

REDEEM



A new therapeutic approach to
type 2 diabetes mellitus

Aleksandra Dugandžić

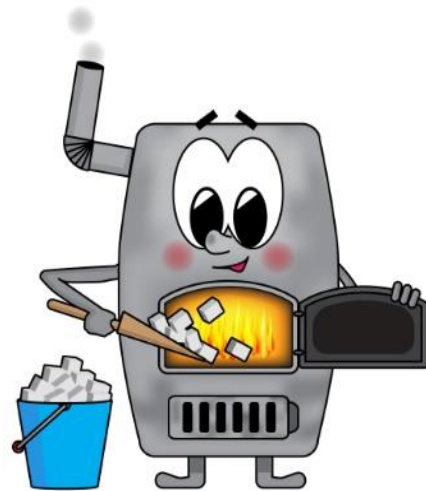
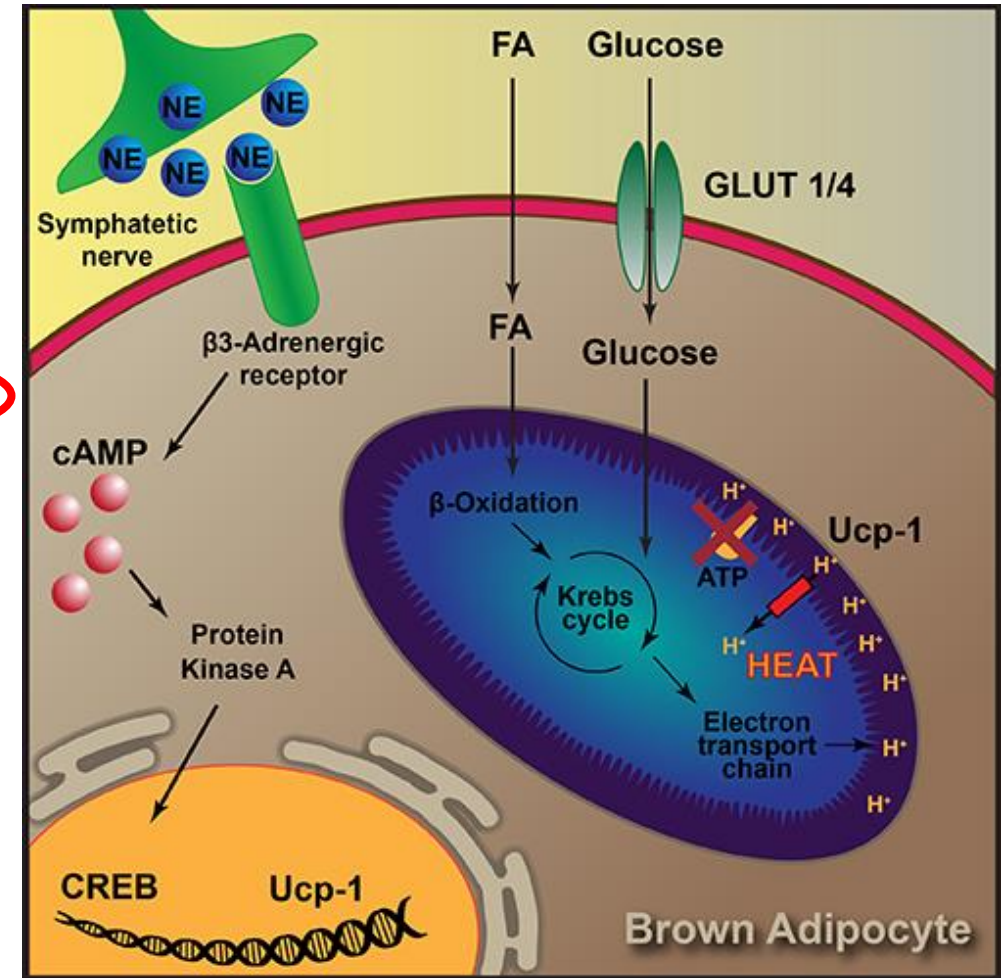


Alliance4Life

At the beginning....

Activation: 1. after a cold exposure

2. after a meal (diet-induced thermogenesis)

