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# BOOK OF ABSTRACTS





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**BOOK OF ABSTRACTS**



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## OPENING CEREMONY

### Obesity and type 2 diabetes mellitus – inseparable twins?

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Obesity and type 2 diabetes (T2D) share a close association. Research highlights that obesity is a common risk factor that can lead to the development of (pre)diabetes.

Worldwide obesity has nearly tripled since 1975. In 2016, more than 1.9 billion adults were overweight. The latest WOF data from 2021 showed that the number of people with obesity has increased to 800 million in the last 5 years.

Diabetes mellitus affected 463 million individuals worldwide in 2019 and this is expected to rise to 783 million cases by 2045. Most common type of diabetes is T2D (90%) and 90% of T2D patients have (pre)obesity – diabetes.

Obesity is a disease and risk factor of many cardiometabolic comorbidities (e.g., T2D), which are caused by the metabolic effects of adipose tissue.

Management of (pre)obesity becomes an integral part of several recent recommendations for the management of T2D. In patients with diabetes, reducing weight is one of the cornerstones of treatment.

Weight loss of >5% improves glycaemic control, lipid levels, and BP in adults with (pre)obesity and T2D. These effects can be achieved by improving energy balance and/or introducing obesity medications or glucose lowering agents with significant weight reduction as GLP-1 RA, tirzepatide and SGLT-2 inhibitors. Metabolic surgery resulting in durable remission or improvement of the disease.

Patients with (pre)diabetes / diabetes benefits from weight loss (prevention, remission T2D, better control of cardiometabolic, cardiovascular, renal conditions).

We must take a holistic management of these conditions as they are interconnected with two serious pandemics.

## Barriers to obesity management for adolescents living with obesity

**Jason C G Halford** (School of Psychology, University of Leeds, European Association for the Study of Obesity, Leeds, UK)

Obesity in adolescence has a greater lifelong impact on health than adult onset obesity. It is also associated with a substantial mental health burden with increased risk of depression and anxiety and low self esteem. The ACTION-Teens study is the first to explore barriers to effective obesity care in Adolescents Living with Obesity (ALWO), their Care Givers (CG), and Health Care Practitioners (HCP). It aimed to identify perceptions, attitude and behaviours along with other potential barriers to effective obesity treatment from ALWO, their CGs and their HCPs in 10 countries.

The study found divergent information sources were used to learn about obesity and weight management, with ALWO relying far more on YouTube and Social media. The perception of obesity having a strong / very strong impact on health was highest in the HCPs and lowest in the CGs. 76% of ALWO perceived their weight as above normal compared to only 66% of CGs perceiving their child's weight as above normal. 65% of ALWO believed their weight loss was entirely their responsibility and CGs consistently underestimated their child's weight loss attempts and intentions.

The greatest barrier for ALWO was the inability to control their hunger. However, HCPs did not appear to understand ALWO motivations to and barriers to weight loss potentially trivialising these issues. ALWO reported complex feelings after recent weight discussions with their HCP. And notably a high proportion of ALWO had poor mental health and low self esteem related to age, gender and obesity class. Implications will be discussed.

### References:

Halford et al (2022) Misalignment among adolescents living with obesity, caregivers, and healthcare professionals: ACTION Teens global survey study. *Pediatric Obesity*  
*Pediatr Obes.* 2022 Nov;17(11):e12957. doi: 10.1111/ijpo.12957. Epub 2022 Jul 15.

**Keywords:** Adolescents, Obesity Management, Motivations and Barriers, Information Sources, Mental Health

## Technology in Treatment of Obesity and Diabetes: Today and Tomorrow – An American Perspective

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Obesity is a global epidemic with close to 1 billion people. In order to deal with this disease one has to define it to be able to diagnose it, stage it, formulate treatment plan and execute a follow up strategy. Diabetes mellitus afflicts about 537 million people worldwide (IDF Diabetes Atlas, 10th Edition); thus, the same principles hold for diabetes mellitus management.

The use of technology in all of its renditions will be discussed, from obtaining vital signs to measuring waist circumference to using smartphone apps and social media all the way to utilizing the latest in diabetes technologies (continuous glucose monitoring and integrated hybrid close loop systems for insulin delivery).

**Keywords:** obesity, technology, treatment, diabetes



## SESSION 1: CHILDHOOD OBESITY

### Primary prevention of childhood obesity – is it possible?

*Berit L Heitmann (Frederiksberg and Bispebjerg Hospital, Frederiksberg C, Denmark)*

Primary prevention of overweight and obesity aims to reduce the number of new cases among individuals, thus targeting those with a healthy weight. Secondary prevention focuses on reducing the occurrence of established cases, effectively treating overweight and obesity. Tertiary prevention aims to stabilize or reduce the comorbidities associated with obesity.

