

NEONATAL OVER-NUTRITION CAUSES SEX AND AGE DEPENDANT LONG-TERM EFFECTS ON BODY WEIGHT, BODY COMPOSITION AND SERUM TRIGLYCERIDE AND FREE FATTY ACID LEVELS



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The authors have nothing to declare

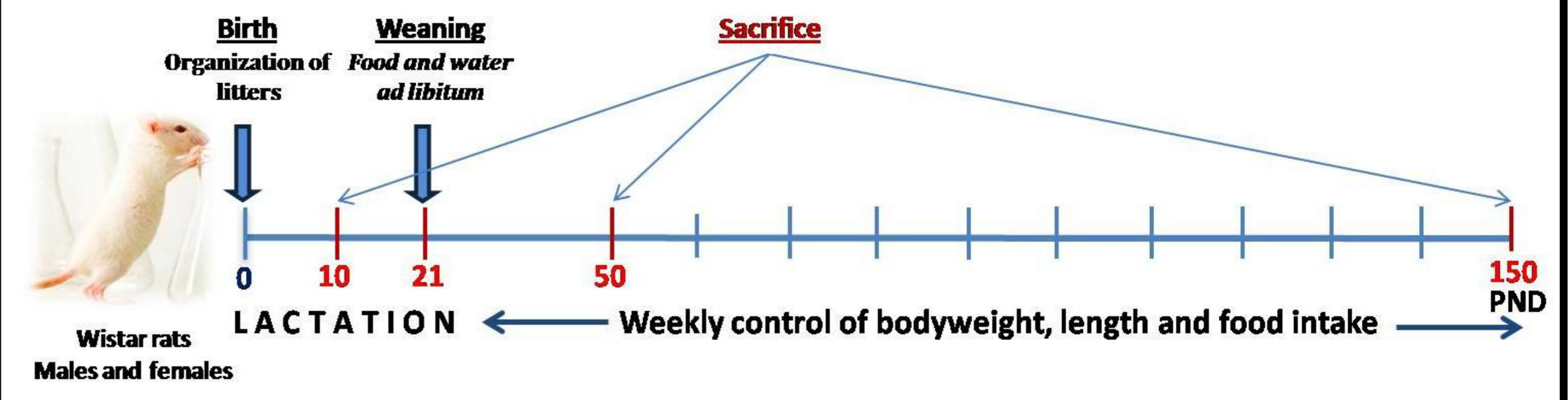
BACKGROUND METHODOLOGY

Early nutritional disturbances, such as neonatal over-nutrition (NON) during infancy, can increase the propensity to become overweight or obese in later life and have been demonstrated to have effects on adult metabolic homeostasis. Moreover, the appearance of some of these long-term effects can be delayed or change throughout life. Moreover, males and females are often differentially affected by early environmental changes.

At birth, Wistar rats were organized into litters of 4 pups/dam [(L4); neonatal over-nutrition (NON)] and 12 pups/dam [(L12); control (CT)] with equal numbers of males (M) and females (F) in all litters. Rats were sacrificed on postnatal days (PND) 10, 50 or 150.

Body weight and length were monitored on the day of birth and then weekly from weaning until the day of sacrifice. Subcutaneous (SC) and visceral (VAT) adipose tissue were dissected and weighed.

Serum levels of TG and NEFA were measured.



HYPOTHESIS & AIM

We aimed to determine how neonatal overnutrition affects body weight (BW), body composition and serum triglyceride (TG) and non-esterified fatty acids (NEFA) levels at different postnatal ages in male and female rats. We hypothesized that the effects would be both age and sex dependant.

RESULTS

At PND10, BW was greater in NON rats of both sexes ($p < 0.0001$; Fig. 1A) and this continued until approximately PND60. This effect on BW then dissipated and reappeared at PND90, but only in males ($p < 0.0001$). At PND10 and until weaning (PND21) SCAT was increased by NON (Fig.1B), with females more affected than males ($p < 0.0001$). At P150, NON males again had increased SCAT (Fig.2B). At weaning, VAT was increased in NON rats ($P < 0.001$) and males had more VAT than females ($p < 0.0001$). Serum levels of TG were unaffected by NON at PND10 (Fig.1C) and PND50 (Fig.3A), but were increased at PND150 (Fig.2C), with NON males having higher levels than NON females ($p < 0.03$). Serum NEFA levels were unchanged at PND10 (Fig.1D). At PND50, NON females had lower NEFA levels than CT females and NON males (Fig. 3B), while NON males tended to have increased NEFA levels compared to CT males. At PND150, NEFA levels (Fig.2D) were increased in NON males compared to CT males ($p < 0.05$).