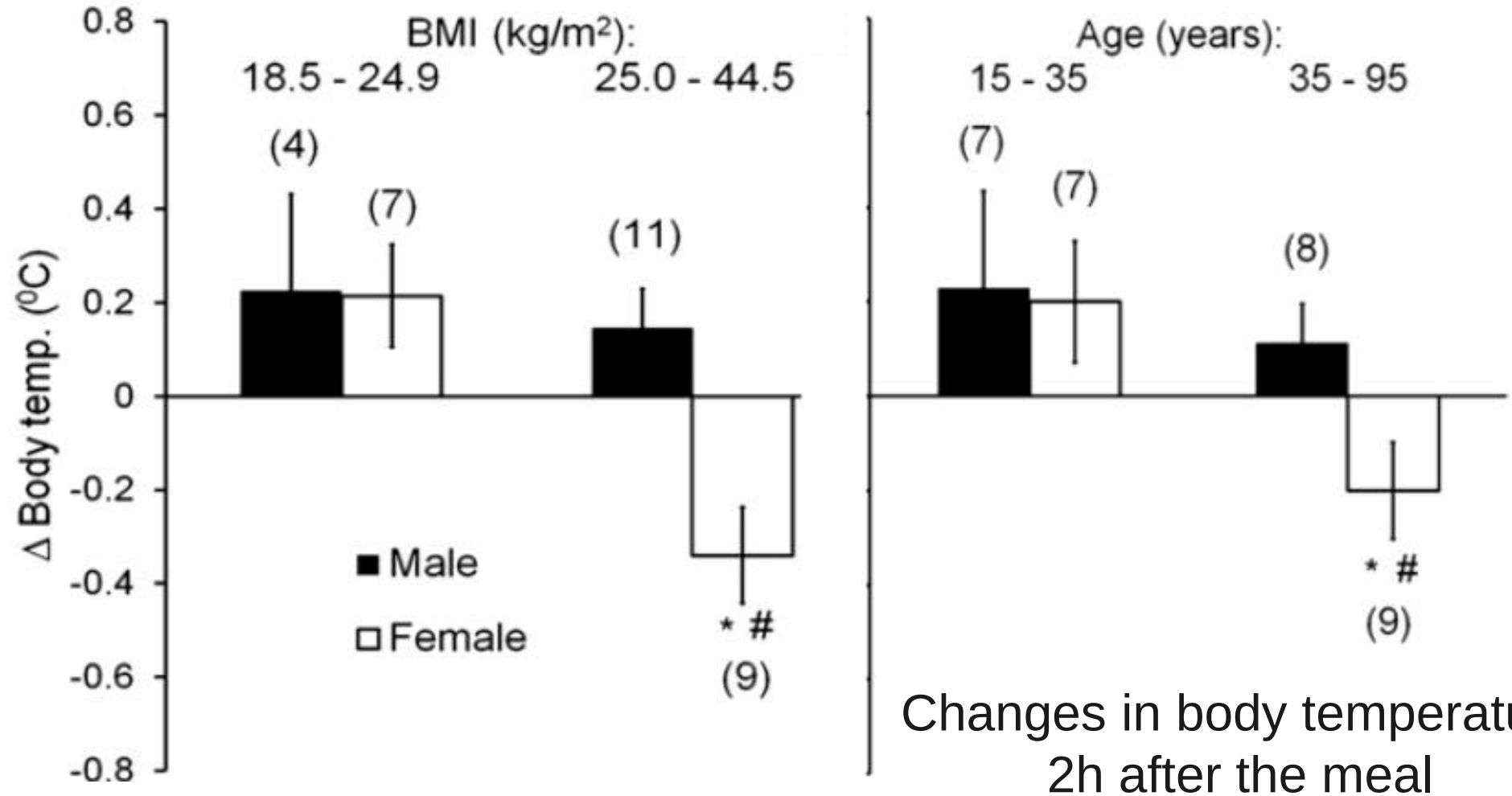


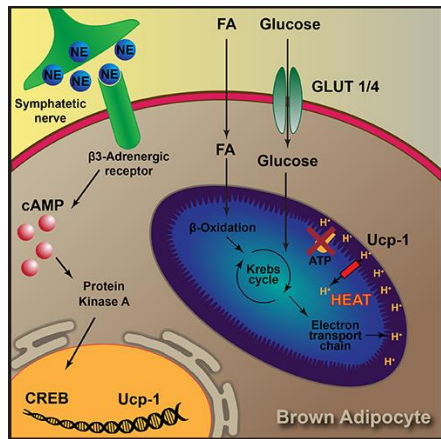
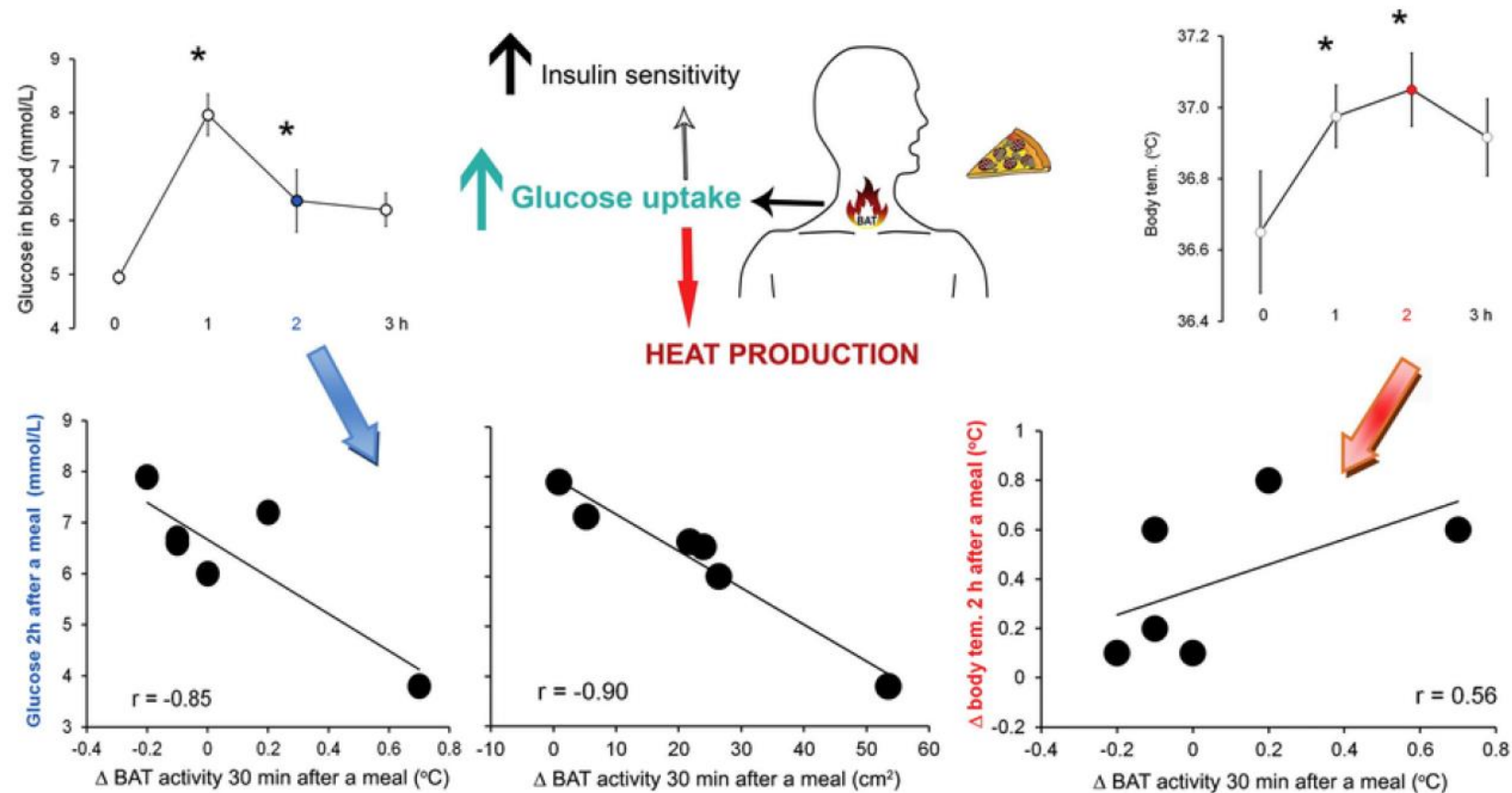
Modified from Fenzl A et al. Horm Mol Biol Clin Invest 2014;19:25–37.

Brown Adipose Tissue (BAT)