Over the past 2–3 decades, several hundred randomized controlled trials (RCTs) have been conducted to prevent overweight and obesity among children. However, with the exception of one study, all previous interventions targeted groups of children, with some having a healthy weight while up to 50% already had established overweight or obesity. Although some of these interventions were found to be effective, it remains unclear whether they prevented the development of overweight in healthy weight children or resulted in weight loss among children with established overweight.

A few secondary analyses from some of the interventions suggest the latter scenario, indicating that only children with overweight benefited from the intervention by losing weight, even though they were not the specific target. This presentation will discuss the current evidence regarding the effects of primary prevention interventions for overweight and obesity among children.

**Keywords:** prevention, children, obesity

## Differential diagnosis of obesity in children: From endocrine disorders to genetic causes of obesity

**Irena Aldhoon Hainerova** (Department of Children and Adolescents, Faculty Hospital Kralovske Vinohrady and Third Faculty of Medicine Charles University, Prague, Czech Republic)

Obesity in children represents a global health problem of the 21st century and is one of the most common pediatric chronic diseases. An evaluation of a child with obesity requires a comprehensive history, thorough physical examination and diagnostic studies. The development of body height, weight and BMI over past years may help in exclusion of possible endocrine disorders associated with increased body weight, such as hypercortisolism, deficiency of growth hormone and hypothyroidism. Symptoms of central nervous disturbances should be checked in all patients presenting with obesity, in particular in those with rapid onset. History should include information on nutrition, physical activity, sedentarism, mental behavioral health, sleep patterns, and unhealthy weight control practices. Childhood obesity results from complex genetic, physiological, socioeconomic, and environmental influences. Individual risk factors related to child's history and environment will also be discussed. There is a 40 to 70% genetic contribution to obesity risk. Polygenic forms of obesity are the most common in comparison to single gene mutations. Children with genetic causes of obesity may present with phenotypic characteristics, some being part of a complex syndrome, such as Prader-Willi syndrome. Mutations in genes involved in leptin melanocortin pathway often result in early-onset obesity. A discovery of setmelanotide, a novel specific MC4R agonist, showed to be effective in animal and human studies. Its administration induced reduction in food intake and weight loss without simultaneous activation of sympathetic nervous system and is approved for some types of gene mutations in humans. Differential diagnosis will be presented on real-life cases.

## Before screen time assessment is crucial for prediction of body weight problems adolescents

***Zvetelina T Totomirova*** (Clinic of Endocrinology and Metabolic Disease, Military Medical Academy, Sofia, Bulgaria), ***Mila V Arnaudova*** (MBAL VITA, Sofia, Bulgaria)

Regular physical activity is essential for weight maintenance. Use of different electronic devices is increasing especially at teen-age and leads to long before screen time.

The aim of our research is to assess correlation between before screen time and body weight maintenance of adolescents in single country region in Bulgaria.

We studied 128 boys and 134 girls in a single country region (mean age 12.02±3.03 years, mean BMI 20.38±4.36 kg/sq.m). Children were asked to fill in questionnaires to detect their before screen activities. Timer on smart phone was used to calculate the exact time spent in sports, open air activities, before screen time and sleep time.

10.45% of girls and 10.93% of boys were overweight and 2 girls (1.49%) and 6 boys (6.25%) have been diagnosed with obesity. 13.43% of interviewed girls and 14.06 % of boys reported performing active sport each day. Before screen time (defined as before TV screen, smartphone, computer, etc. time) in 49.25% of girls and 31.25% of boys was limited to be between 60 and 120 minutes per day (limitation mainly due to parents' control). BMI demonstrated high positive correlation with average time spent in physical activity ( $r=0.782$ ) and high negative correlation with before screen time ( $r=-0.674$ )

Before screen time is an important factor for weight gain. Its assessment and recommended decrease should be emphasised. Proper distribution of free time between outdoor activities and before screen and leisure time of adolescents is essential for normal development and should be under parents' special view.

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2. Lowe CJ, Morton JB, Reichelt AC. Adolescent obesity and dietary decision making—a brain-health perspective. *The Lancet Child & Adolescent Health*. 2020 May 1;4(5):388-96.

