



Category: Functional Genomics

Poster Prize Winner

# Differential effects of genetic - and diet - induced obesity on fertility, spermatogenesis and sperm epigenome in adult male rats

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## Abstract

Obesity is a global health issue affecting millions of people of different age groups. The incidence of male obesity induced infertility is rising in couples undergoing ARTs suggesting that obesity is an established risk factor for male infertility. Recent studies demonstrate that paternal diet induced obesity could induce epigenetic disturbances in offspring. Obesity is a multifactorial disorder with predominantly genetic or environmental causes. No studies have compared the effect of genetic and diet induced obesity on male reproduction. The present study aims to delineate effects of obesity on male fertility, spermatogenesis and sperm epigenome using two rat models: genetically induced obese (GIO) – WNIN/OB and diet induced obese (DIO) – High fat diet. Body weights were similar in both groups, but, differential effects on hormonal profiles were observed. Fertility assessment showed decreased litter size mainly due to increased pre- and post-implantation loss in DIO group. However, GIO group were infertile due to decrease in libido. We observed a decrease in sperm counts in GIO group but not in DIO group despite the body weights being similar in both the groups. Flow cytometry and cell type specific marker expression studies in testis revealed that both DIO and GIO affect mitosis and differentiation process by increasing spermatogonial proliferation. In DIO group, no effect was observed on meiosis whereas in GIO group, we observed an effect on meiosis. Spermiogenesis process was affected in both the groups. In order to study the effect of genetic and diet induced obesity on different aspects of spermatogenesis, we performed qRT-PCR to study expression of genes involved in spermatocyte progression, spermiogenesis process, reproductive hormone receptors and leptin signaling in testis. Since epigenetic mechanisms are susceptible to environmental and genetic changes, we analyzed the methylation status of *Igf2-H19* DMR in spermatozoa of both the groups by pyrosequencing and observed hypomethylation in GIO group; however, no changes observed in DIO group. Differential effects were observed in both DIO and GIO group. Our study demonstrates the differences in the effects of genetic and diet induced obesity on the male germ line suggesting that human obesity induced subfertility/infertility could be a combination of both environmental and genetic factors.

**Citation:** Deshpande, S., Nemani, H. and Balasinor, N.H. Differential effects of genetic - and diet - induced obesity on fertility, spermatogenesis and sperm epigenome in adult male rats [Abstract]. In: Abstracts of the NGBT conference; Oct 02-04, 2017; Bhubaneswar, Odisha, India: Can J biotech, Volume 1, Special Issue, Page 102. <https://doi.org/10.24870/cjb.2017-a88>