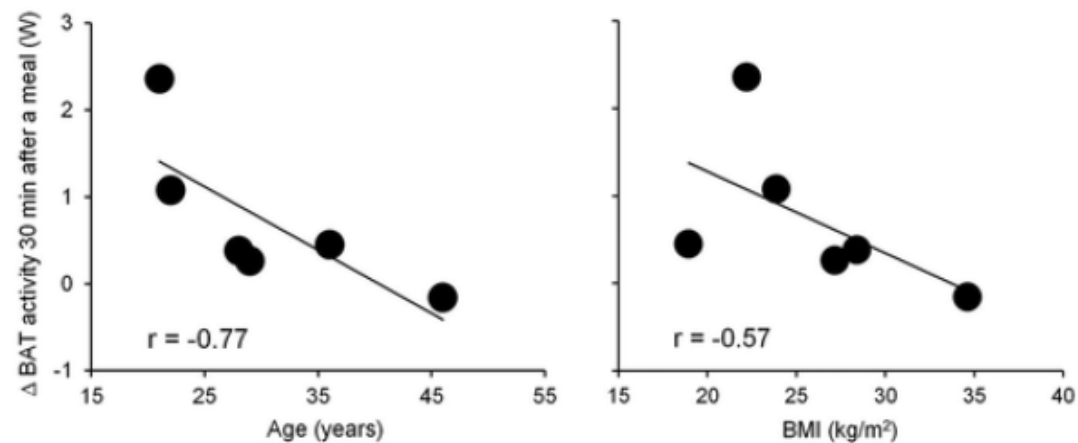


Diet-induced thermogenesis





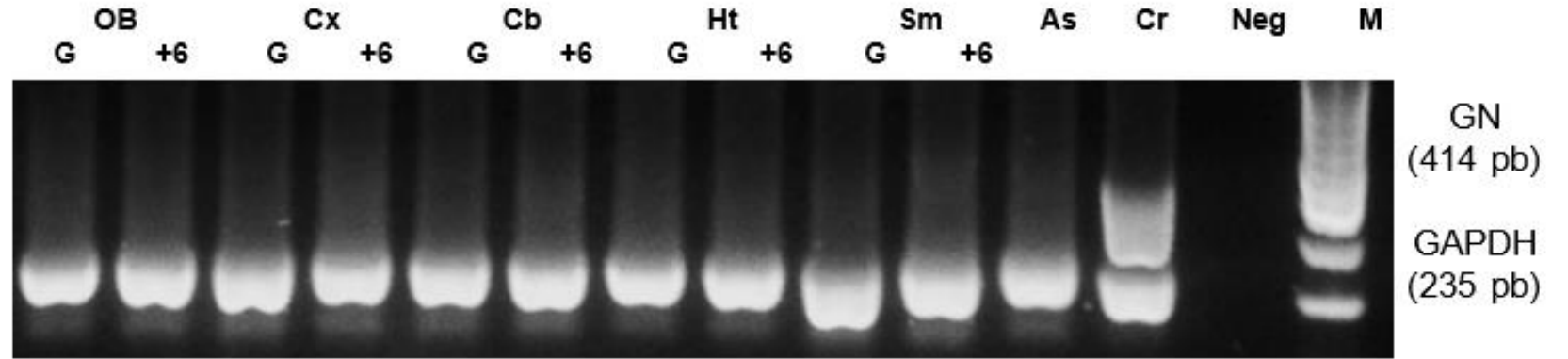
Habek et al,
Infrared Physics & Technology,
89, 2018, 271-276