POSTNATAL DAY 10

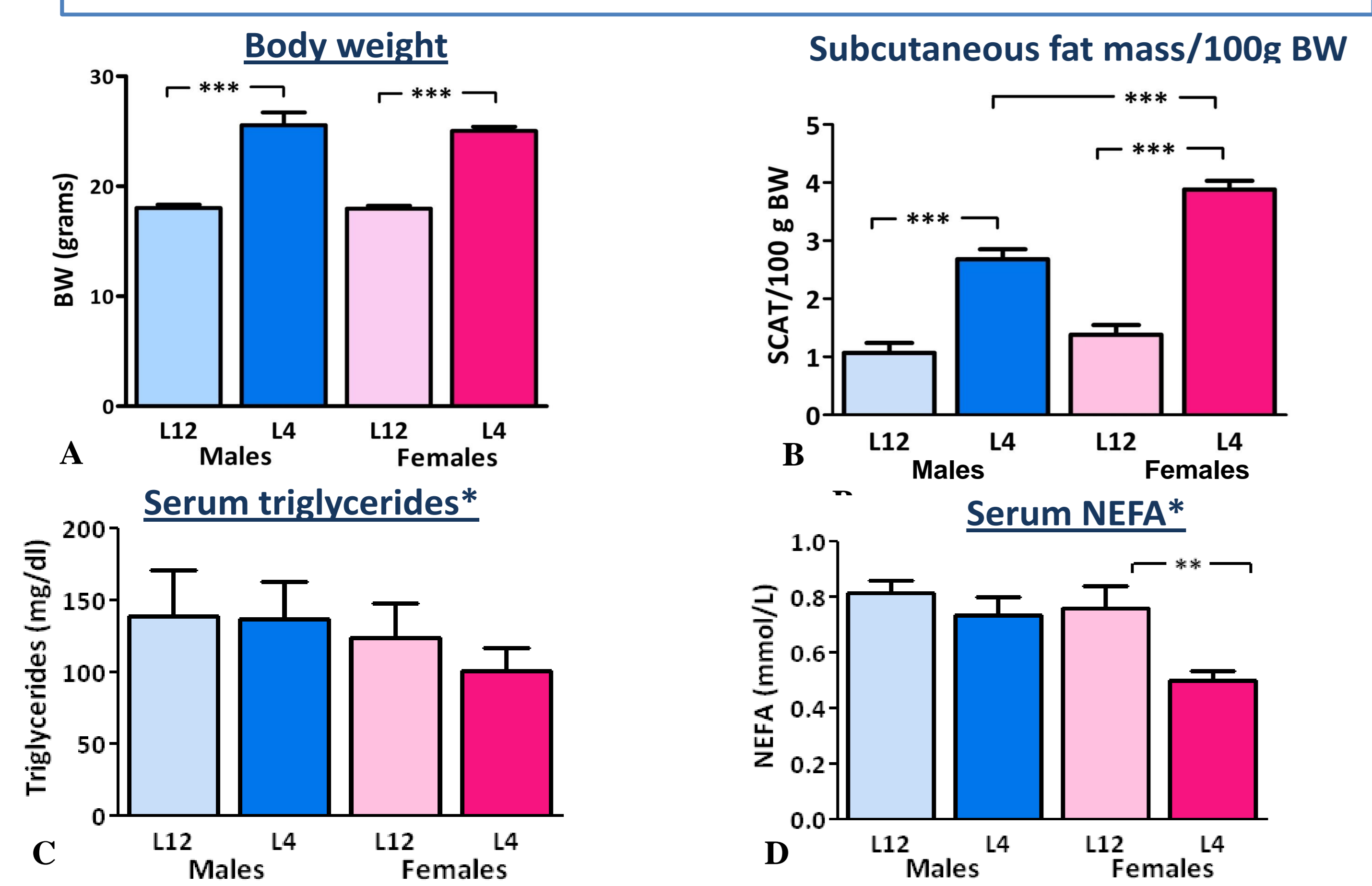


Figure 1. Body weight (A), subcutaneous adipose tissue (B), serum triglyceride (C) and NEFA (D) levels of male and female rats at 10 days of age raised in litters of 12 (L12) and 4 (L4) pups/dam $**p < 0.01$, $***p < 0.0001$. *Non-fasting samples

