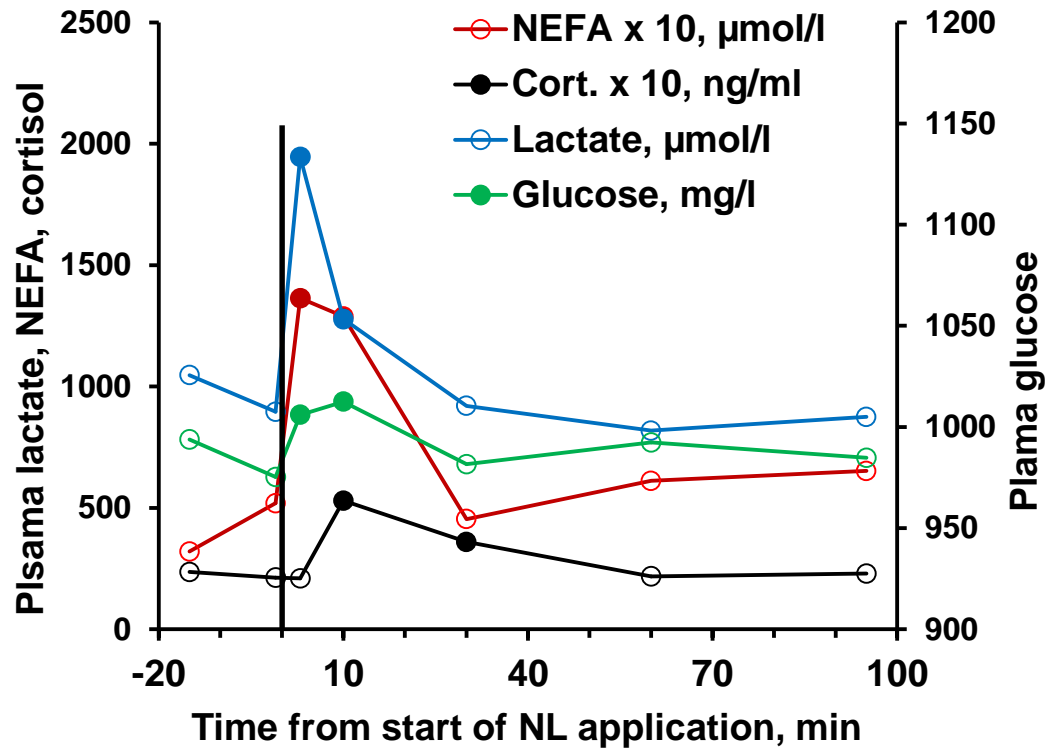
Increase in ACTH followed by cortisol

Increase in noradrenalin

Full dot: significant increase from baseline



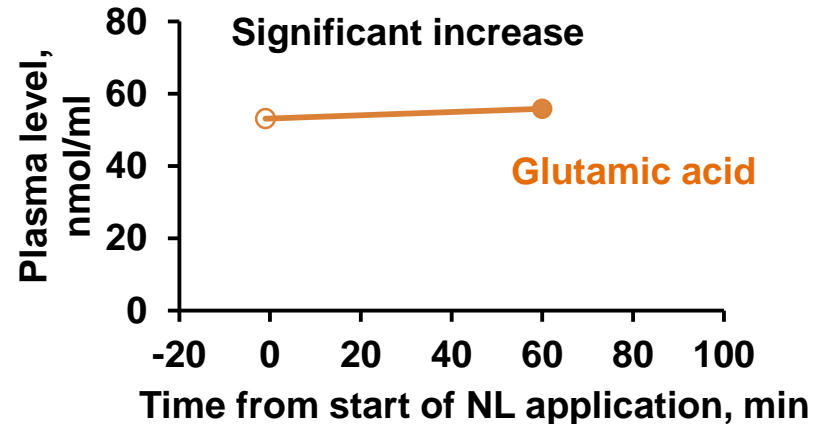
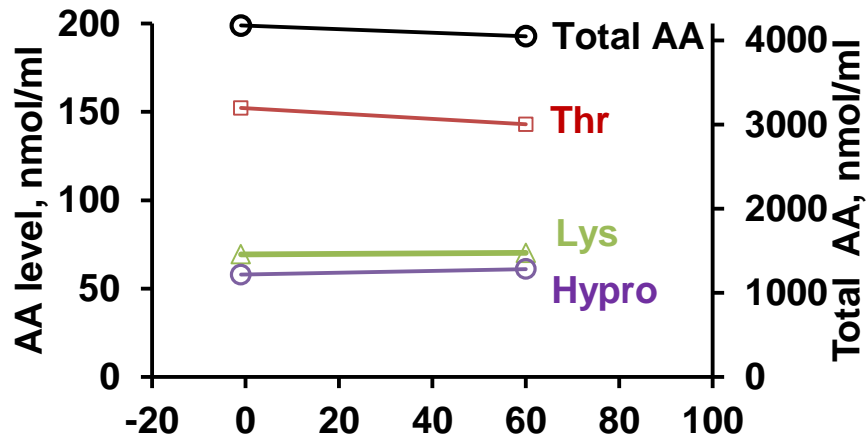
Metabolic response to Nose lasso



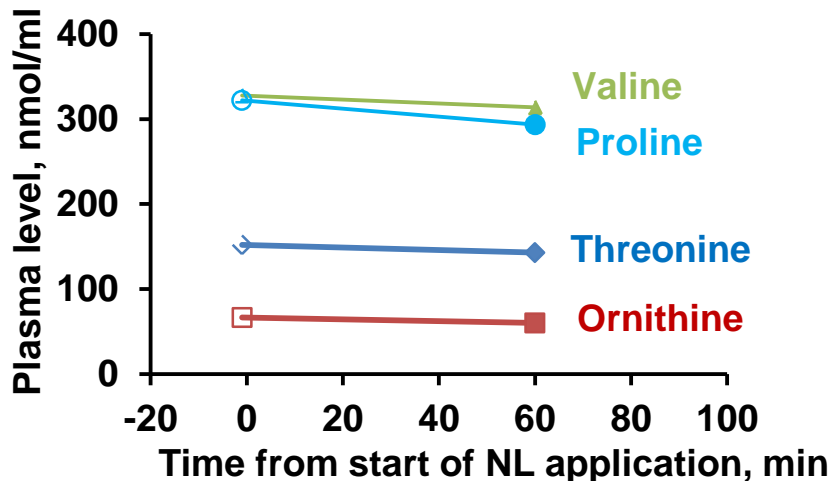
Increase in **NEFA**, **lactate** and **glucose** at + 3, +10 min before cortisol, in parallel to noradrenalin

Metabolic response to the Nose Lasso

No significant variation



Significant decrease



No marked variations
 Variations similar to those related to fasting (utilization of AA for neoglucogenesis)
 Earlier transient effects?

Response to the Nose Lasso

Plasma glucose, lactate and NEFA are increased: intense mobilization of energy from body reserves, essentially fat and glycogen under catecholamines (firstly) and cortisol (secondly)

No clear mobilization of AA from proteins : lack of measurement at +30 min ? stressor not sufficient ?

General conclusion

- ❑ The adrenal axis stimulates the utilization of circulating nutrients (glucose and AA)
- ❑ The adrenal and sympathetic axes stimulate mobilization of fat and glycogen (protein ?) reserves
- ❑ The adrenal axis alone is not sufficient to maintain glucose level in the minutes following a stressor application
- ❑ The sympathetic axis allows a very rapid response (in particular mobilization of glycogen and fat reserves) sufficient to maintain (even increase) plasma glucose

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