**Keywords:** adolescents, before screen time, weight control

## Fatty liver disease in children

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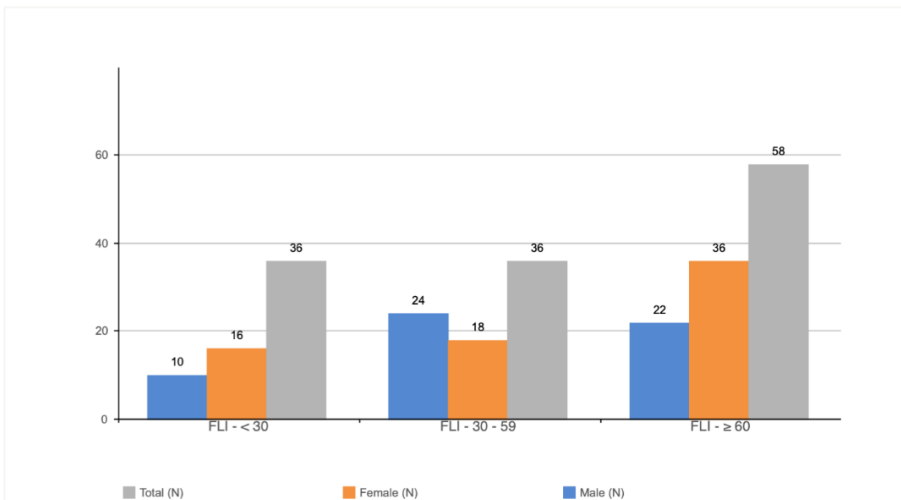
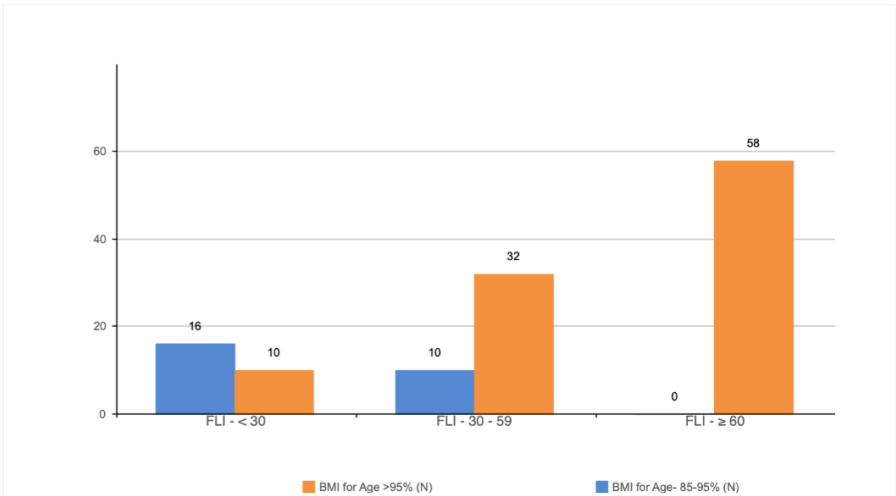
**Objective:** We aimed to estimate the prevalence of NAFLD defined by the Fatty Liver Index (FLI) (1) in overweight and obese children. Hence, each component of FLI algorithm is frequently measured in our clinical setting, it was feasible to determine the grade of NAFLD in children who visited our Institute during COVID-19 Pandemic.

**Methods:** A retrospective study was conducted on 126 children aged 6–14 years who had a BMI $\geq$ 85th percentile for age and gender based on the Centers for Disease Control and prevention (CDC) 2000 growth charts. (2). Data was obtained from medical records of children, who underwent measurement of waist circumference, body mass index, and laboratory examinations of triglyceride and gamma glutamyl-transferase (GGT) concentration during their ambulatory visit in National Institute of Endocrinology, Georgia during Covid-19 pandemic.

BMI for age, waist circumference, triglyceride, and GGT concentrations in serum measured in each participant were plugged into the algorithm for the prediction of fatty liver. Exclusion criteria were concomitant liver disease, type 1 diabetes, and obesity due to iatrogenic causes.

**Results:** Among investigated children, majority of those with severe risk of NAFLD according to the FLI were obese (Fig.1) (BMI to age > 95 % in percentiles). Interestingly, obese girls showed the higher prevalence of severe NAFLD than boys.(Fig2).FLI score below 30 rules out NAFLD, 30 < FLI < 60 indicates an intermediate risk and FLI $\geq$ 60 indicates high risk of NAFLD.

**Conclusion:** Our study showed that FLI algorithm is cost-effective, easily calculated and could help clinicians monitor treatment dynamic.