POSTNATAL DAY 150

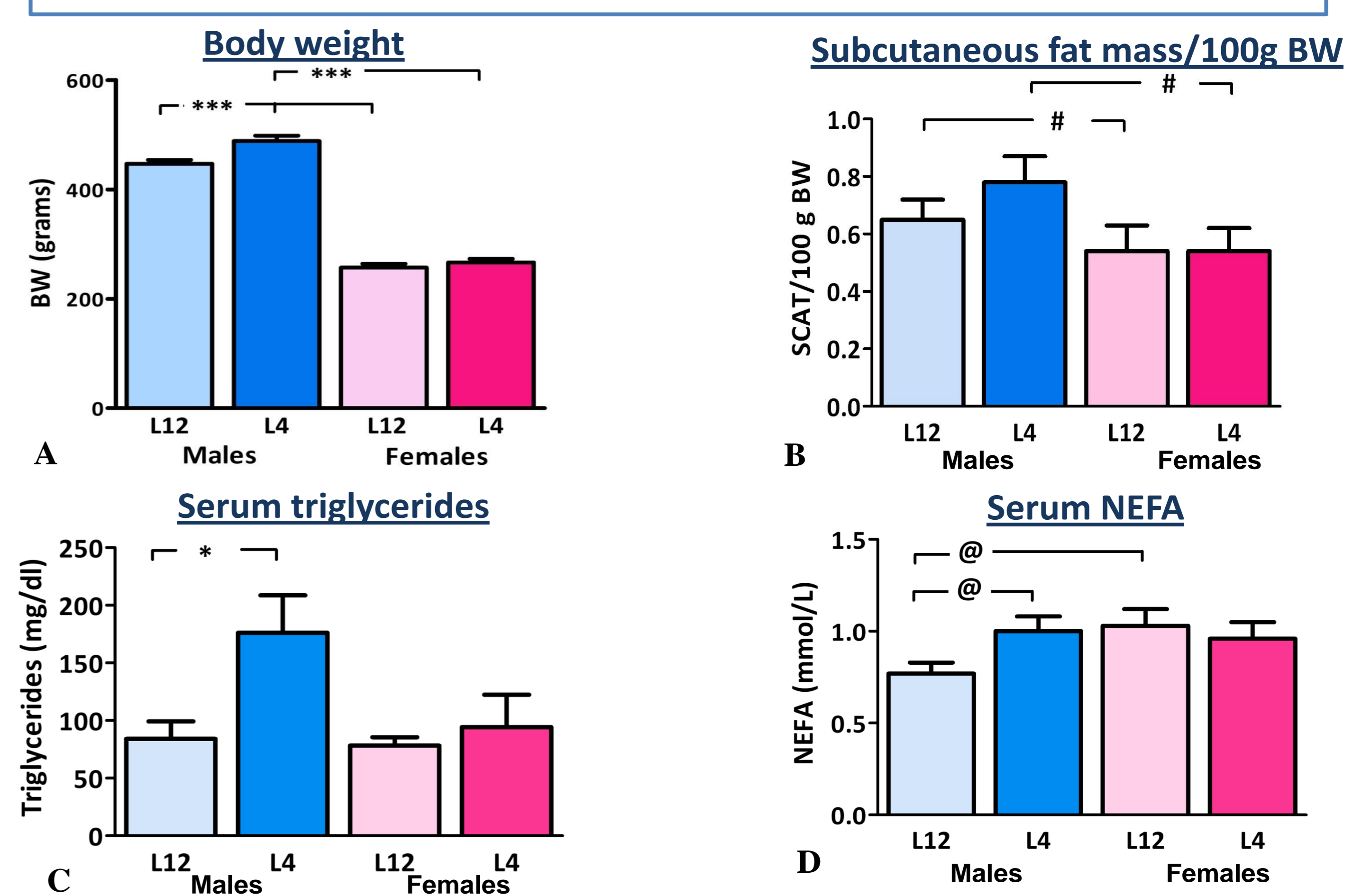


Figure 2. Body weight (A) and subcutaneous adipose tissue (B), serum triglyceride (C) and NEFA (D) levels of male and female rats at 150 days of age raised in litters of 12 (L12) and 4 (L4) pups/dam. $***p < 0.0001$, $*p < 0.05$, # overall litter sex effect, @ T-test $p < 0.04$

POSTNATAL DAY 50

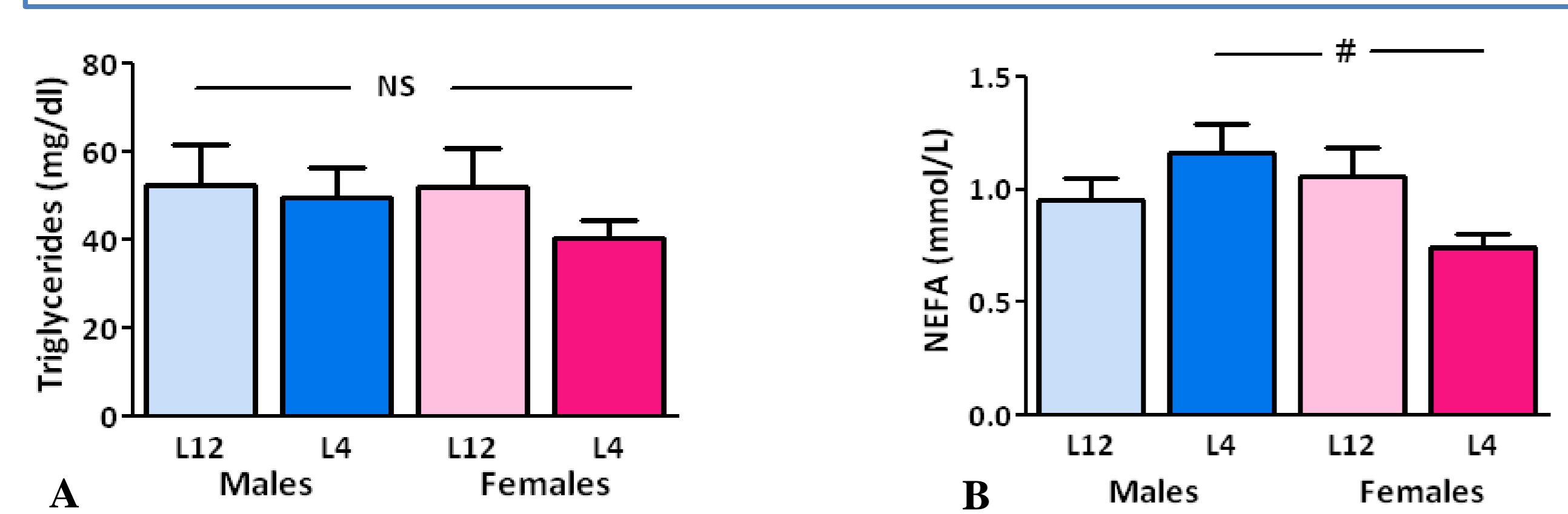


Figure 3. Serum triglyceride (C) and NEFA (D) levels of male and female rats at 50 days of age raised in litters of 12 (L12) and 4 (L4) pups/dam. # Litter size*sex effect, NS: not significant. There was no effect on body weight or adipose tissue mas.

CONCLUSIONS:

1. Early over-nutrition affects males and females differently, even prepubertally.
2. The long-term effects of neonatal overnutrition are both age and sex dependant.
3. Neonatal over-nutrition could possibly affect the aging of metabolic homeostasis.