mance after a perturbation. This study was conducted to examine the relationship between FE and resilience in high-yielding dairy ewes phenotypically divergent in FE. First, to estimate FE, we used 40 Assaf ewes fed a TMR *ad libitum*, and measured individual DMI and milk yield daily over 3 weeks. Feed efficiency was calculated as the difference between the actual and predicted intake estimated through net energy requirements for maintenance, production and weight change. Then, higher (H-FE; n = 9) and lower (L-FE; n = 9) efficient ewes were subjected to an acute nutritional challenge by withdrawing the TMR and feeding them only wheat straw for 3 days. After this challenge, all animals were fed again the TMR *ad libitum*. The milk yield profile was described using a piecewise model with 5 parameters: V_1, a constant representing the pre-challenge stage; V_2, the linear slope of the response during the 3-d challenge; V_3 and V_4, the linear and quadratic components of the recovery period (post-challenge); and V_5, a constant representing the stabilization period (post-challenge), which started on day 5 of refeeding and lasted until day 10. Orthogonal contrasts were used to test differences between pre-challenge and stabilization periods. As expected, milk yield during the pre-challenge period was greater in more efficient (H-FE) than in less efficient (L-FE) ewes (V_1; $P < 0.05$), with no difference in DMI ($P > 0.10$). The drop (V_2) caused by the challenge was also stronger in H-FE ($P < 0.05$). During the recovery period, the linear component (V_3) tended to be higher in H-FE ewes ($P = 0.089$), and no differences were found in the quadratic component (V_4; $P > 0.10$). In the stabilization period, milk yield (V_5) was again higher in H-FE ($P < 0.001$). However, pre-challenge values (V_1) were not fully recovered in either H-FE or L-FE ($0.05 < P < 0.10$ for V_1 vs V_5), which might be explained by a persistent detrimental effect of the challenge, at least in the short-term. Overall, the temporal pattern of variation in milk yield seem to be linked to the pre-challenge milk yield level and not to the FE. In any case, results suggest that improving FE would not detrimentally affect resilience. Acknowledgements: Projects PID2020-113441RB-I00 (MCIN/AEI/Spain) and SMARTER (H2020#772787/European Union), and grant PRE2021-098235 (MCIN/AEI/Spain).

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Resilience to acute underfeeding in dairy sheep diverging in feed efficiency: 2) blood metabolites

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Keywords
Lactating ewes; Nutritional challenge; Glucose; NEFA; BHB.

In the current scenario of climate change and economic instability, it can be expected that livestock will increasingly face nutrition-related challenges. Resilience (understood as the ability of an animal to revert quickly to high production and health status in response to a perturbation) would therefore be of great importance. However, animal breeding is still focused on higher production or, at best, higher feed efficiency (FE). Yet, it is uncertain whether improving FE could detrimentally affect resilience, particularly in small dairy ruminants. This experiment was carried out to examine the relationship between resilience and FE; namely, to compare the variation in some blood metabolites in dairy ewes phenotypically divergent for FE and subjected to an acute nutritional challenge. First, to estimate FE, we used 40 Assaf ewes fed a TMR *ad libitum*, and measured individual dry matter intake and milk yield daily over 3 weeks. Feed efficiency was calculated as the difference between the actual and predicted intake estimated through net energy requirements for maintenance, production and weight change. Then, after selecting two groups of FE ewes: higher (H-FE; n = 9) and lower (L-FE; n = 9) efficient ewes, they were subjected to a nutritional challenge. The trial consisted of three periods: the pre-challenge (when animals were fed TMR *ad libitum*), the challenge (lasting for 3 days, when the TMR was withdrawn and the ewes were only fed wheat straw) and the post-challenge (lasting for 10 days, when animals were fed again TMR *ad libitum*). At the end of each period, blood samples were collected (before milking and feed administration) and the serum was analyzed for glucose, non-esterified fatty acids (NEFA) and β-hydroxybutyrate (BHB) concentrations during the trial. The data were subjected to repeated measurements analysis, with animals nested within the group. The results showed that glucose levels tended to be marginally greater in H-FE than L-FE ($P = 0.058$), and dropped significantly ($P < 0.001$) due to the underfeeding. Surprisingly, pre-challenge levels were not recovered on day 10 post-challenge. No differences between groups were detected for NEFA concentrations, which sharply increased during the straw challenge and showed the lowest values in the post-challenge period ($P < 0.001$). Regarding BHB, higher levels due to feed deprivation were only observed in the H-FE group (Group × Period interaction, $P = 0.022$). This could derive from a greater tissue mobilization and might have prevented a stronger drop in glycaemia in these more efficient ewes. Results on blood serum metabolites may suggest that selection for high FE dairy ewes would not negatively influence their resilience, as more (H-FE) and less (L-FE) efficient ewes responded to and recovered from the acute nutritional challenge similarly. Acknowledgements: Projects PID2020-113441RB-I00 (MCIN/AEI, Spain) and SMARTER (H2020 #772787, European Union), and predoctoral grant PRE2021-098235 (MCIN/AEI, Spain).