### References:

- 1- <https://bmcpediatr.biomedcentral.com/articles/10.1186/s12887-022-03575-w>
- 2- [https://www.cdc.gov/growthcharts/html\\_charts/bmiagerev.htm](https://www.cdc.gov/growthcharts/html_charts/bmiagerev.htm)

**Keywords:** Fatty liver disease, Childhood obesity, Obesity epidemic

## Possibilities of physical activity prescription for children with obesity

**Dalibor Pastucha** (Department of Rehabilitation and Sports medicine, University Hospital and Medical Faculty of Ostrava University, Ostrava, Ostrava, Czech Republic)

Along with dietary measures, physical activity belongs to the basic non-pharmacological procedures in the treatment of obesity. The presentation provides an overview of the rules for the prescription of physical activities, main principles of prescription relate to the heart rate, type, intensity and type of physical activities with regard to other associated diseases in children with obesity. There is a strong evidence for intensity of physical activity where is effective in reducing weight. It is known that rather lower activity at an intensity between 50-60% VO<sub>2</sub>max (maximum oxygen consumption) leads to a preferential utilization of fatty acids as a source. To evaluate the effect on the organism in terms of the load on the cardiovascular system, cardiac monitoring is most often used, or heart rate by using a smart watches, smart phones or sprt testers. The use of spiroergometric examination with determination of VO<sub>2</sub>max and of training heart rate appears to be optimal for practice and is the most valuable indicator in the assessment cardiorespiratory fitness. Using the results of the stress test, we can determine the optimal weekly the frequency of training, the duration of the training unit, or to recommend one the intensity of the training load, which will be sufficient for the given child effective and will lead to the desired weight reduction.

**Keywords:** children, obesity, physical activity, prescription, spiroergometry

## SESSION 2: BARIATRIC SURGERY

### New perspectives of bariatric treatment

*Martin Fried (OB KLINIKA a.s., Prague, Czech Republic)*

Obesity is a chronic disease that affects millions of people worldwide and is associated with many health complications. The main goal of obesity treatment is to improve health by achieving and maintaining weight loss or through imposing metabolic changes.

For treatment, there are several interventions available, such as diet and exercise, drug therapy, surgical procedures. If used as MONO therapy, they often show insufficiency to achieve/maintain adequate weight loss and/or metabolic improvement in long term.

Patients seeking low invasive, however still efficient treatment or those with insufficient treatment results or side effects may, under view of **new developments both in pharma and surgery**, benefit from combined approach of both, anti-obesity medications and bariatric surgery.

There are several new anti-obesity drugs that have been developed or are in development. These drugs target different pathways in the body, such as hormones, neurotransmitters, receptors, enzymes, i.e. to reduce food intake, increase energy expenditure, alter nutrient absorption. In bariatric-metabolic surgery new understanding of the mechanisms of action, which involve not only mechanical restriction or malabsorption, but also neurohormonal modulation, gut microbiome alteration, immune system regulation, and epigenetic changes is being applied to the treatment pathways.

For optimal success, heterogeneity of treatment response needs to be incorporated into management plans. Low invasive bariatric-metabolic surgery combined with pharmacotherapy can lead to additive weight-loss benefits and less side effects and it usually works in synergy with medications. Thus, combined approach to obesity treatment that involves anti-obesity medications and BMS are complementary to each other.

Anti-obesity medications may help prepare patients for bariatric surgery by inducing pre-operative weight loss and reducing surgical risk and/or through leveraging treatment outcomes if used in the immediate postoperative period. May also help to prevent or treat weight regain after bariatric surgery by enhancing satiety and reducing hunger. In non-responders to medication before they get surgery may trigger respond to the medication after surgery.

New obesity treatment model that utilizes combination of new drugs and low invasive treatment (such as surgical, endoscopic and other new technologies-magnetic surgery), can enhance patient outcomes without significantly increasing risks.



## Long-term type II diabetes (T2DM) remission: Can long-term remission be predicted by only age and insulin use status?

**Joshua Fultang** (University Hospital Ayr, The University of West of Scotland, Ayr, UK), **Ugochukwu Chinaka** (University Hospital Ayr, The University of West of Scotland, Ayr, UK), **Jean Rankin** (University Hospital Ayr, The University of West of Scotland, Ayr, UK), **Andisheh Bakshi** (University Hospital Ayr, The University of West of Scotland, Ayr, UK), **Abdulmajid Ali** (University Hospital Ayr, The University of West of Scotland, Ayr, UK)

**Introduction:** Preoperative counselling and good patient selection improve T2DM outcomes after bariatric surgery. This study aimed to analyse the preoperative predictors of T2DM remission and deduce a simple predictive tool for remission.

