Influence of the Factors of Maternal Milieu on Taste Preferences and Metabolic Parameters in Mouse Male and Female Offspring

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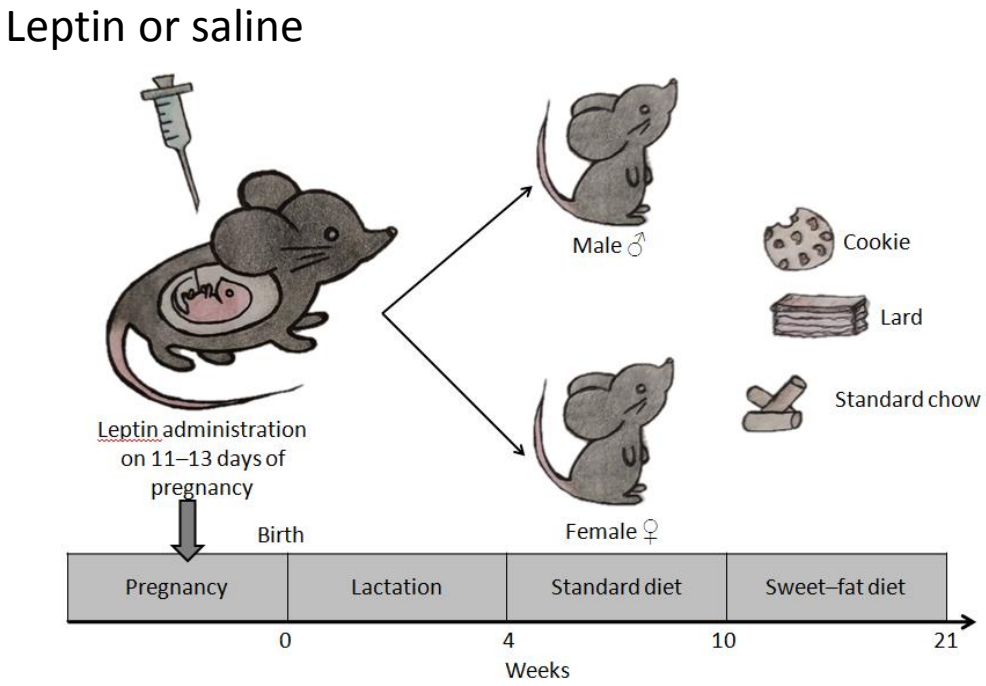
Obesity is now a leader among noncommunicable diseases. Calorie overload induces the obesity development, and the preference and availability of sweet and fat foods contribute to obesity spread. Prenatal and early postnatal conditions affect the susceptibility to obesity and may influence on taste preferences, however, the mechanisms mediating maternal effects on taste preferences in offspring are unknown.

The adipose hormone leptin may be one of the factors mediating maternal influence on offspring phenotype. An increase in leptin blood levels in pregnant mice counteracts the development of diet-induced obesity in the offspring, and the programming leptin effects may be different in the offspring of different sexes. It is not known whether the beneficial programming effect of maternal leptin on the susceptibility to obesity is associated with its effect on taste preferences.

Aim: to evaluate the effect of leptin administration to pregnant mice on metabolic phenotype, the rate of diet-induced obesity, and taste preferences , and liver gene expression in offspring of different sexes