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INTERNATIONAL SYMPOSIUM ON THE NUTRITION OF HERBIVORES

11th edition

June 4-8, 2023
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INTERNATIONAL SYMPOSIUM ON THE NUTRITION OF HERBIVORES

WELCOME

The International Symposium on the Nutrition of Herbivores (ISNH) is a worldwide gathering of leading scientists, students, industry, extension, and primary producers that addresses various issues related to herbivore nutrition in natural ecosystems or commercial production systems. It is the world's most important scientific forum on this topic, in which the nutrition of domestic and wild herbivores is discussed from the perspective of sustainability, food security, and conservation.

The Symposium was held for the first time in South Africa (1983), later taking place in Australia (1987), Malaysia (1991), France (1995), the USA (1999), Mexico (2003), China (2007), UK (2011) and Australia (2014). In 2018, the 10th and last edition took place in Clermont-Ferrand, France, with ~500 participants from all continents. Unfortunately, due to the Covid-19 pandemic, the sequence of holding a symposium edition every four years has been disrupted. The ISNH is now resumed in its 11th edition in Brazil for the first time in Latin America.

The historical evolution of the different editions denotes the transition from the pure nutrition ecology of the first ones towards a more global contextualization of the role of herbivores in food security as well as issues related to the role of herbivores in greenhouse gas emissions, human food, and human well-being associated with the different production systems. Furthermore, the most recent editions have boldly expanded the spatial scale of herbivory analysis, which now ranges from the genome to the production system.

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Resilience to acute underfeeding in dairy sheep diverging in feed efficiency: 2) Blood parameters

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INTRODUCTION

In the current scenario of climate change and economic instability, it can be expected that livestock will **increasingly** face **nutritional challenges**.

Resilience (understood as the ability of an animal to revert quickly to high production and health status in response to a perturbation) would therefore be of great importance. However, animal breeding is still focused on higher production or, at best, higher feed efficiency (FE).

Yet, it is uncertain whether **improving FE** could detrimentally **affect resilience**, particularly in small dairy ruminants.

OBJECTIVE

Examine the **relationship between resilience and FE**; namely, to compare the variation in some **blood metabolites** in dairy ewes phenotypically **divergent for FE** and **subjected to an acute nutritional challenge.**

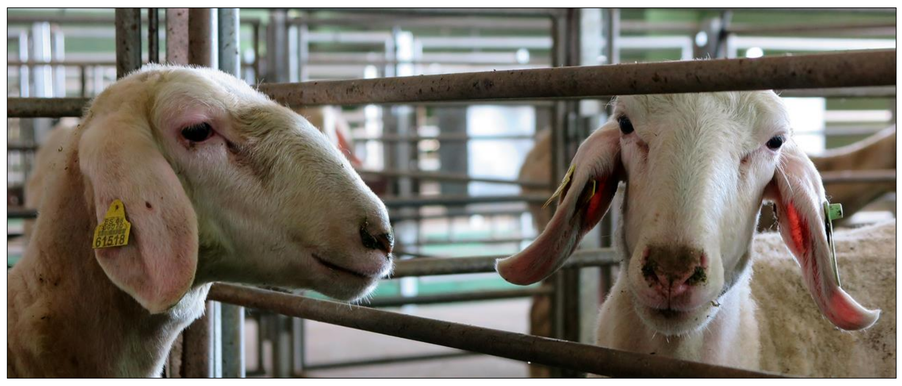
MATERIALS AND METHODS

40 lactating Assaf ewes (housed in individual pens and fed *ad libitum* a 50:50 TMR)

