Investigation into β-cell adaptation during puberty

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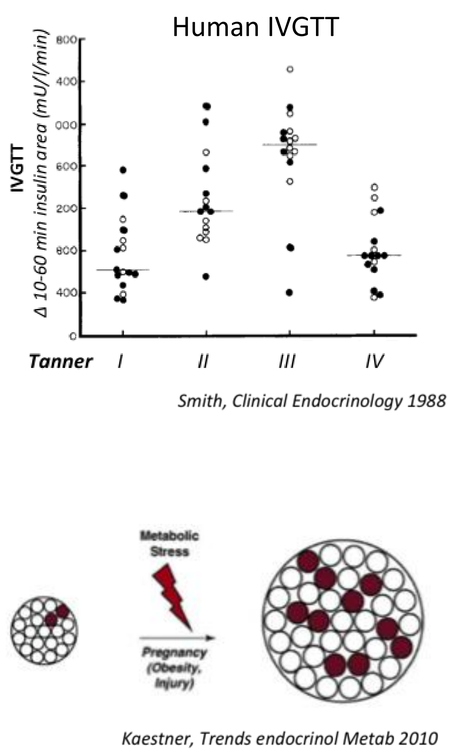
Introduction

Puberty is a time of hormonal changes that are associated with insulin resistance. Although insulin sensitivity is restored at the end of puberty in healthy youth, it does not resolve in obese adolescents leading to an increase of cardio metabolic diseases such as type 2 diabetes.

In response to an increase in insulin demand, as during pregnancy or obesity-induced insulin resistance, β-cells increase their functional mass to maintain glucose homeostasis.

However, the mechanism of pancreatic β-cell compensation in the face of pubertal insulin resistance has not been established. Hormonal changes during puberty could be linked to this β-cell adaptation.

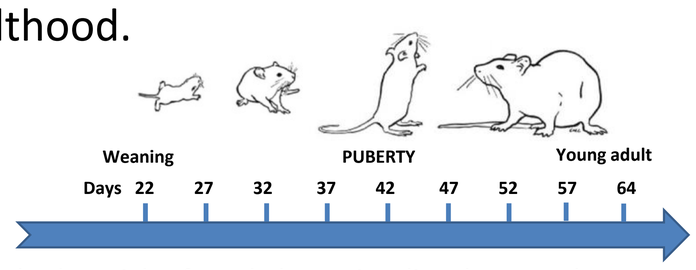


Objective

To characterize pancreatic β-cell adaptation to pubertal insulin resistance.

Methods

- Wistar rats were subjected to metabolic and hormonal test every 5 days from weaning to adulthood.

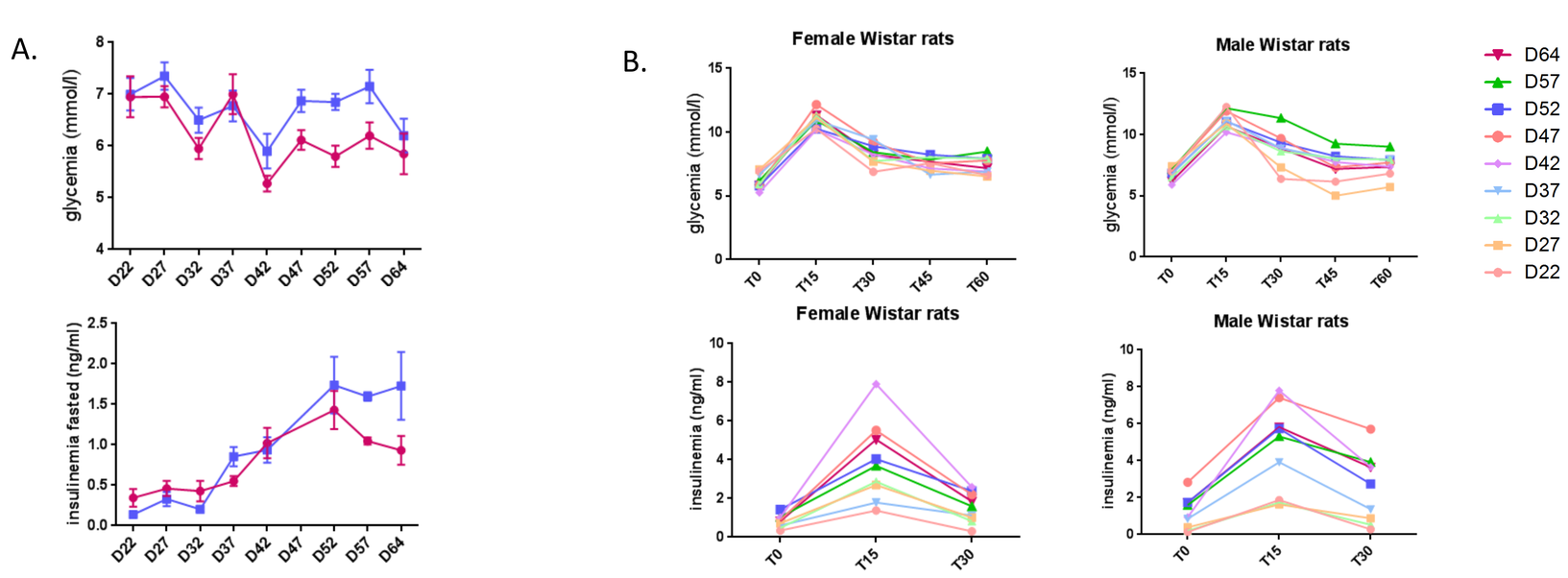


-body weight, fasted plasma insulin, glucose tolerance test
-vaginal opening, estradiol, testosterone, IGF1 levels

- β-cell proliferation was assessed by immunostaining of pancreatic cryosections for Ki67 and insulin.