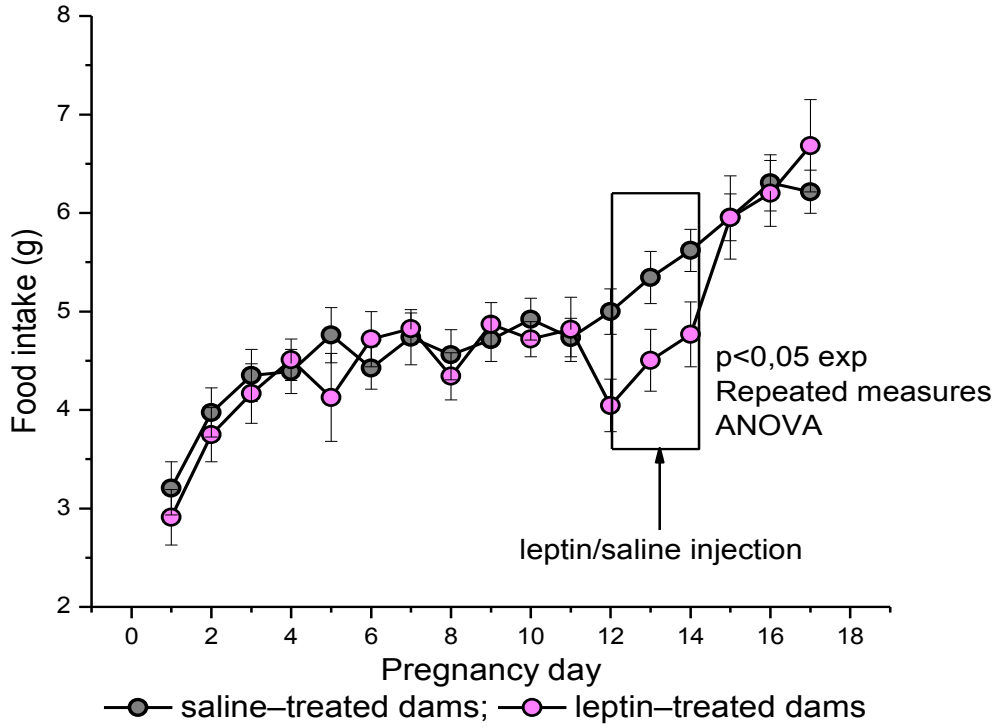
METHODS



The animals were sacrificed by decapitation, and samples of liver were collected to measure gene expression.

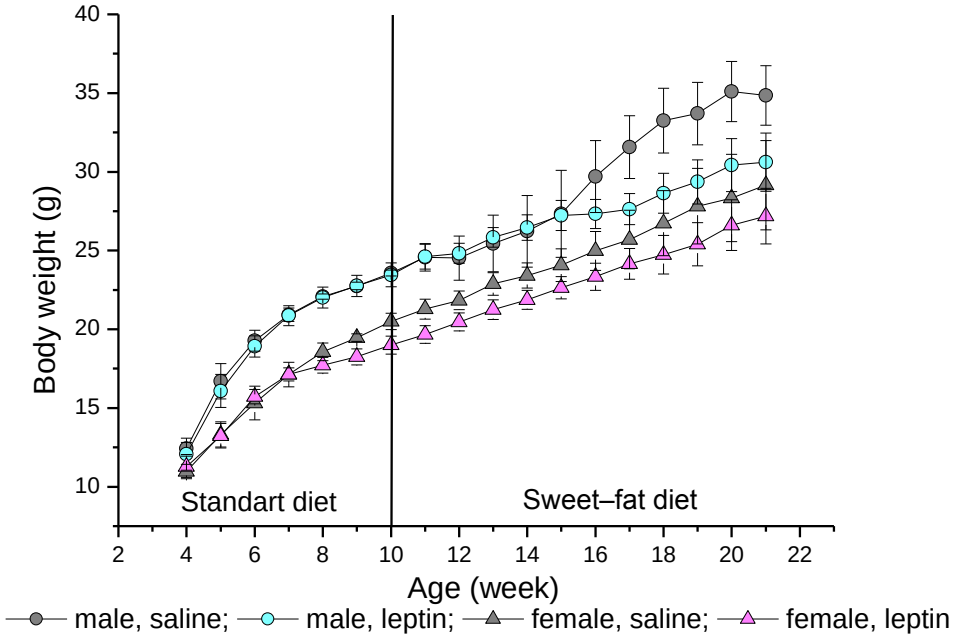
Results

Figure 1. Influence of leptin administration on food intake changes in pregnant mice.



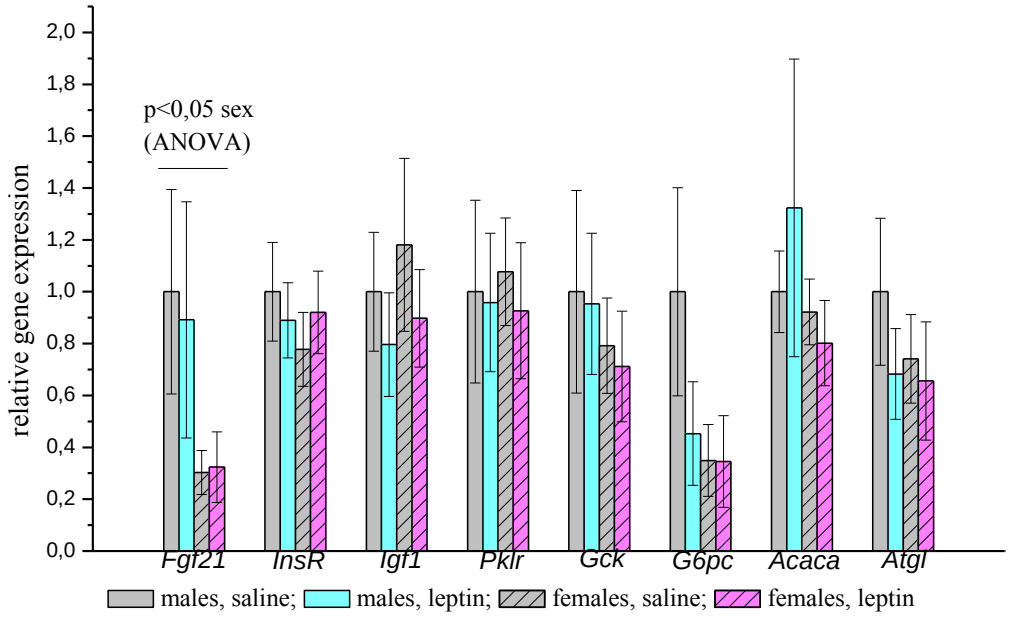
Leptin administration on days 11-13 of pregnancy reduces food intake in pregnant mice on 18-20%.