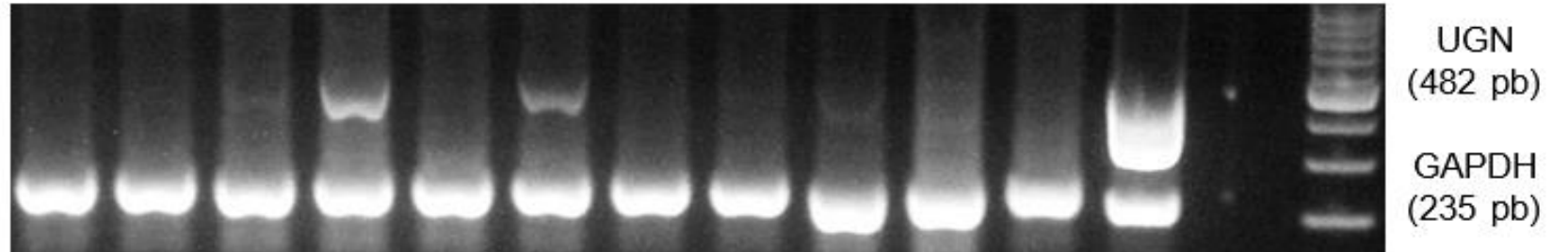
HABEK DOCTORAL THESIS



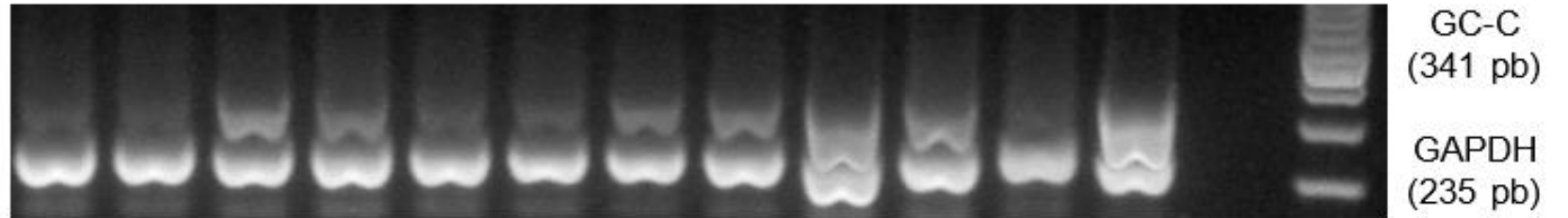
A: GN

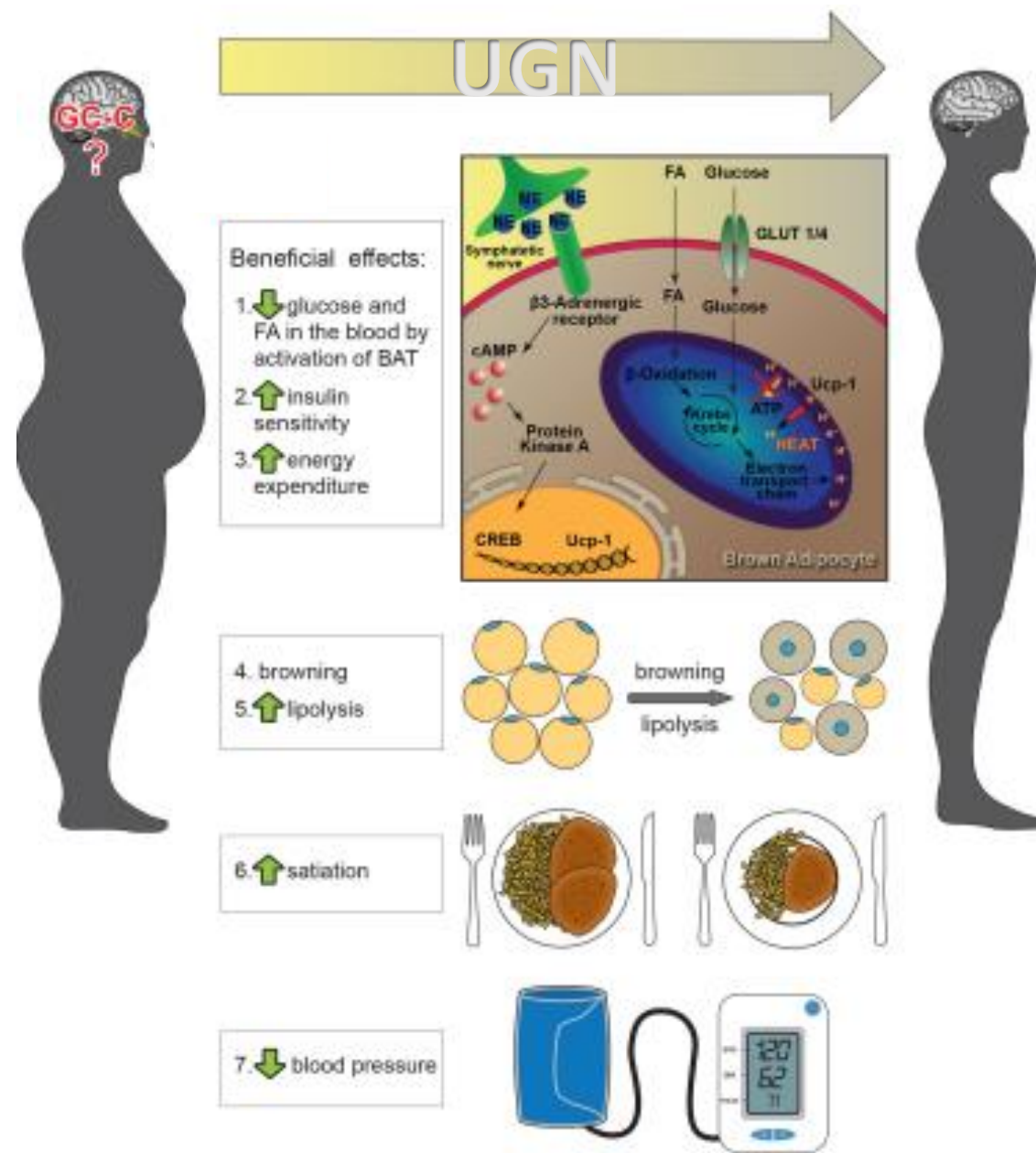


B: UGN

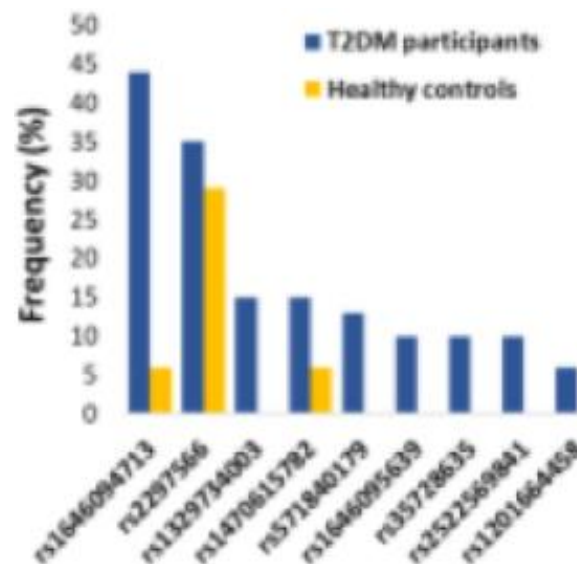
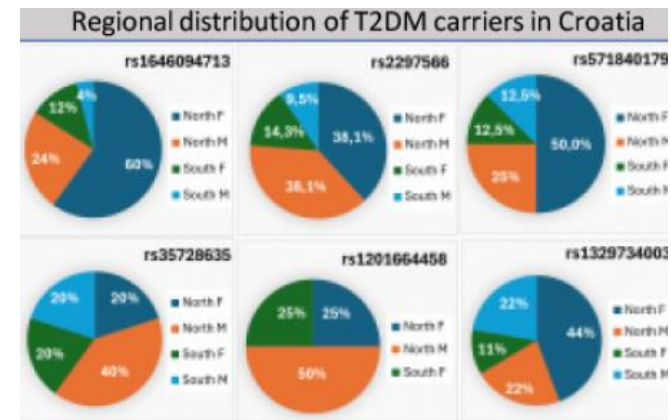
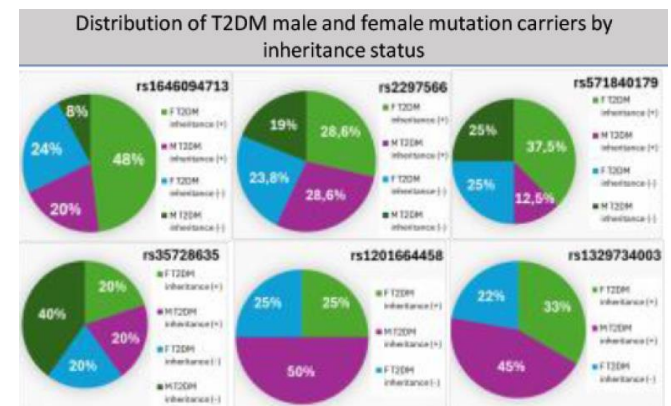
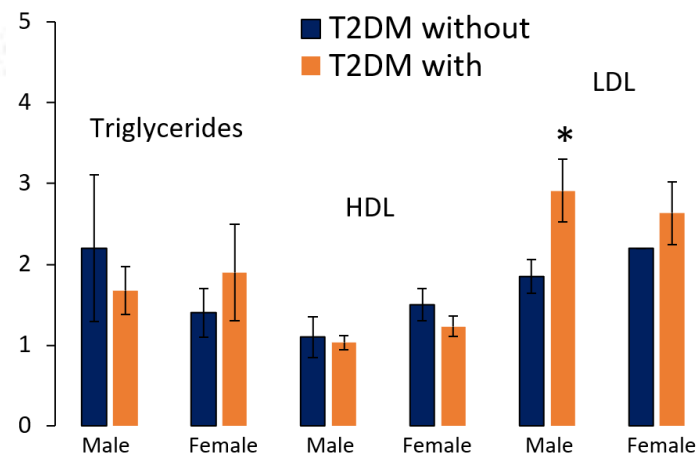
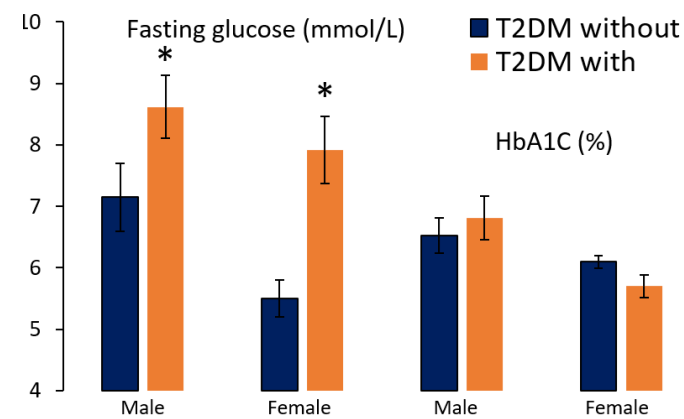


