

The level of methionine deficiency determines its effects on energy metabolism in growing rats

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Conflict of Interest Disclosure

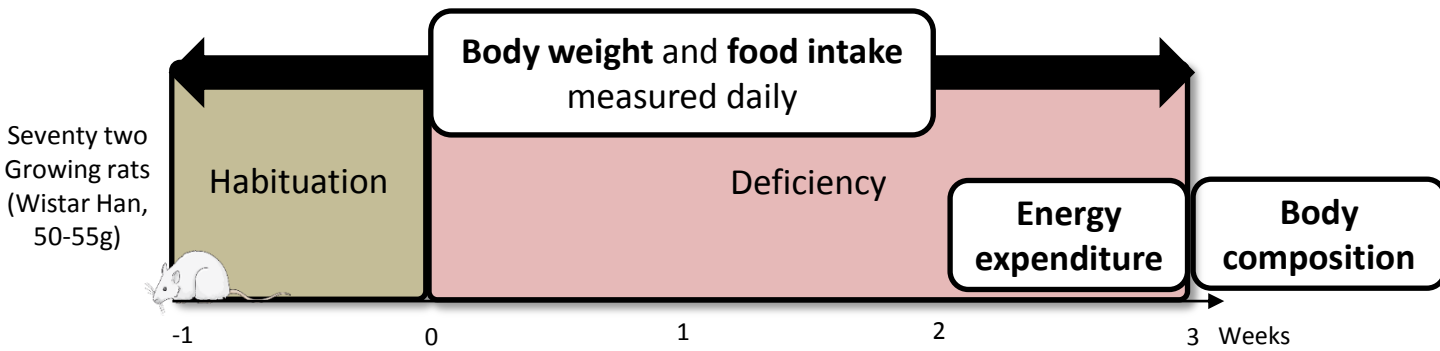
I have no conflict of interest to report in relation to this presentation.

Background

- Protein or amino acid deficient diets **enhance energy intake**, leading to **a risk of higher adiposity** (protein leverage hypothesis)^{1,2}.
- It also **increases energy expenditure** and **improves insulin sensitivity**, which in turn lowers blood lipids and adiposity³ and methionine deficiency has been reported as **beneficial for long-term health**⁴.
- However, when fed to young animals, methionine-deficient diets induce **growth retardation**⁵⁻⁶.
- Some studies investigated the effects of several levels of methionine intake⁷⁻⁸, but not in post-weaning rats.

Objective

➔ **Characterize the effects of multiple methionine deficient levels on growth and energy metabolism in growing rats**

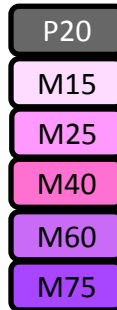
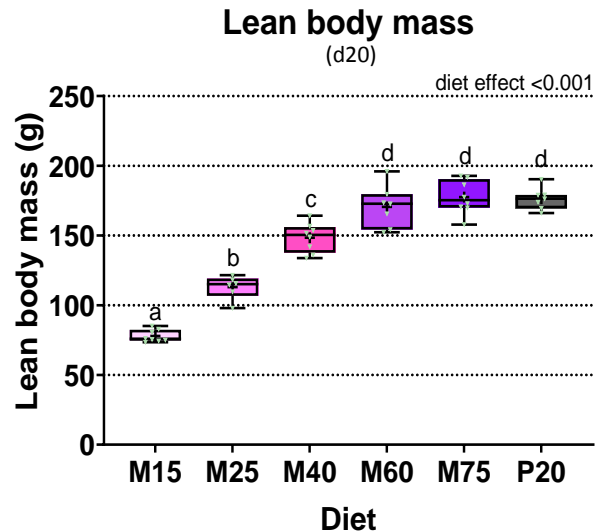
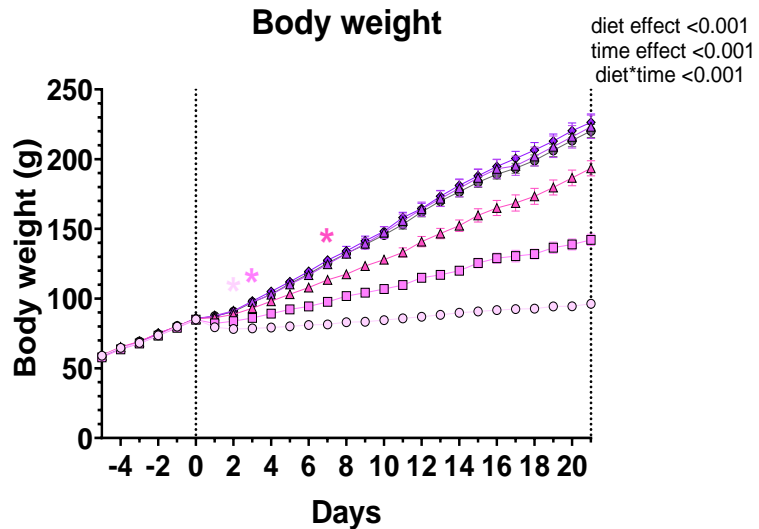


Body weight was analyzed by repeated measures mixt model, and other variables by one-way ANOVA.