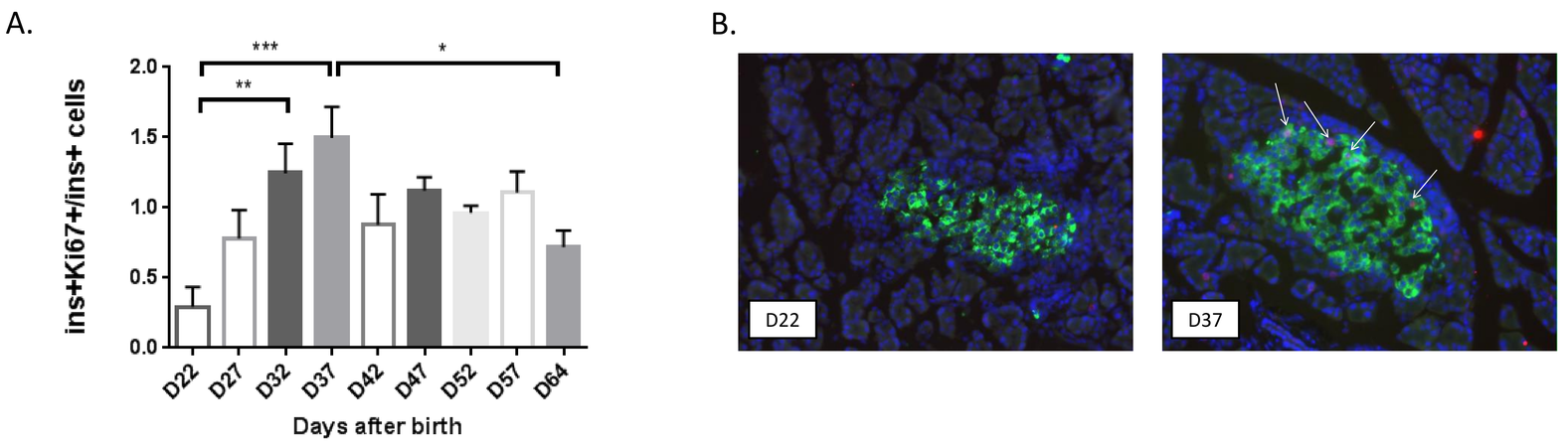
Results

Fig 1. Glucose intolerance and increased insulin levels during puberty in female and male Wistar rats.



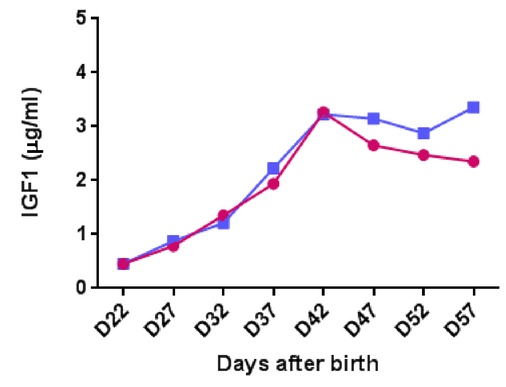
Analysis of metabolic parameters in Wistar rats from weaning to adulthood. *(A) Fasted blood glucose and insulin levels. Males n=4 (blue), females n=4 (red). (B) Glucose tolerance test (1g/kg glucose IP). (C) AUC for glycemia and insulinemia from IPGTT at 27, 42 and 57 days of life. Males n=4, females n=4. *p<0,05, **p<0,01.*

Fig 2. Increase in β-cell proliferation between weaning and puberty in Wistar rats.



β-cell proliferation between 22 and 64 days of life in male and female Wistar rats. *(A) Percentage of Ki67+insulin+ cells over insulin+ cells. Mean +/- SEM. n=4-5.*p<0,05, **p <0,01,***p<0,005. (B) Representative immunostaining for insulin (green), Ki67 (red), nuclei (blue) in pancreatic sections (days 22 and 37 of life). Arrows show positive nuclei for Ki67.*

Fig 3. Increase in IGF1 levels between weaning and puberty in Wistar rats.



IGF1 levels between 22 and 57 days of life in Wistar rats. *Males n=4 (blue), females n=4 (red).*

Conclusions and perspective

- **Insulin resistance and β-cell proliferation increase during puberty in rats. The parallel increase in IGF1 levels and β-cell proliferation point to a possible role of growth hormone in compensatory β-cell expansion.**
- **In future studies we will assess whether β-cell adaptation is compromised in a pathological model of metabolic stress during puberty.**

Disclosure statement
None of the authors have a conflict of interest to declare.

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