C: GC-C





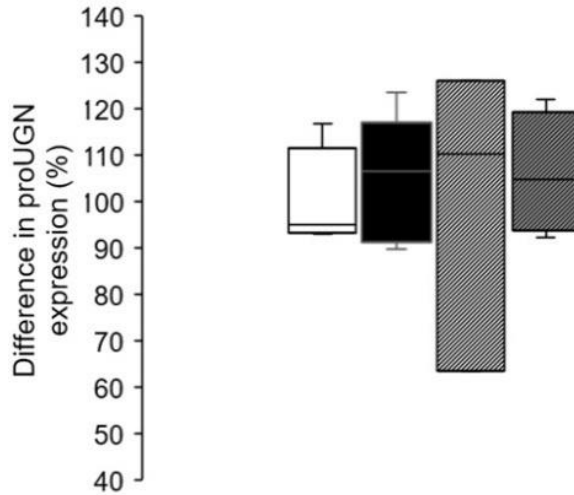
„Human UGN KO” preliminary results in patients with T2DM



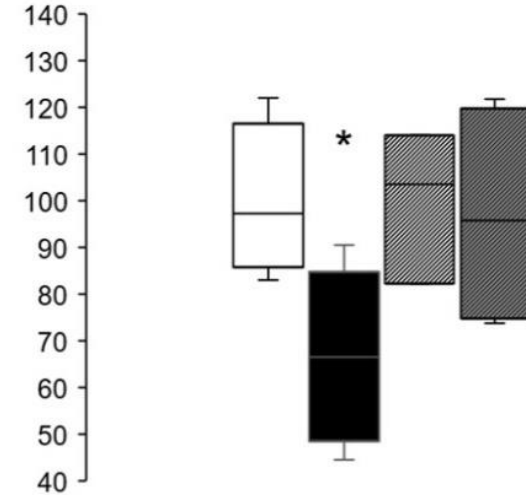
Gender dependent differences in proUGN expression in human brain of subjects with obesity



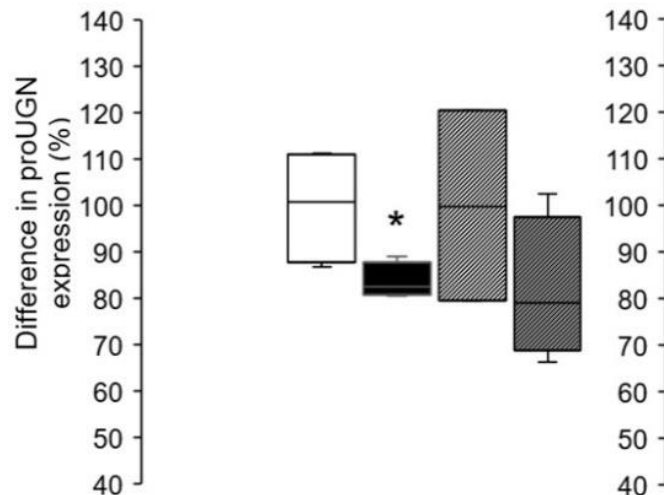
A: BA9



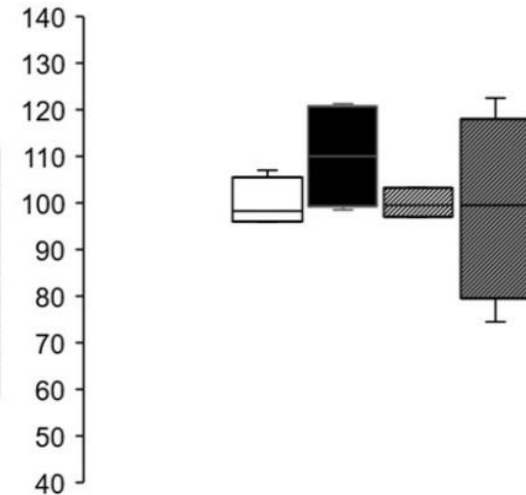
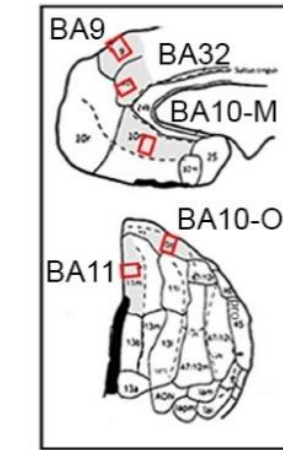
B: BA11



C: BA10 - O and M



D: BA32



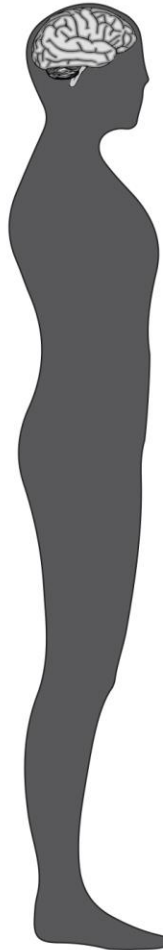
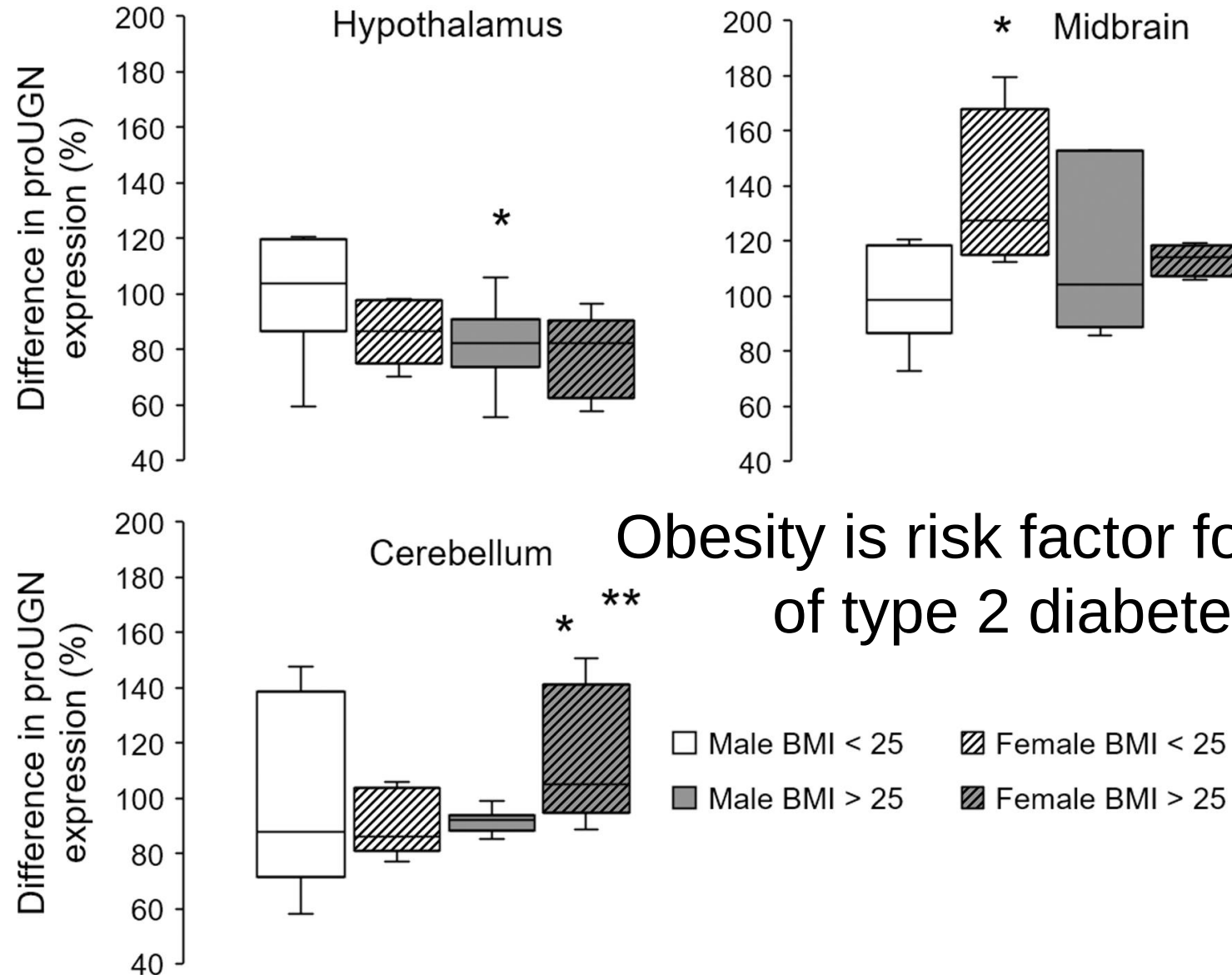
□ Male BMI < 25

