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Metabolism

Paternal Exercise Improves Glucose Metabolism in Adult Offspring

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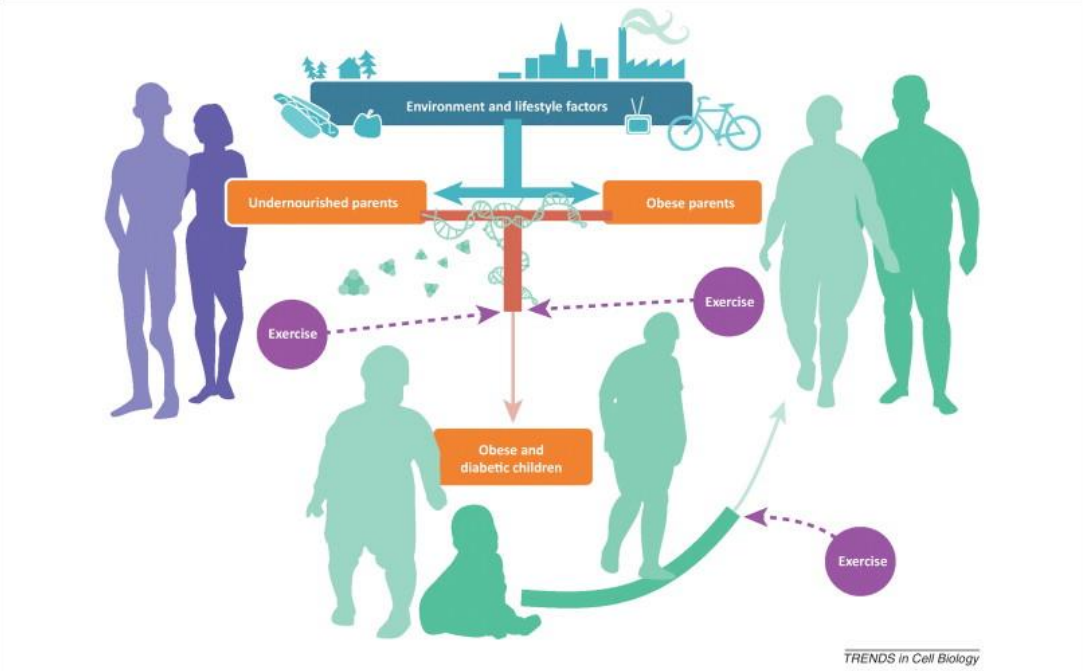
WHY I CHOOSE THIS PAPER?

Because it brings evidences about the **paternal influences on offspring outcomes** in adultlife.

Also, because it was based on **many experiments we can do in our lab**, showing that with a good idea we can publish our studies in high quality journals!

PREMISE (1)

Studies in rodents and humans have shown that **maternal healthy or unhealthy state protects or predispose**, respectively, offspring to **type 2 diabetes in long-term**, a matter that is being also demonstrated by **paternal influences.**