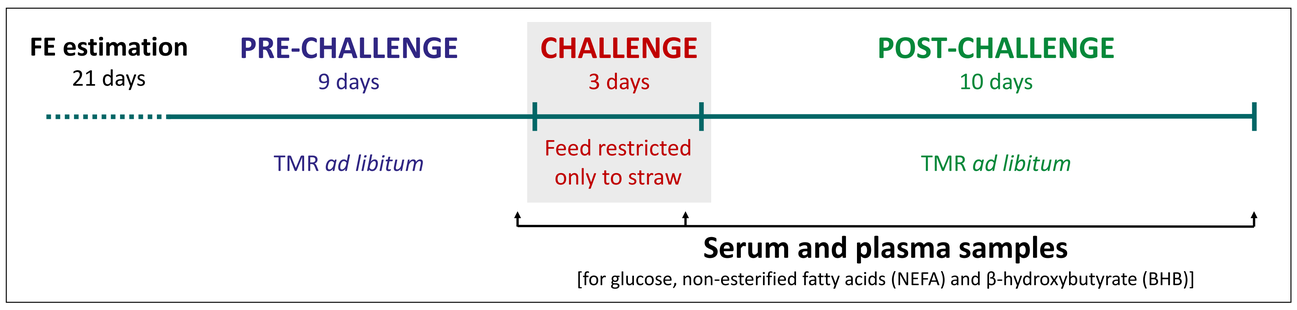
FE estimation (Feed intake + dairy performance monitored over 3 weeks)

Actual intake – predicted intake [based on net energy requirements for maintenance, production and weight change (INRA, 2018)]

Selection of { **H-FE**: least efficient ewes (n = 9); **L-FE**: most efficient ewes (n = 9)



Nutritional challenge



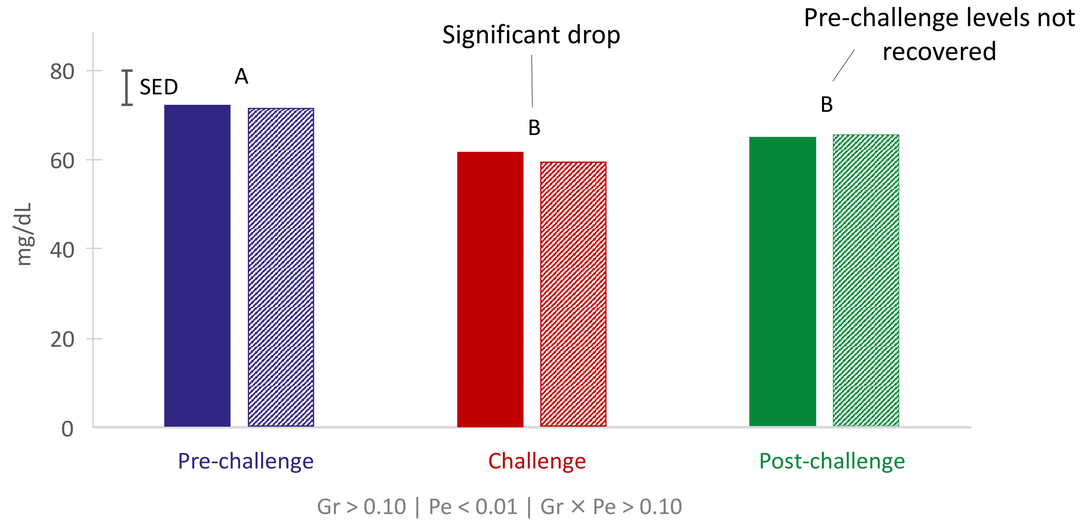
Statistical analysis

- Repeated measurement analysis, animals nested within the group.
- Fixed effects of group (Gr: H-FE and L-FE), period (Pe: pre-challenge, challenge and post-challenge) and their interaction (Gr × Pe).
- Means adjusted for multiple comparisons using Bonferroni's method.