■ Male BMI > 25

▨ Female BMI < 25

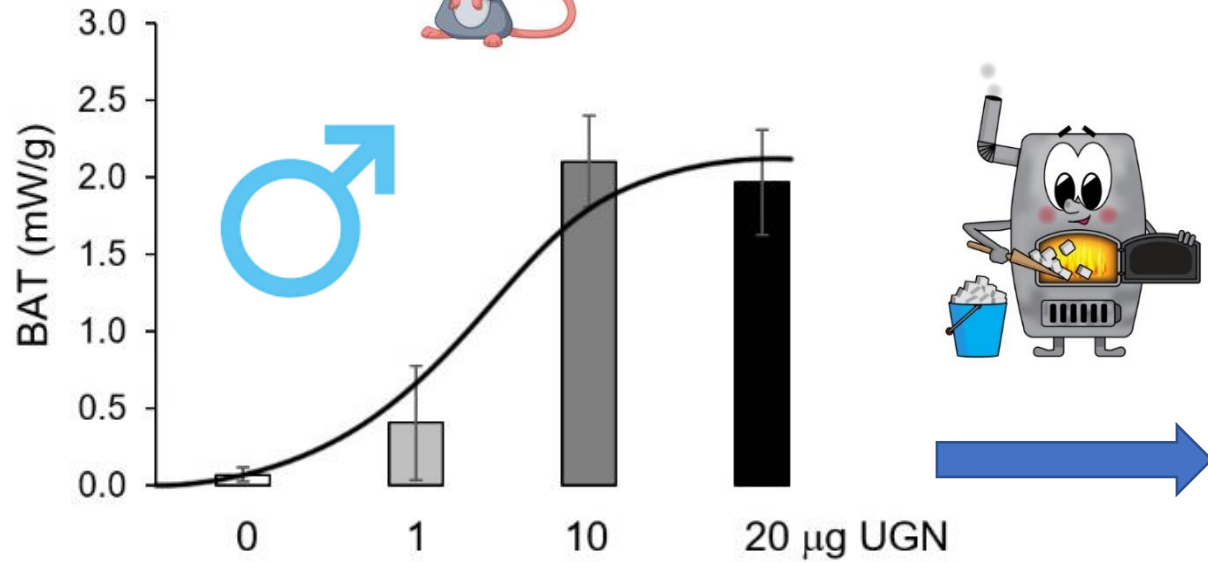
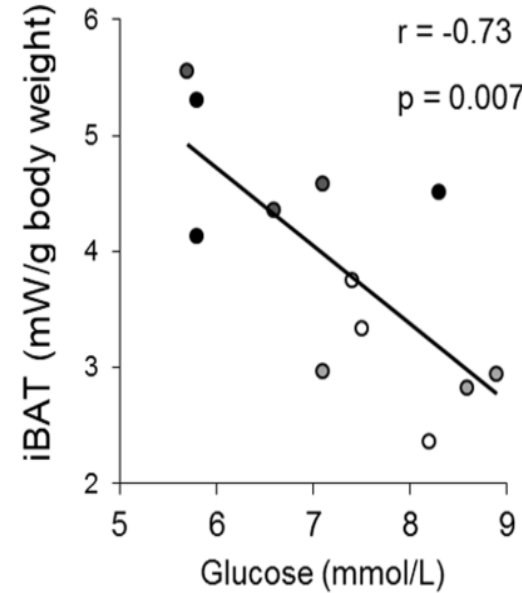
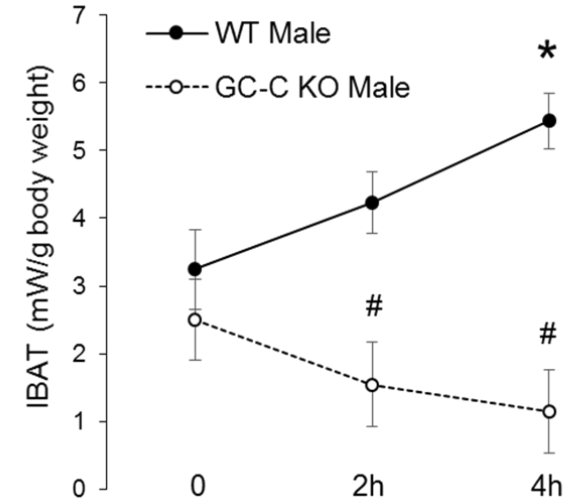
■ Female BMI > 25