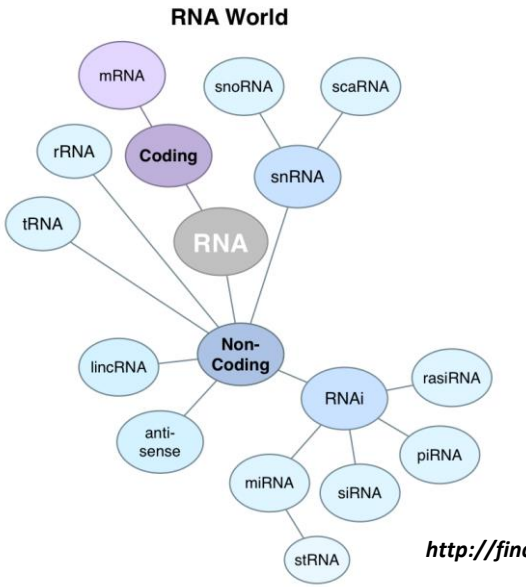


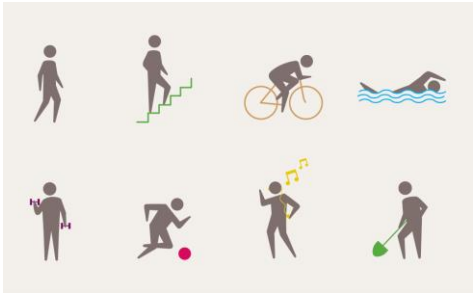
Kirchner et al., 2013: Trends in Cell Biology

PREMISE (2)

The **father's exercise pattern may have positive or negative impact on offspring metabolism**, thus, it is a matter of debate.

These paternal influences are probably transmitted through the sperm and it seems that **microRNAs, which are involved in nin-Mendelian transgenerational inheritance in mammals plays a role in such sperm transmission of phenotype.**





http://finchtalk.blogspot.com/2009/05/small-rnas-get-smaller.html

QUESTION (OBJECTIVE)

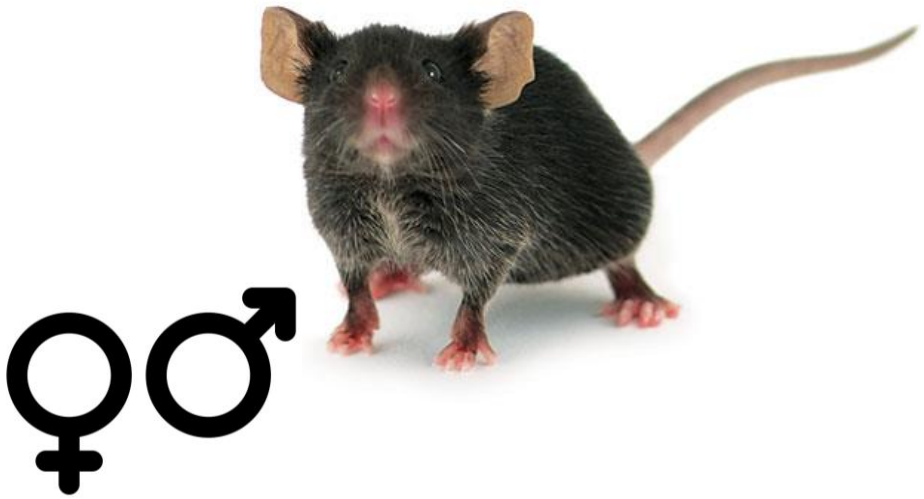
Investigate the role paternal exercise in mice fed chow- or high-fat diet on metabolic health of adult offspring. Also, evaluate the small RNA profile of sperm from exercise-trained males.

HYPOTHESIS ('MINE')

Paternal exercise habits influences the offspring metabolism at long-term and involves small RNAs from the sperms.