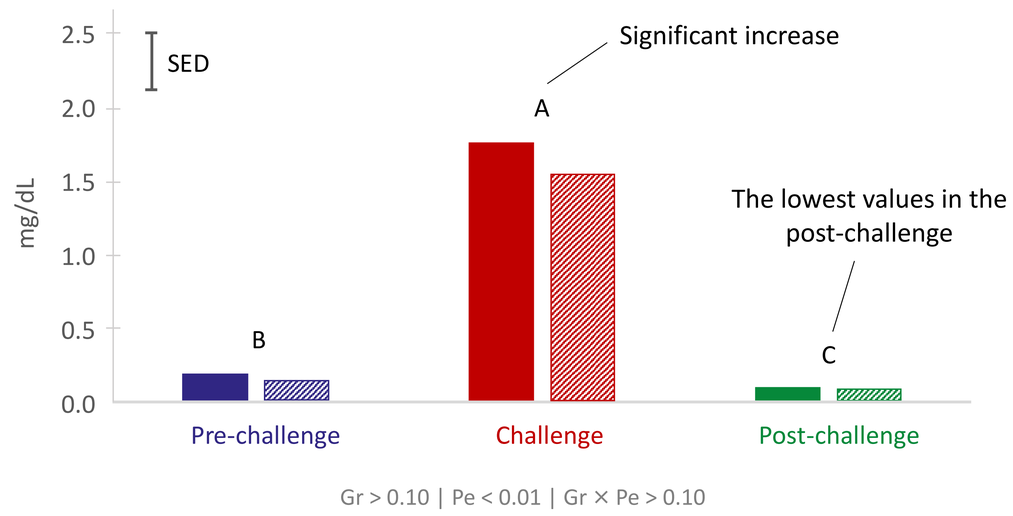
RESULTS AND DISCUSSION

P-values for the effects of group (Gr), period (Pe) and their interaction (Gr × Pe) are shown below each panel.
[A, B, C] Superscripts indicate significant differences (P < 0.05) due to the effect of Period.
[a, b] Superscripts indicate significant differences (P < 0.05) due to the effect of Group × Period.

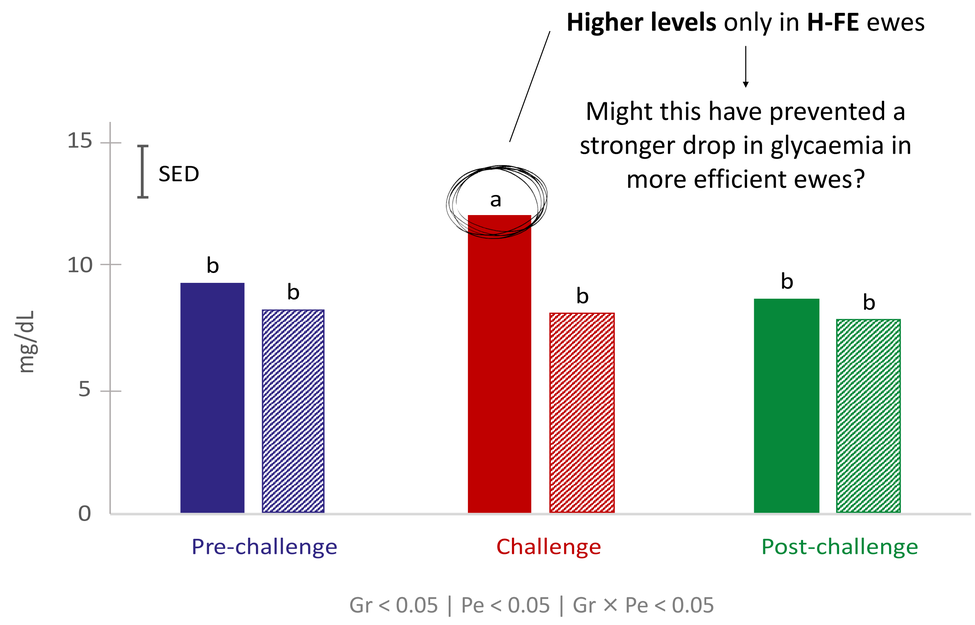
GLUCOSE



NON-ESTERIFIED FATTY ACIDS (NEFA)



β-HYDROXYBUTYRATE (BHB)



CONCLUSIONS

Results on **blood serum metabolites** may suggest that **selection for high FE dairy ewes would not negatively influence their resilience**, as more (H-FE) and less (L-FE) efficient ewes responded to and recovered from the acute nutritional challenge similarly.

Projects PID2020-113441RB-I00 (MCIN/AEI/Spain) and SMARTER (H2020#772787/European Union), and grant PRE2021-098235 (MCIN/AEI/Spain)