

Melatonin treatment suppresses appetite genes and improves adipose tissue plasticity in diet-induced obese zebrafish

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Purpose: Overweight and obesity are important risk factors for diabetes, cardiovascular diseases, and premature death in modern society. Recently, numerous natural and synthetic compounds have been tested in diet-induced obese animal models, to counteract obesity. Melatonin is a circadian hormone, produced by pineal gland and extra-pineal sources, involved in processes which have in common a rhythmic expression. In teleost, it can control energy balance by activating or inhibiting appetite-related peptides. The study aims at testing effects of melatonin administration to control-fed and overfed zebrafish, in terms of expression levels of orexigenic (Ghrelin, orexin, NPY) and anorexigenic (leptin, POMC) genes expression and morphometry of visceral and subcutaneous fat depots. **Methods:** Adult male zebrafish (n = 56) were divided into four dietary groups: control, overfed, control + melatonin, overfed + melatonin. The treatment lasted 5 weeks and BMI levels of every fish were measured each week. After this period fishes were sacrificed; morphological and morphometric studies have been carried out on histological sections of adipose tissue and adipocytes. Moreover, whole zebrafish brain and intestine were used for qRT-PCR. **Results:** Our results demonstrate that melatonin supplementation may have an effect in mobilizing fat stores, in increasing basal metabolism and thus in preventing further excess fat accumulation. Melatonin

stimulates the anorexigenic and inhibit the orexigenic signals. Conclusions: It seems that adequate melatonin treatment exerts anti-obesity protective effects, also in a diet-induced obesity zebrafish model, that might be the result of the restoration of many factors: the final endpoint reached is weight loss and stabilization of weight gain. © 2018, Springer Science+Business Media, LLC, part of Springer Nature.

Adipose tissue

Diet-induced obesity

Melatonin

Zebrafish

anorexigenic agent

appetite stimulant

ghrelin

leptin

melatonin

nuclear factor Y

orexin

melatonin

messenger RNA

neuropeptide Y

orexin

proopiomelanocortin

adipocyte

adipose tissue

adult

agriculture

animal cell

animal experiment

animal model

animal tissue

Article

basal metabolic rate

body mass

body weight gain

body weight loss

brain

controlled study

diet induced obesity

diet supplementation

drug effect

food intake

gene expression

intestine

intra-abdominal fat

lipid storage

male

morphology

morphometry

nonhuman

plasticity

priority journal

real time polymerase chain reaction

subcutaneous fat

tissue section

treatment duration

zebra fish

adipose tissue

animal

appetite

brain chemistry

cell count

cell size

cytology

diet

disease model

gene expression

genetics

metabolism

obesity

Adipocytes

Adipose Tissue

Animals

Appetite

Body Mass Index

Brain Chemistry

Cell Count

Cell Size

Diet

Disease Models, Animal

Gene Expression

Male

Melatonin

Neuropeptide Y

Obesity

Orexins

Pro-Opiomelanocortin

RNA, Messenger

Zebrafish