STUDY DESIGN

7 WKS male mice feeding chow or HFD for 3 wks in the presence of a wheel (spontaneous exercise) or not (sedentary)



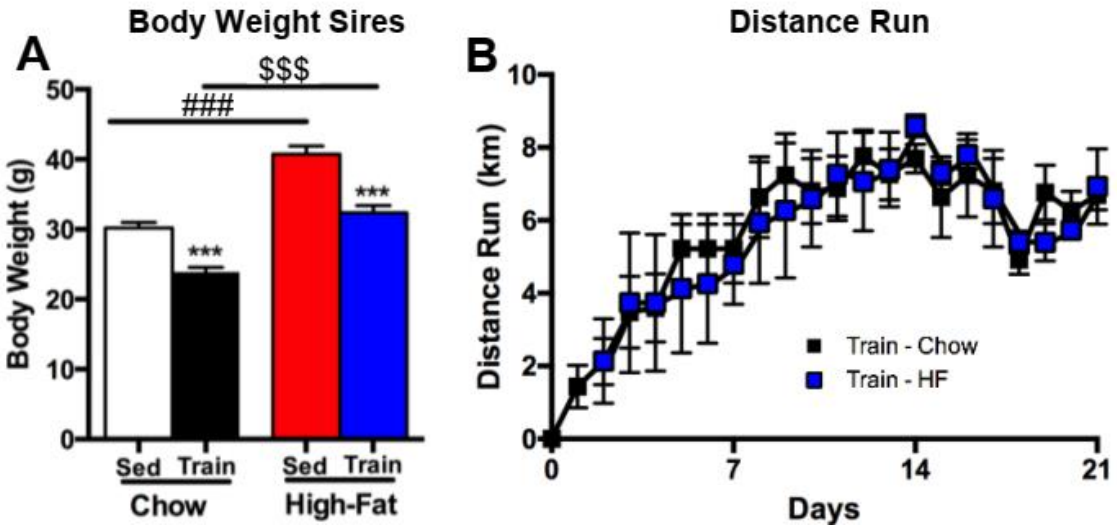
These mice bred with female for 3 days and **male/female offspring were studied** (5 per dam mouse)

In vivo and ex vivo metabolic assessments until 52 wk of age

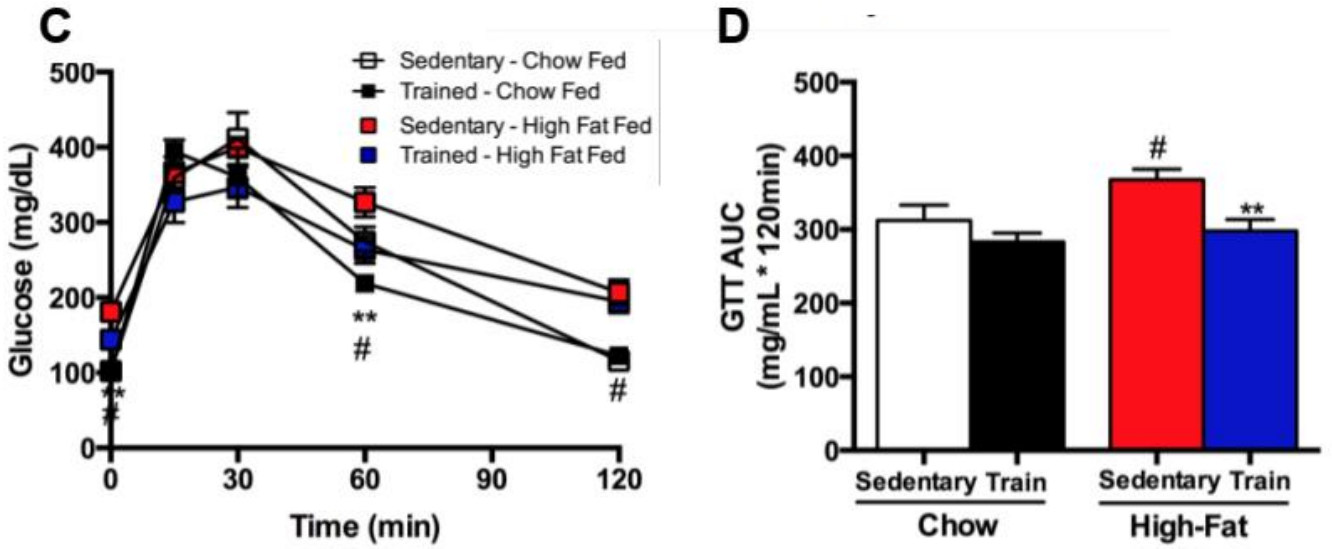
STATISTICS

The data are means ± standard error of the mean. Statistical significance was defined as $P < 0.05$ and determined by two-way analysis of variance, with Tukey and Bonferroni post hoc analysis.

