4-2016

The Impact of Depleting Dietary microRNA in a High-Fat Diet

Briley Moates
University of Nebraska-Lincoln, briley.moates@huskers.unl.edu

Sonia Manca
University of Nebraska-Lincoln, smanca2@unl.edu

Janos Zempleni
University of Nebraska-Lincoln, jzempleni2@unl.edu

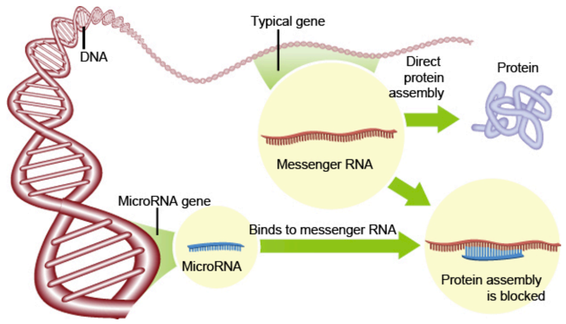
The Impact of Depleting Dietary microRNA in a High-Fat Diet

Briley Moates, Sonia Manca, Janos Zempleni

Departments of Nutrition and Health Sciences and Animal Science, University of Nebraska-Lincoln

Introduction

- MicroRNAs (miRNAs) regulate genes in animals and plants and can be synthesized endogenously.



- In milk, miRNAs are encapsulated in exosomes. These vesicles protect miRNAs from degradation and facilitate cellular uptake by endocytosis.

- Bovine miRNAs have nucleotide sequences complementary to human gene transcripts and are able to regulate human genes.

Previous Studies

- Endogenous miRNA synthesis does not compensate for dietary miRNA depletion.

- Dietary depletion of dietary miRNAs reduces fecundity in mice (litter size, litters surviving to weaning).

- Depletion of dietary miRNAs reduces weight and body fat in mice.

Objectives

We tested the hypothesis that a high-fat diet would increase the difference in body weight between C57BL/6J mice provided dietary microRNA (Exo +) and mice which were fed the same diet depleted of microRNA (Exo-).

Methods

- 20 mice were fed 3.5 g once per day for seven weeks.

- Divided into four feeding groups:

Exo+, Fat

	g
L-Cystine	**0,75**
Choline bitartrate (41.1% choline)	0,625
Tert-butylhydroquinone	**0,0035**
Vitamin mix (AIN-93-VX)	2,5
Mineral mix (AIN-93G-MX)	**8,75**
Fiber	12,5
Dextrinized cornstarch	**33**
Sucrose	25
Soybean oil (no additives)	**17,5**
Normal/Sonicated Milk Powder (10% of kcal)	26,1675
Soy Protein	35,7
Cornstarch	37,525
Lard	50
TOT	250,021

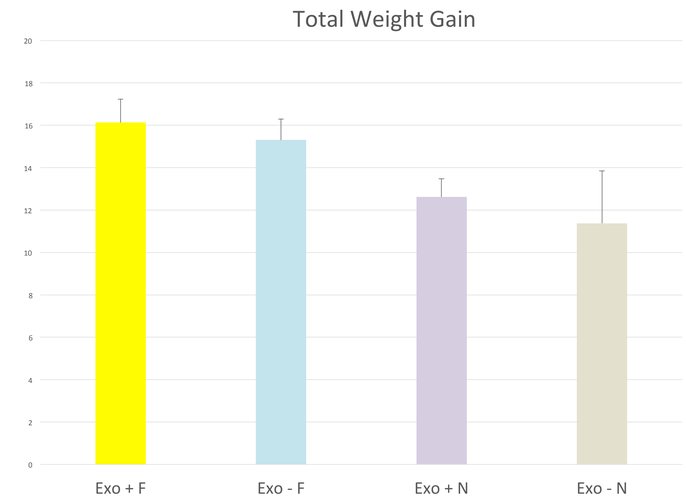
Exo -, Fat

Exo+, Normal

	g
L-Cystine	**0,75**
Choline bitartrate (41.1% choline)	0,625
Tert-butylhydroquinone	**0,0035**
Vitamin mix (AIN-93-VX)	2,5
Mineral mix (AIN-93G-MX)	**8,75**
Fiber	12,5
Dextrinized cornstarch	**33**
Sucrose	25
Soybean oil (no additives)	**17,5**
Normal/Sonicated Milk Powder (10% of kcal)	26,1675
Soy Protein	40,815
Cornstarch	**82,389**
TOT	250

Exo-, Normal

Results



- A high-fat diet did not increase the difference between body weight of Exo+ and Exo- mice, when compared to mice consuming a normal, low-fat diet.

Conclusions

- The data demonstrate that depleting miRNAs from a high-fat diet does not impact the difference in body weight between Exo+ and Exo- subjects.

- Depleting dietary miRNAs from normal low-fat diets do result in differences in body weight, fat, fecundity, purine metabolism, and gut microbiome.

References

Baier S, Nguyen C, Xie F, Wood JR, Zempleni J. MicroRNAs Are Absorbed in Biologically Meaningful Amounts from Nutritionally Relevant Doses of Cow Milk and Affect Gene Expression in Peripheral Blood Mononuclear Cells, HEK-293 Kidney Cell Cultures, and Mouse Livers1–3. The Journal of nutrition

Sadrhi M, Xie F, Wood JR, Zempleni J. Dietary depletion of cow's microRNAs impairs fecundity in mice.