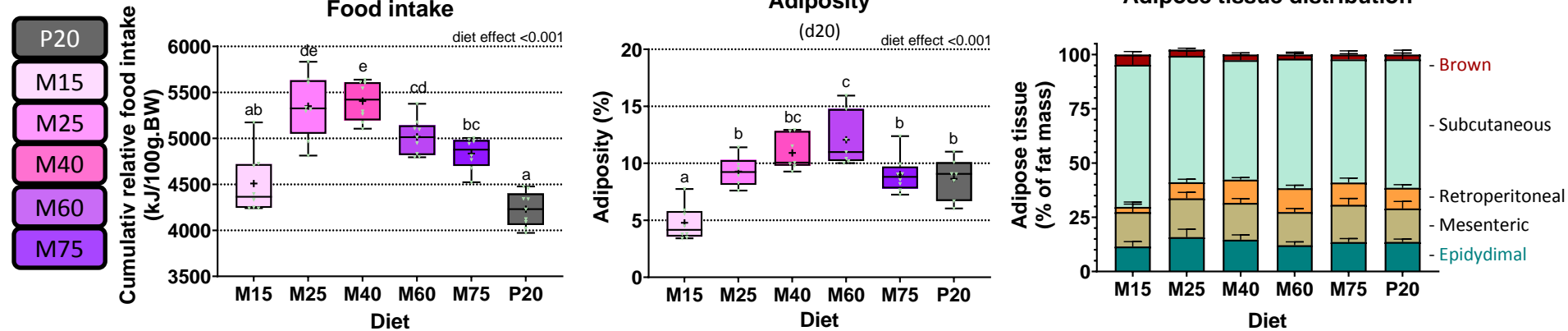
Diets:

- P20** Control
- M15** 15% of control methionine
- M25** 25% of control methionine
- M40** 40% of control methionine
- M60** 60% of control methionine
- M75** 75% of control methionine

* Other indispensable amino acids were supplemented to the control's level.
 * Diets were isonitrogenous by adjusting alanine content.



- Methionine deficiency induced **growth retardation** for severely to moderately deficient diets (15, 25, 40%).
- The lower body weight was mainly reflected by a **reduced lean body mass**.



- Growing rats fed methionine-deficient **diets increased their FI**, probably to compensate for the methionine deficiency unless the latter is too severe (15%).
- In the absence of dietary compensation (15%), **adiposity was also decreased**.
- The increase in FI was maximal for the moderate deficient diets, leading to **higher adiposity for the 60% diet**.
- The most impacted adipose tissue **was retroperitoneal fat**, which is associated with metabolic syndrome¹.

→ Potential explanation of methionine deficiency's positive effect of long-term health².

P20

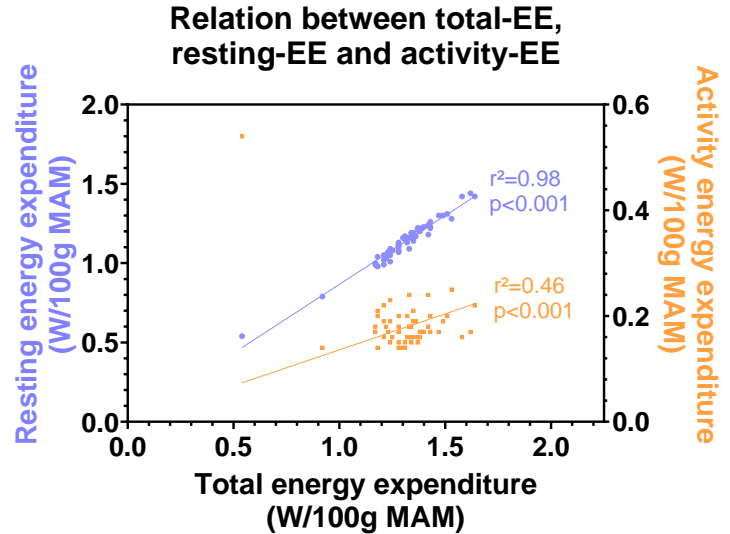
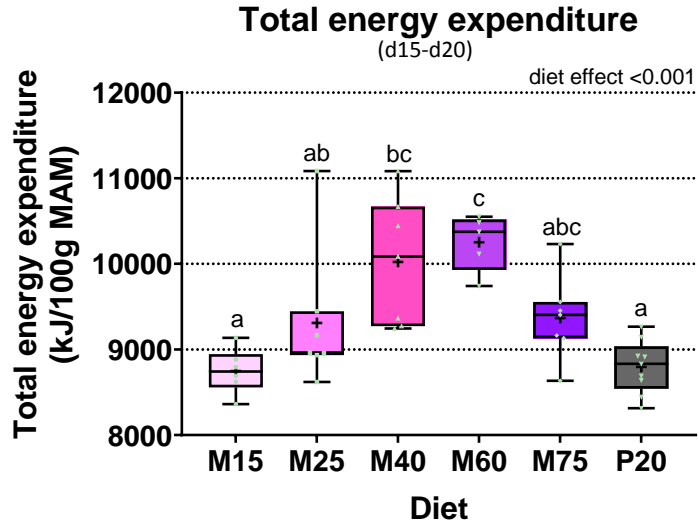
M15