**Methods:** This retrospective observational study reviewed patients who underwent a laparoscopic Sleeve Gastrectomy (SG) or Roux-en-Y gastric bypass (RYGB) at University Hospital Ayr, NHS Ayrshire and Arran between 2010–2018. R studio software was used to perform a multilevel regression analysis to model pre-operative predictors of short and long-term remission. The primary endpoint was achievement of an improvement in HbA1c. Secondary endpoint was T2DM remission defined by HbA1c levels of <5.7%, without ongoing use of anti-diabetic medication for one year.

**Results:** 158 individuals analysed. 22 with diet controlled T2DM were excluded. 62% of the 136 patients included were female. Average age at surgery was  $49.48 \pm 7.79$  years. 50.7% of T2DM patients underwent a SG (n=67). The mean referral weight and BMI were  $132.34 \pm 24.74$  Kg and  $46.53 \pm 7.54$  Kg $m^{-2}$  respectively. 38.34% of individuals were on insulin preoperatively, average HbA1c at referral and duration of diabetes were  $7.68 \pm 1.58\%$  and  $6.82 \pm 4.92$  years respectively. Long-term (> 5 years) remission rates were comparable for both types of surgery (p=0.09). Preoperative variables which reflected the severity of T2DM were seen to influence postoperative remission. Severity of obesity had a neutral effect (BMI p=0.348). We propose a model to predict long term remission from age and insulin use status.

**Conclusion:** Bariatric surgery leads to T2DM remission dependent on severity of diabetes. Long-term outcomes can be predicted from two preoperative variables.



## Does preoperative weight loss (POWL) influence type II diabetes remission (T2DM) following bariatric surgery?

**Joshua Fultang** (University Hospital Ayr, The University of West of Scotland, Ayr, UK), **Ugochukwu Chinaka** (University Hospital Ayr, The University of West of Scotland, Ayr, UK), **Jean Rankin** (University Hospital Ayr, The University of West of Scotland, Ayr, UK), **Andisheh Bakshi** (University Hospital Ayr, The University of West of Scotland, Ayr, UK), **Abdulmajid Ali** (University Hospital Ayr, The University of West of Scotland, Ayr, UK)

**Introduction:** The debate remains rife on the role of weight loss as a preoperative intervention in bariatric surgery. Some have opined it leads to superior outcomes in terms of weight loss. However, evidence on its influence on short and long-term T2DM remission remains scanty.

**Methods:** This retrospective observational study focused on patients who underwent a laparoscopic Sleeve Gastrectomy (SG) or Roux-en-Y gastric bypass (RYGB) at University Hospital Ayr, NHS Ayrshire and Arran between 2010–2018. R studio software was used to perform a univariate regression analysis to model percentage preoperative weight loss (%PoWL) to the primary endpoint defined by HbA1c levels of <5.7% without ongoing use of antidiabetic medication for one year. This was assessed for immediate (1 year), short (<3 years) and long-term remission (> 5 years).

**Results:** 158 individuals were identified of which 22 with diet controlled T2DM were excluded. Preoperative weight loss was achieved by most individuals, with an average percentage of  $9.70 \pm 6.16\%$ . 50.7% of T2DM patients underwent a SG (n=67). There was no significant difference in the %POWL achieved by the RYGB cohort ( $9.41 \pm 6.18\%$ ) versus  $9.98 \pm 6.16\%$  in the SG cohort ( $p=0.59$ ). The influence of %PoWL was limited to the first year post-operatively where the odds of remission were 0.076 times more for any increment in %PoWL ( $p$ -value=0.02). Both short and long-term remission were independent of %PoWL.

**Conclusion:** PoWL does not influence long-term T2DM remission and its inclusion as an eligibility criterion for bariatric surgery remains questionable.

## Partial jejunal diversion with jejuno-colic anastomosis. After initial enthusiasm – disappointment

**Pavol Holéczy** (Surgical, Hospital AGEL Ostrava-Vítkovice, Ostrava, Czech Republic), **Marek Bužga** (Physiology and pathophysiology, Ostrava University, Medical Faculty, Ostrava, Czech Republic), **Martin Bolek** (Surgical, Hospital AGEL Ostrava-Vítkovice, Ostrava, Czech Republic), **Eva Evinova** (Gastroenterology, Hospital AGEL Ostrava-Vítkovice, Ostrava, Czech Republic), **Jiří Stach** (Surgical, Hospital AGEL Ostrava-Vítkovice, Ostrava, Czech Republic)

In addition to standard bariatric operations, new, so-called experimental operations are introduced. They should achieve similar results with less invasiveness.

**Objective** is to report our results in the group of patients to whom we laparoscopically performed partial jejunal diversion (PJD) with jejuno-colic anastomosis as part of the study.