Gender dependent differences of proUGN expression in subjects with obesity

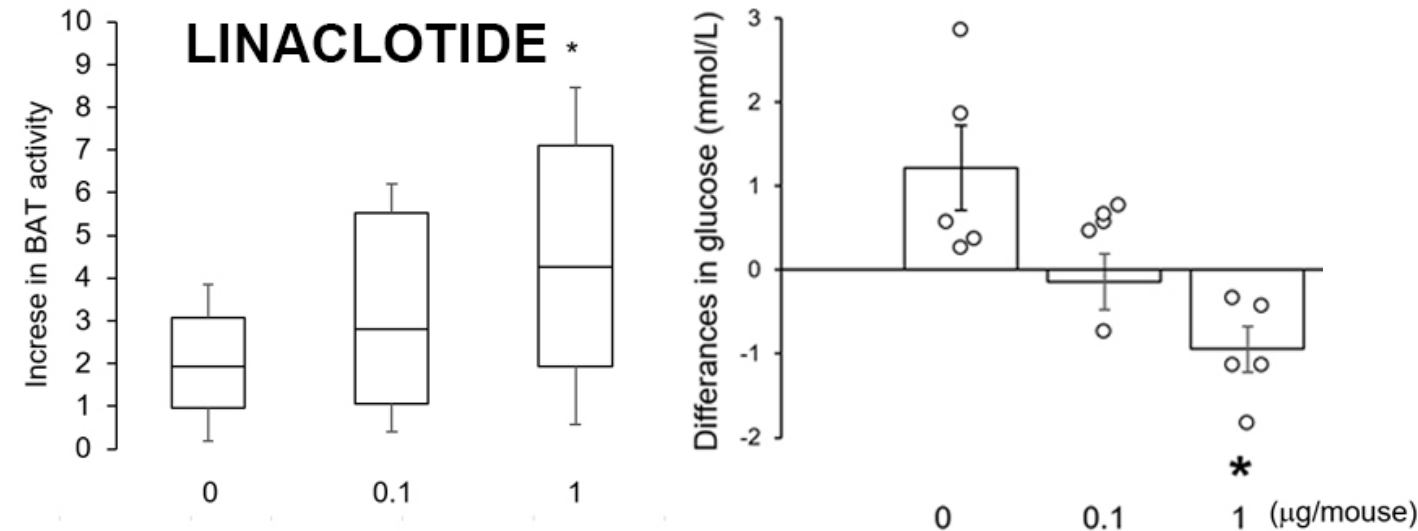


Obesity is risk factor for development of type 2 diabetes mellitus

Acute UGN application increases BAT activity in male mice



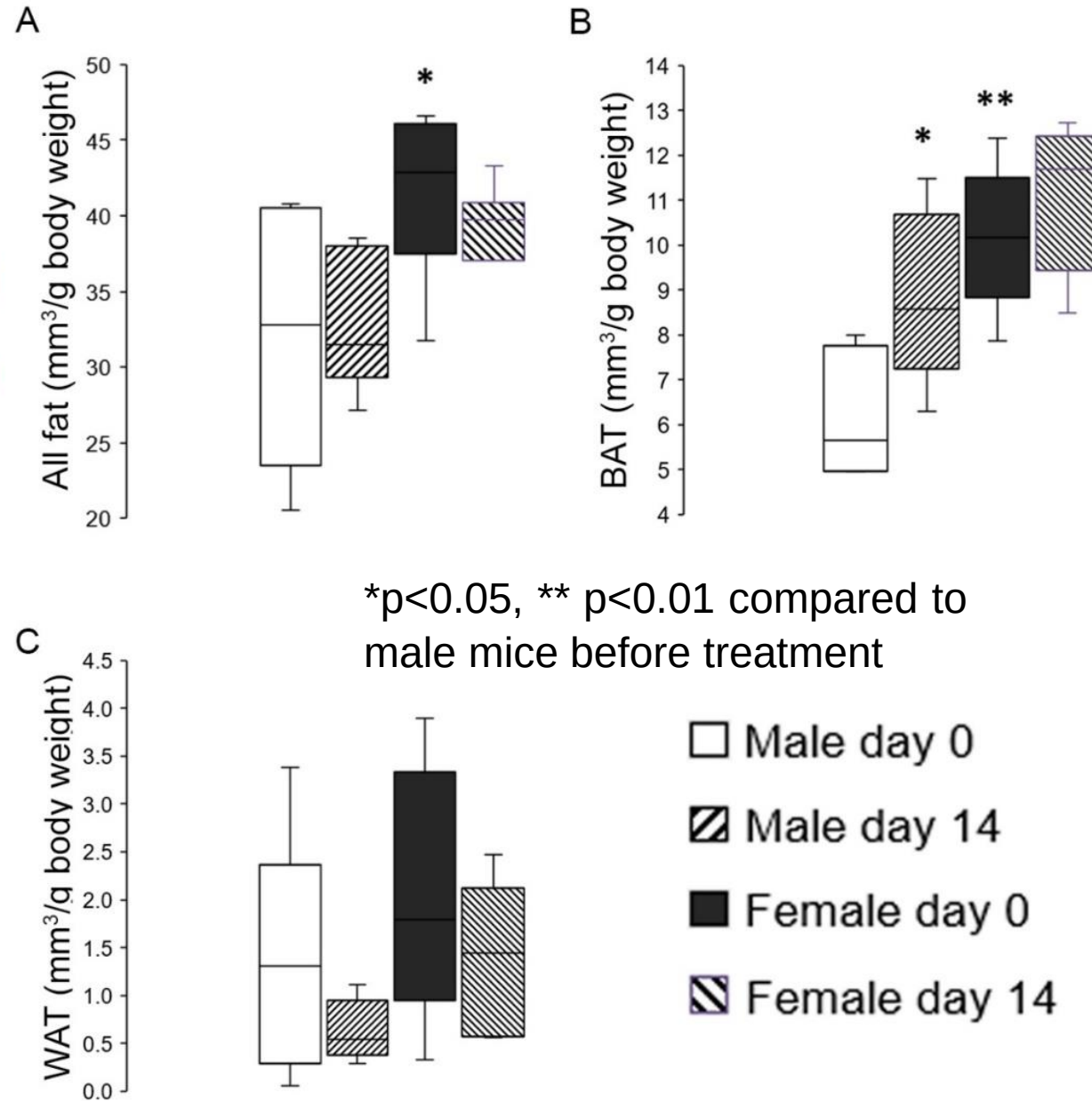
Habek N et al. Pflug Arch Eur J Phy 2020



Decrease glucose concentration

Habek N et al. Front Pharmacol. 2025;16:1569163.
doi: 10.3389/fphar.2025.1569163.

Chronic UGN application increase BAT volume in male mice



14 days of i.n. UGN application twice a day in total of 10 µg/mice

Habek, Ratko et al. Different roles of brain uroguanylin and brown adipose tissue in males and females. *In press* Biology of sex differences

REDEEM



A new therapeutic approach to type 2 diabetes mellitus



Simultaneous measurements:

- ① metabolic rate
- ② respiratory quotient
- ③ glucose concentration in blood and interstitial fluid
- ④ brown adipose tissue activity
- ⑤ body temperature

- ① animal body weight
- ② food and water intake
- ③ motoric activity
- ④ respiratory quotient
- ⑤ energy expenditure
- ⑥ brown adipose tissue (volume & activity)
- ⑦ body composition