M25

M40

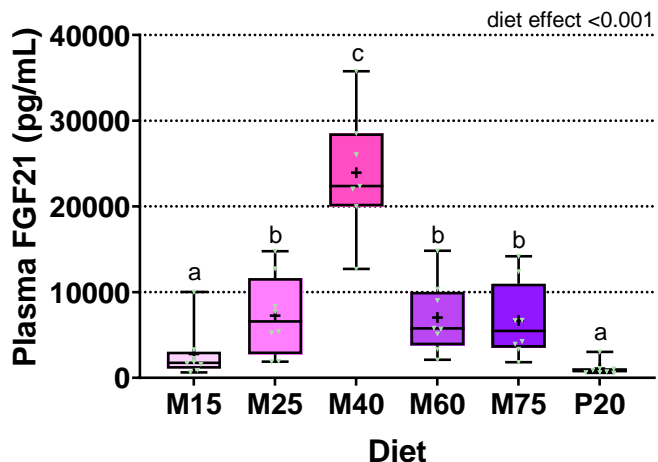
M60

M75

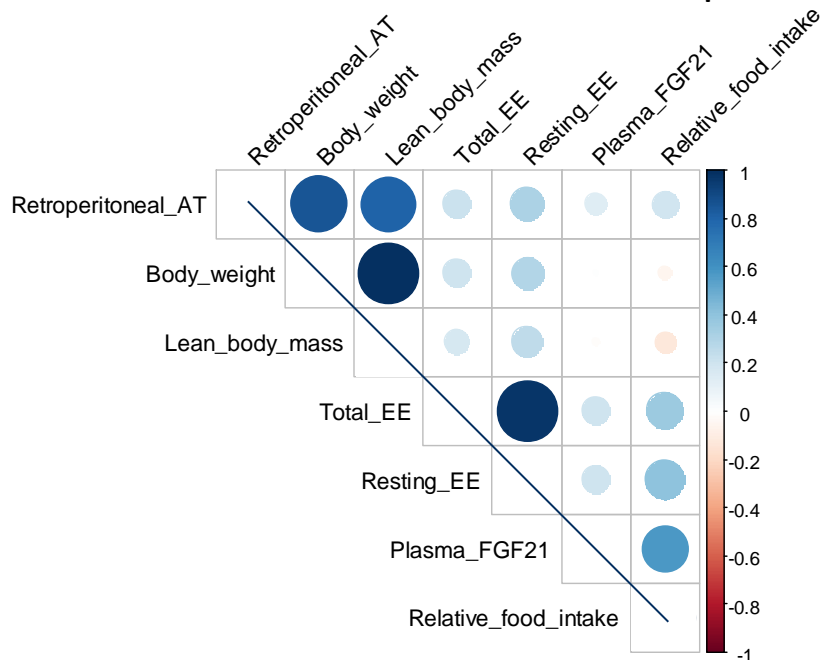


- Rats subjected to a moderate deficiency (40 and 60%) **increased their energy expenditure.**
- The higher energy expenditure was mainly mediated by **resting energy expenditure.**
- However, the higher TEE does not balance the higher energy intake for the M60 rats, which have an increase in body fat.

Plasma FGF21



Correlation matrix between measured parameters



- FGF21 is enhanced during methionine deficiency.
- FGF21 is not the sole mediator of methionine deficiency.

- Our study on post-weaning rats confirmed the results obtained on mice¹ and on older rats².
- Concerning the level of methionine deficiency compared to control (P20):

M15 - Severe deficiency (15%) lower FI and induces growth retardation, with a lower fat deposition.

M25 - Intermediates severe/moderate deficiency (25-40%) increase their FI but cannot avoid their growth
M40 retardation.

M60 - Moderate level of methionine deficiency (60%) increases FI and does not induce growth retardation, but their higher EE cannot balance their excess of energy intake, leading to higher adiposity.

M75 - Slight deficiency (75%) support growth.

P20