**Material and methodology:** After optimistic initial results of PJD with ileo-jejunal anastomosis, we performed PJD in 7 patients (5 women), aged 37 to 62 years (average 48.14) with creating the jejuno-colic anastomosis. Our vision was to enable this procedure to be performed endoscopically in the future. It was a prospective, non-randomized study. We carried out the operations between March 2018 and June 2020. The anastomosis was 40 cm from the ligamentum Treitz and onto the colon, just behind the hepatic flexure.

**Results:** Initial results in terms of weight reduction and metabolic effect were better than PJD with jejuno-ileal anastomosis. However, we observed intractable diarrhoea once and we had to cancel the anastomosis after a year. In three patients, we had to cancel the anastomosis for hepatic fibrosis and cirrhosis. For the remaining three patients, we have retained PJD and are under surveillance.

**Conclusion:** Although the initial results were optimistic, after a year or two we were forced to cancel the PJD with jejuno-colic anastomosis. We believe that it poses too great risk of metabolic complication and, in the modification proposed and carried out by us, does not represent an appropriate path to less invasiveness.

**Keywords:** bariatrics-partial jejunal diversion- laparoscopy

## Partial jejunal diversion – a new type of metabolic operation, case reports

*Petra Šrámková (OB klinika, Prague, Czech Republic)*

**Introduction:** Bariatric-metabolic surgery is the most effective method to improve diabetes compensation. In about 80 % of patients, it leads to long-term disappearance of clinical signs of diabetes, transition to glucose tolerance disorder or complete normalization of glycemia. One of the new and less used surgical options is partial jejunal diversion (PJD). This procedure allows food and digestive enzymes to enter the ileum more rapidly, leading to increased secretion of GLP-1, PYY, and probably other gut hormones, thereby improving glucose homeostasis and weight loss. When partial jejunal diversion is used in bariatric-metabolic surgery, the passage of food through the intestine is shortened and accelerated by connecting two parts of the small intestine. This has, especially for patients with T2D, a significant effect on the fundamental improvement or complete remission of diabetes. According to the latest international recommendations of ASMBS and IFSO published in October 2022, metabolic surgery is suitable for adult patients with diabetes and patients with other metabolic complications from a BMI above 30.

In 2 case reports, I present the fundamental improvement of diabetes in patients after PJD.

**Conclusion:** Partial jejunal diversion is an operative method with a fast and very good effect on diabetes compensation.

**Keywords:** Partial jejunal diversion, Metabolic surgery, T2D



## SESSION 3: DIET AND EXERCISE IN OBESITY MANAGEMENT

### Aerobic-strength training modulates anthropometric parameters, metabolism, cognition and adiponectin levels in cerebrospinal fluid in the elderly

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**Introduction:** Obesity accelerates aging-associated cognitive decline, and regular exercise improves cognition alongside anthropometric parameters, metabolism, fitness, and cognition in the elderly. The neuroprotective potential of circulating exercise-regulated molecules has been demonstrated in mice. Our aim was to investigate effects of exercise intervention on selected clinical parameters and circulating adiponectin levels in the elderly.

**Methods:** Study population consisted of 38 seniors (M/F 10/28;  $66.1 \pm 5.9$  years; BMI  $26.3 \pm 3.7$  kg/m<sup>2</sup>). Before and after intervention (3-month aerobic-strength training, 3 x 1 h/week), body composition (bioelectrical impedance, MRI), physical fitness (Rockport test), muscle strength (dynamometry), REE & RQ (indirect calorimetry), insulin sensitivity and metabolic flexibility (euglycemic hyperinsulinemic clamp), cognitive functions (standardized tests), volume of specific brain areas (MRI), adiponectin (serum, cerebrospinal fluid (CSF); ELISA, immunoblotting), glycemia and insulinemia were assessed.

**Results:** Training reduced BMI, waist circumference, blood pressure and insulinemia, and improved insulin sensitivity, metabolic flexibility, physical fitness (VO<sub>2</sub>max) and cognitive functions (memory domain) (all  $p < 0.05$ ). The improvement of cognitive functions was more pronounced in individuals with mild cognitive impairment (MCI,  $p < 0.05$ ). Training led to a small but consistent increase of CSF adiponectin in cognitively healthy ( $p < 0.05$ ) but not in MCI individuals ( $p > 0.1$ ). Adiponectin in CSF was positively correlated with psychomotoric attention score and volume of corpus callosum.

**Conclusions:** Relatively short-term aerobic-strength training improved metabolism, anthropometric parameters and physical fitness in the elderly, which could contribute to slowing down of aging-associated cognitive decline. Exercise modulated CSF adiponectin, indirectly supporting the neuroprotective potential of this adipokine in humans.