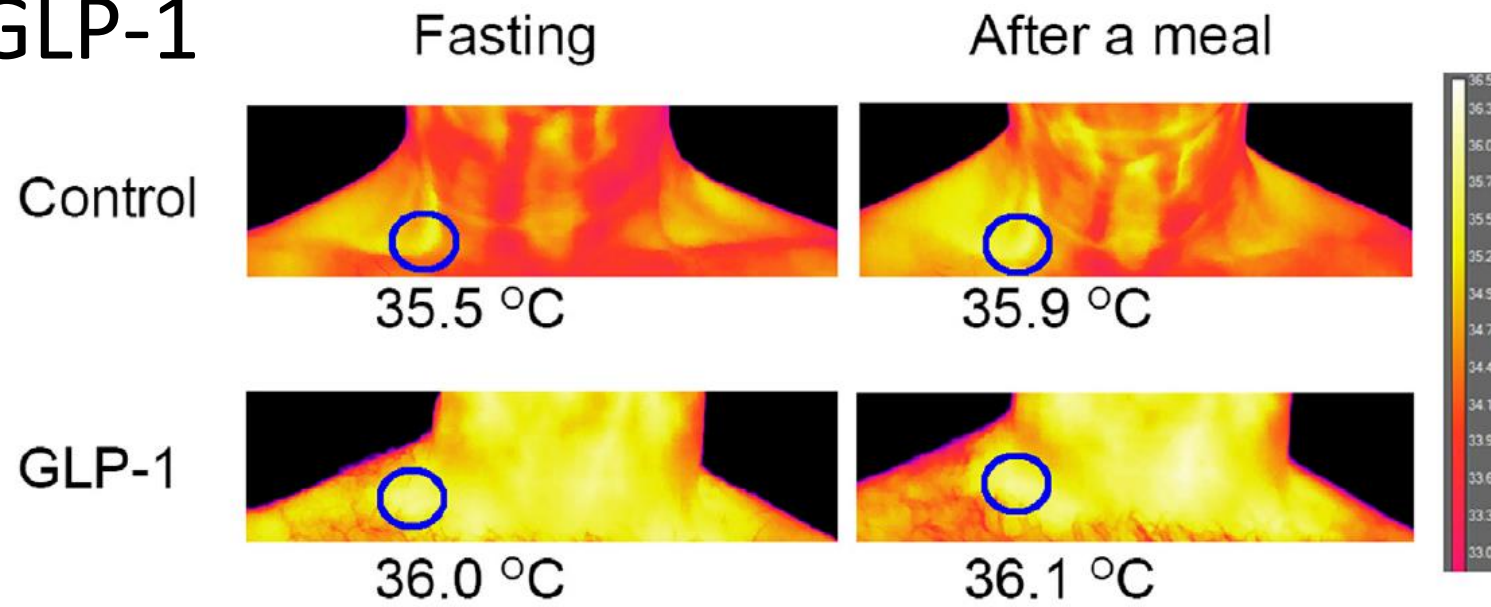
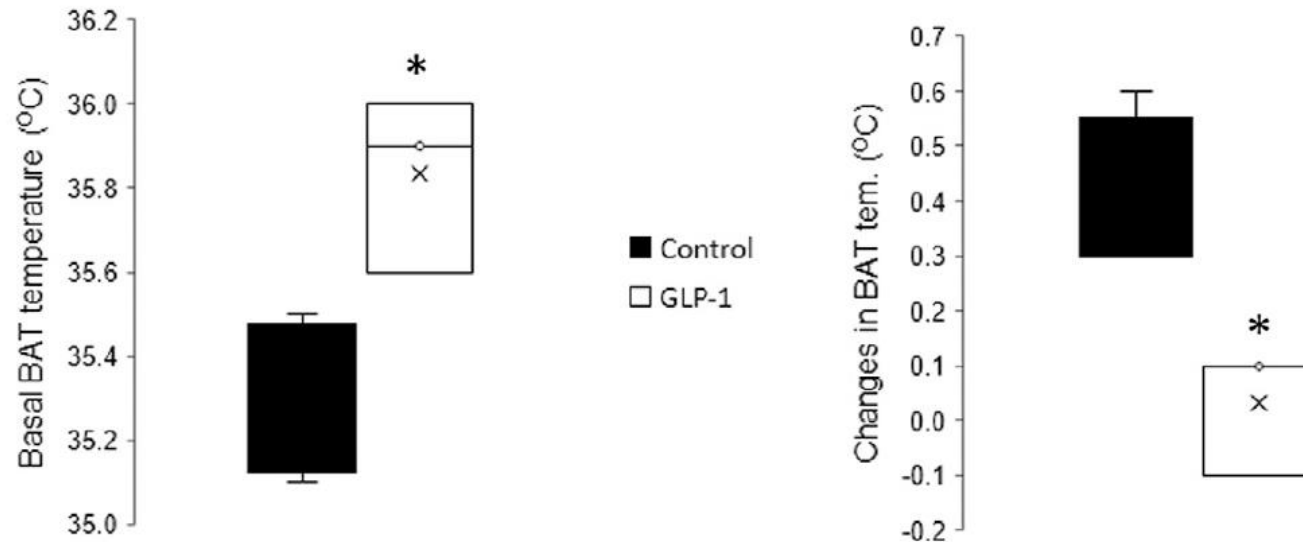


METABLAB

Design and manufacture a mobile metabolic laboratory for human metabolism research (Human Metabolic Data Acquisition System)

Establishing a laboratory to discover new drugs to increase metabolism and activate brown adipose tissue (BAT) in an animal model of T2DM (Metablab)

What about GLP-1



THEREFORE

Aims of REDEEM are:

1. Determine BAT activation and metabolic parameters in patients with T2DM depending on gender and reproductive stage of life measured by the HuMetaDAS system
2. Determine effects of tirsepatide (Mounjaro) and semaglutide (Ozempic) on BAT activation and metabolic parameters in men and women with T2DM measured by the HuMetaDAS system
3. In the animal model of T2DM determine if the regulation of BAT activity and metabolism by tirzepatide, semaglutide or linaclotid is gender and phase of the sexual cycle dependent using MetabLab



**CROATIAN
INSTITUTE
FOR BRAIN
RESEARCH**



REDEEM - PK.1.1.13.0024 www.redeem.hr

HuMetaDAS:



Members of the research team:

Asst. Nikola Habek, MD, PhD

Milan Kordić, mag. Ing. ele. and employees of MKP Ltd.

Zvonko Miličević, MD, PhD – head of the Department of Science, Teaching, Projects and Clinical Trials

Assoc. prof. Miro Bakula, MD, PhD - head of the Department of Endo., Diabetes and Met. Diseases

Metablab:



Members of the research team:

Asst. Nikola Habek, MD, PhD

Assoc. prof. Marina Radmilović, PhD - Laboratory for neuroregenerative medicine

Milan Kordić, mag. Ing. ele. and employees of MKP Ltd



HRZZ

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Foundation

Croatian Science Foundation
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CURE (IP-2025-02-8273)

A
A D R I S



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REPUBLIC OF CROATIA
Ministry of Science and
Education



**Funded by the
European Union**
NextGenerationEU

National Recovery and Resilience Plan 2021-2026
BURDEN (10106-25-2985)



Thank you for attention