RESULTS – paternal characteristics



Training prevented the impairments caused by the HFD



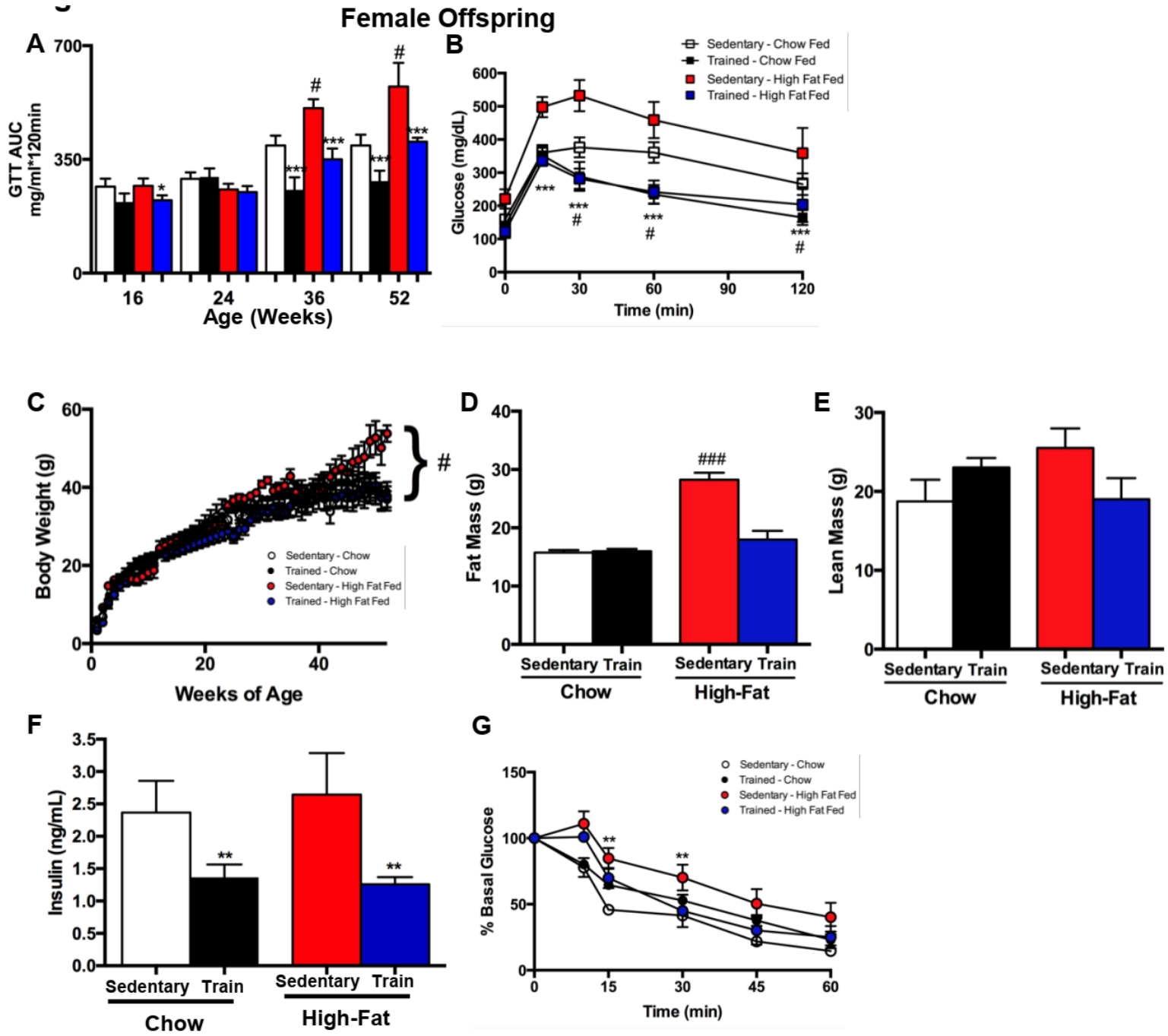
* vs. Sed

\# vs. chow

RESULTS - offspring

♀

Together, these data indicate that paternal exercise improves glucose tolerance and insulin sensitivity in female offspring. Moreover, paternal exercise abolishes the detrimental effects of a paternal high-fat diet on offspring metabolic health .