Figure 2. Influence of leptin administration to pregnant mice on offspring body weight changes during standard and fat and sweet diet feeding.



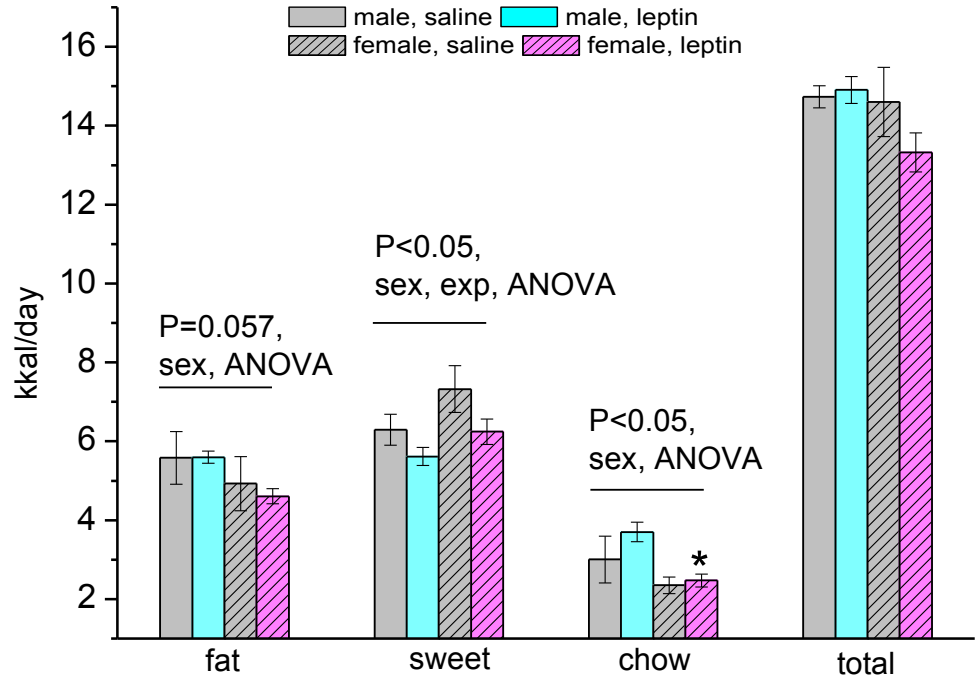
Prenatal exposure to leptin did not affect body weight in males when kept on a standard diet but reduced the rate of development of obesity when kept on a sweet and fat diet.
In females, prenatal exposure to leptin reduced body weight from the age of puberty (8 weeks), and this trend continued throughout the experiment.

Figure 3. Effect of leptin administration to pregnant mice on offspring gene expression in the liver



Prenatal exposure to leptin did not affect the expression of genes involved in carbohydrate and lipid metabolism in the liver in both males and females. Expression of Fgf21 gene was higher in males.

Figure 4.Influence of leptin administration to pregnant mice on offspring taste preferences.



*P<0.05 between males and females born to leptin-treated mothers, Post Hoc Duncan test.

Males consumed more standard food and less sweet food than females. Prenatal exposure to leptin reduced the consumption of sweet biscuits in both males and females, but did not significantly affect the calorie intake

Conclusion: Increased level of leptin during pregnancy can be a factor that reduces the risk of diet-induced obesity in offspring of both sexes, but the mechanisms mediating programming effect of leptin can vary in offspring of different sexes. The long-lasting effect of maternal leptin on offspring taste preferences may be one of the reasons for its beneficial effect on the susceptibility to obesity in offspring.