**Grant support:** APVV 20-0466, VEGA-2/0076/22, COST DePASS

**Keywords:** adiponectin, aerobic-strength training, cerebrospinal fluid, cognitive functions in the elderly

## Effect of aerobic-strength training and dietary intervention on cognitive performance in obese adults

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**Introduction:** Numerous studies demonstrated that obesity can be associated with decline in cognitive performance. Lifestyle interventions can induce changes in body composition and boost cognitive functions in adults with obesity. The aim of this study was to examine effects of complex lifestyle intervention on cognitive performance in middle-aged sedentary adults with obesity.

**Methods:** **Twenty-five healthy adults with obesity** (M/F 16/9, age  $36.9 \pm 6.1$  yrs., BMI  $34.7 \pm 3.2$  kg/m<sup>2</sup>, VO<sub>2</sub>max  $24.9 \pm 7.1$  ml/kg/min) underwent a 3-month intervention with supervised aerobic-strength training (3 x 1 h weekly, with a progressively increasing work-load), individualized dietary counselling (1x/week) and CBT coaching. Cognitive functions (Auditory Verbal Learning Test/AVLT, Trail Making Test/TMT, Digit Symbol Substitution/DSST, computerized Memtrax), anthropometric parameters (BIA) and aerobic fitness (VO<sub>2</sub>max, spiroergometry) were assessed before and after intervention.

**Results:** Three-month intervention induced weight loss (average ~10kg), favourable changes in body composition (increased LBM, reduced fat mass and visceral fat) (all  $p < 0.001$ ) and an increase in physical fitness (VO<sub>2</sub>max,  $p < 0.0001$ ). Moreover, 3-month intervention increased cognitive performance in AVLT (learning/memory;  $p < 0.036$ ), Trail Making Test (psychomotor tempo;  $p = 0.021$ ), and DSST (attention;  $p = 0.013$ ), without change in Memtrax score and reaction time.

**Conclusion:** The 3-month complex lifestyle intervention, resulting in weight loss and increased fitness, positively affected cognitive performance in healthy adults with obesity. Regular exercise is a known enhancer of cognitive performance, which parallel metabolic and other health benefits, and thus should be an integral part of the weight management in patients with obesity.

**Funding:** APVV-20-0411, APVV-19-0466, ObesitySFITMS:313011V344, VEGA-2-0076-22, COST CA19101

**Keywords:** Physical fitness, Regular exercise training, Cognitive performance, Lifestyle intervention, Memory

## Relationship between determinants of food choice and weight

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**Introduction:** Obesity is a chronic complex disease where multiple behavior and environmental risk factors act on already susceptible genes and biology. The end result is always a positive energy balance, meaning that understanding the myriad of determinants of food choice would lead to better, more adequate population strategies for improving this aspect of the management of obesity. The aim of this study was to investigate the determinants of food choice in a Romanian sample of general adult population and to identify and correlations with socio-demographic and anthropometric factors.

**Methods:** For data collection, which was performed online, we applied The Eating Motivation Survey (TEMS) questionnaire, short version, previously validated in Romanian with the authors' consent, consisting of 45 questions representing 15 factors (taste, habits, need and hunger, health, convenience, pleasure, tradition, considerations related to the origin of food, social, price, appearance, weight control, social norms and social image). We also collected self-reported data regarding age, sex, weight, height, education, income.

**Results:** We collected data from 442 adults, of which 341 women, with an average age of  $37.8 \pm 13.9$  years and average body mass index of  $24.5 \pm 6.3$  kg/m<sup>2</sup>. Taste and tradition were the strongest motivations for choosing foods, but all items related to emotional eating and convenience positively correlated with BMI.

**Conclusions:** In this cross sectional study in general population, there were differences in the determinants of food choice in relation to BMI, but whether these are risk factors for weight gain need to be further studied.

## What are the differences between the subgroups? Comparative analysis on stratified levels of obesity

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**Introduction:** The effect of obesity on respiratory system and secondary parameters associated with other body systems alongside its mechanism of action are not fully understood.

**Aim:** This study aimed to examine the effect of obesity on the respiratory system and different parameters associated with other body systems. In order to estimate this effect and its outcome, individuals from different classes of obesity were compared with normal weight participants who were considered as healthy control group.