RESULTS - offspring

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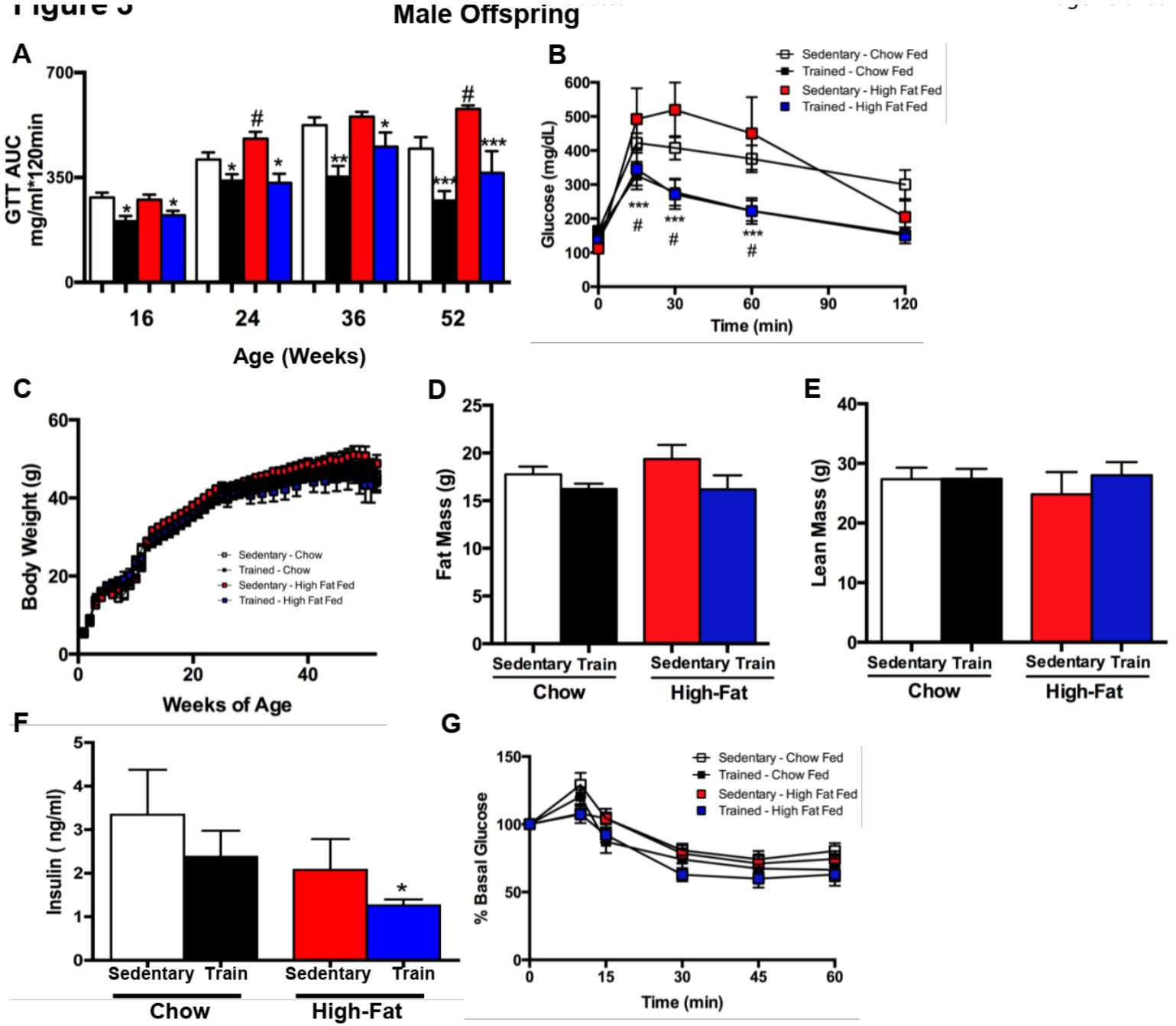
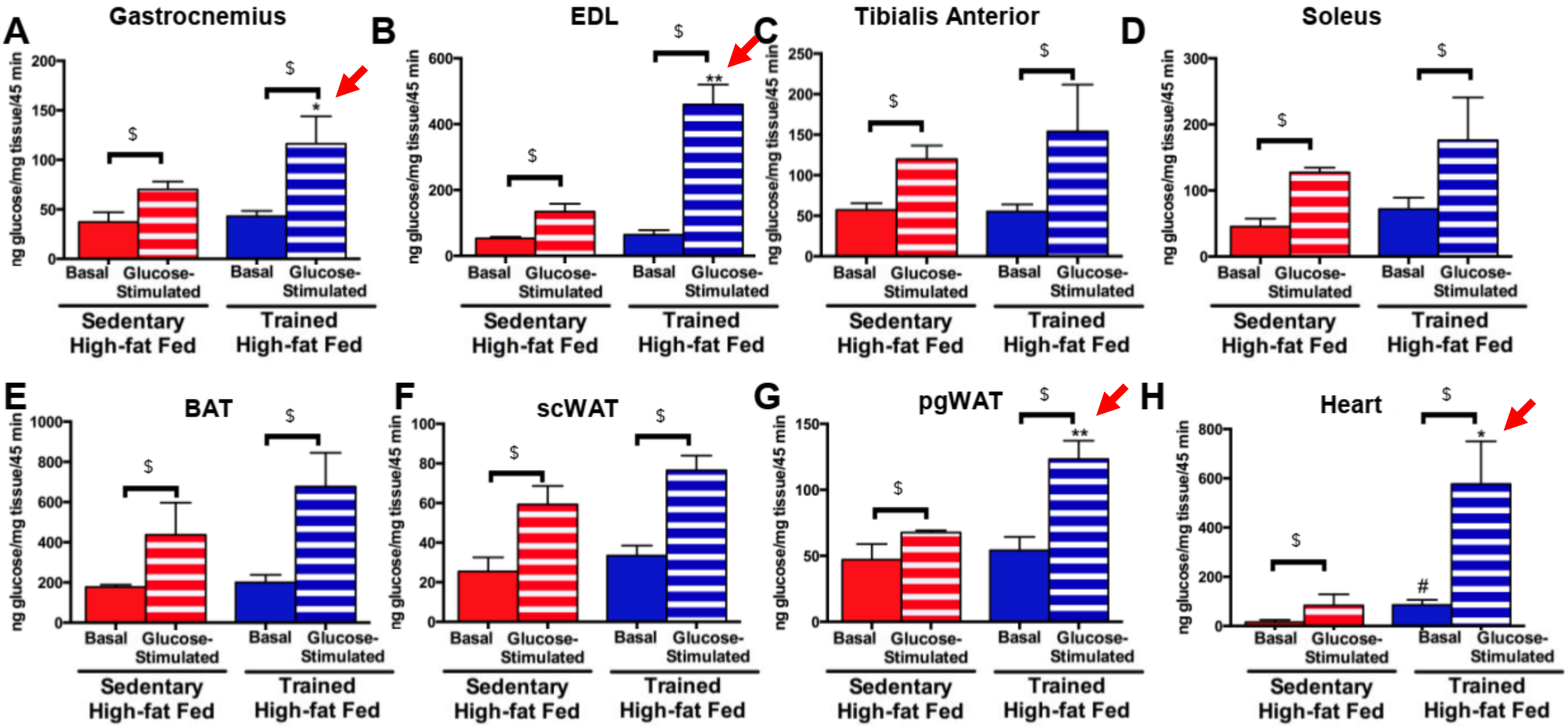
These data indicate that paternal exercise improves glucose tolerance in male offspring and, importantly, negates the unfavorable effects of a paternal high-fat diet on glucose tolerance.



RESULTS – in vivo glucose uptake (only in male HFD)



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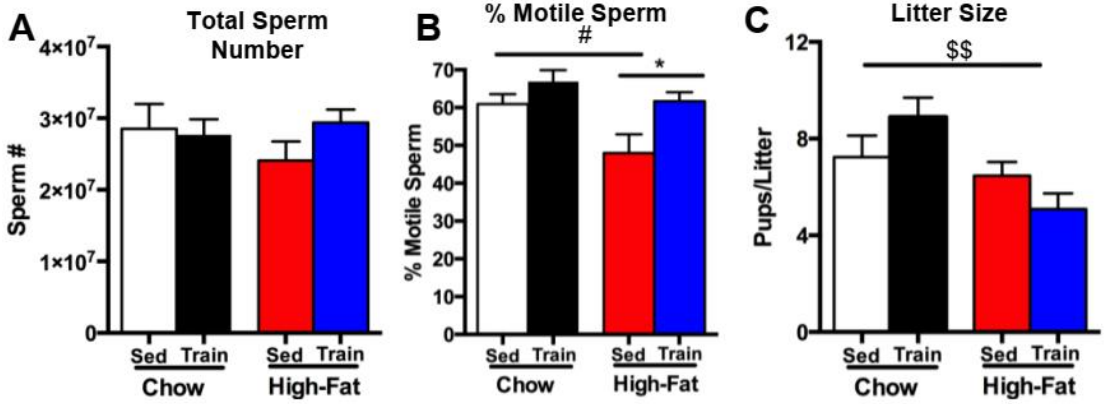
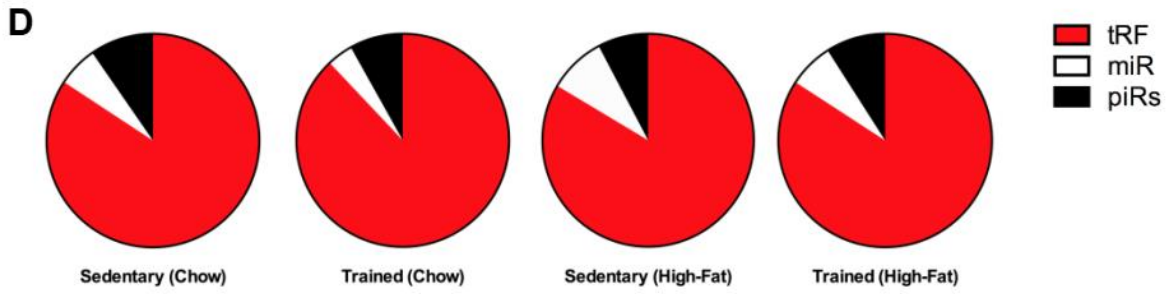
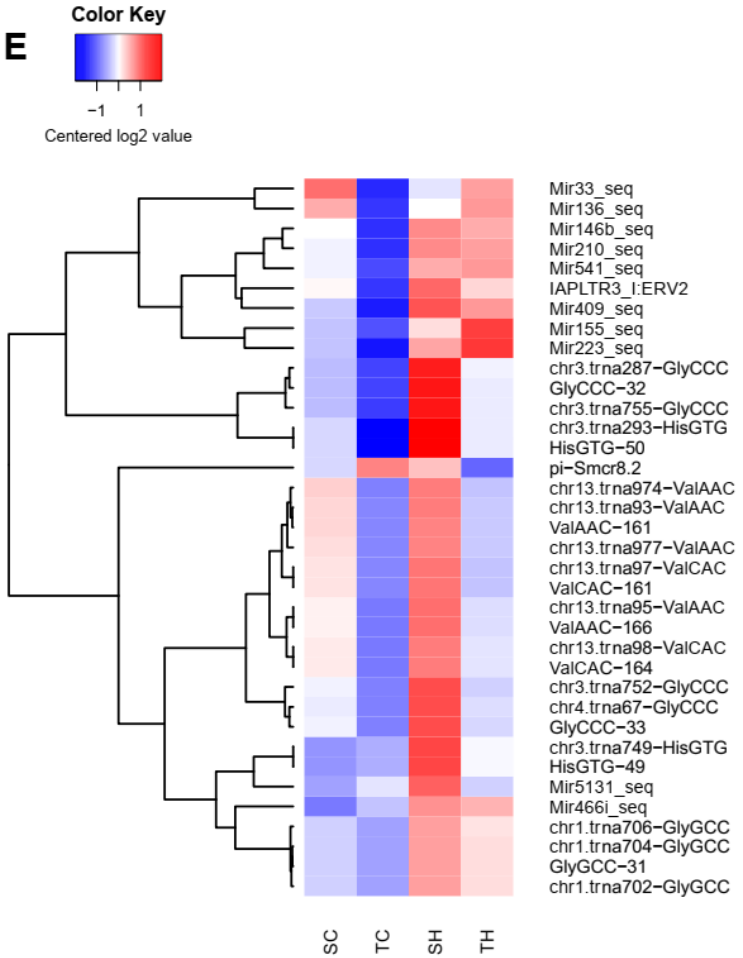
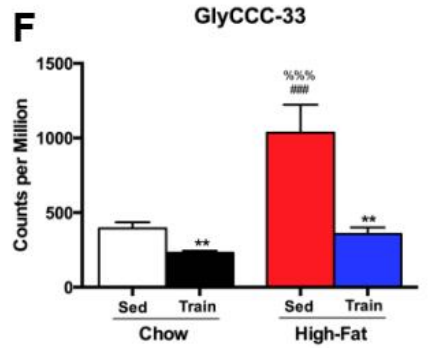
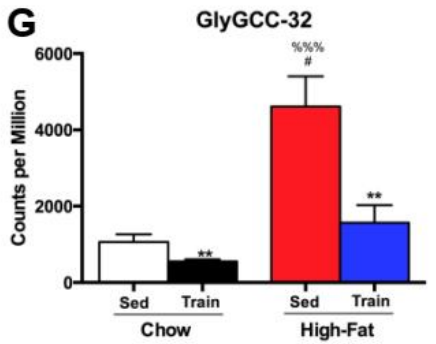


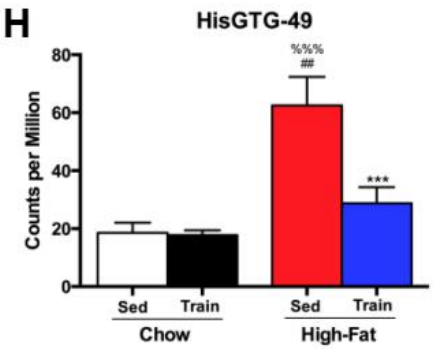


Exercise training reverses high fat diet-induced decreases in sperm motility









Dietary and exercise training effects on the small RNA payload of sperm

HYPOTHESIS (‘MINE’)

Paternal exercise habits influences the offspring metabolism at long-term and involves small RNAs from the sperms.

CONCLUSION

Paternal exercise improves the metabolic health of adult male and female offspring and compensates for the detrimental effects of a paternal high fat diet on offspring health. These data also provide the first detailed profile of the effects of exercise on the complete small RNA profile of sperm, which will provide a valuable resource for future investigation. These findings indicate that paternal exercise prior to conception could be an important tool to combat obesity and type 2 diabetes in future generations.