**Methods:** A hundred participants who met the project's criteria were included in the study and equally divided into 5 subgroups according to their BMI (kg /m<sup>2</sup>) values. Group I: Normal weight (BMI:18.5–24,9), Group II: Over-weight (BMI: 25–29,9) Group III: Class I obese (BMI:30–35), Group IV: Class II obese (BMI: 35,0–39,9) Group V: Class III obese (morbid) (BMI: ≥40). Anthropometric measurements, vital signs, spirometry, respiratory muscle strength, quality of life, and exercise perception were evaluated.

**Results:** There was a statistically significant difference amongst the groups in terms of anthropometric measurements (neck circumference, waist-hip ratio, waist-height ratio), blood pressure, respiratory muscle strength (MIP, MEP), maximum voluntary ventilation and quality of life ( $p < 0,05$ ). There was no significant difference between the groups in terms of spirometry (FVC, FEV<sub>1</sub>, FEV<sub>1</sub>/FVC, PEF) peripheral muscle strength (lower extremity, upper extremity, hand grip) ( $p > 0,05$ )

**Conclusion:** It is observed that obesity has different effects on secondary parameters related to respiratory system and other body systems. The precise mechanisms and causes of these different effects are still unclear.

**Keywords:** Obesity, Spirometry, Respiratory Muscle, Peripheral Muscle, Function

## Nutritional Health in Czechia: Overview of current status and potential for improvement

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Unhealthy nutrition, smoking, and alcohol consumption are prominent behavioral risk factors contributing to over half of all recorded deaths, with diet accounting for 27% of mortality, followed by smoking (20%) and alcohol consumption (7%). In 2020, Czechia reported 340 treatable or preventable deaths per 100,000 population (EU average: 271.7/100,000). In 2019, 19.3% of adults were classified as obese and 39.1% as overweight based on BMI measurements, reflecting similar trends in children.

Despite the significant impact of dietary-related diseases, Czechia was found to have one of the least comprehensive approaches to supporting a healthy diet, according to the recent NOURISHING evaluation conducted as part of the CO-CREATE project. This evaluation quantified the country's underutilization of public health interventions to improve and support the nutritional health of its citizens.

This presentation aims to discuss the current status of nutritional health in Czechia and emphasize the existing gaps in applied public health interventions. Furthermore, it will explore ongoing public health activities targeting components of the NOURISHING framework that have the potential to improve the current situation. By addressing these gaps and implementing evidence-based interventions, Czechia can take significant strides towards promoting healthier dietary habits and reducing the burden of diet-related diseases in its population.



## SESSION 4: BONE MARROW ADIPOSE TISSUE & MICROBIOTA

### Bone marrow adipose tissue under control of nutrient sensors

**Michaela Tencerova** (*Molecular Physiology of Bone, Institute of Physiology of the Czech Academy of Sciences, Prague, Czech Republic*)

Obesity and type 2 diabetes accompanied by increased accumulation of bone marrow adipose tissue (BMAT) affect bone homeostasis. Using anti-diabetic drugs such as thiazolidinediones (TZDs) has a different effect on bone and fat physiology, pointing out a dual role of common factors present in periphery and bone marrow. Insulin signaling, lipid handling, oxidoreductase activity are nutrient-sensing pathways, which are affected by metabolic disturbances and play a critical role in the regulation of glucose metabolism and bone homeostasis. Here I will review our current findings on metabolic changes in BMAT phenotype and its effect on bone marrow microenvironment and stem cell properties in obesity. Also, I will present our recent data with different interventional approaches in animal models of obesity and its effect on BMAT and bone phenotype.

**Keywords:** obesity, bone marrow adiposity, bone marrow stromal cells, cell metabolism, bone fragility



## NOX4 deletion decreased fat mass and diminished bone marrow adiposity in animal model of obesity

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Obesity is associated with accumulation of adipose tissue not only in periphery but also in bones. Storing excess fat generates lipo-toxicity with increased ROS production. Plasma membrane enzyme NADPH oxidase 4 (NOX4) is a major ROS producer, which promotes insulin signaling and drives adipocyte differentiation. Bone marrow adipose tissue (BMAT) expansion is accompanied with up-regulation of NOX4 causing oxidative stress which leads to hyper-metabolic phenotype of bone marrow stromal cells (BMSCs) and is accompanied with accelerated senescence and bone fragility. Thus, we hypothesize that deletion of NOX4 in animal model of obesity may restore bone-fat homeostasis. WT and Nox4<sup>-/-</sup> male mice were fed chow or 60% high-fat-diet (HFD) (n=5-12 per group) for 5 months and examined for metabolic (glucose tolerance test, body composition analysis) and bone phenotyping (uCT, BMAT evaluation). In HFD condition, Nox4<sup>-/-</sup> mice gained less body weight and had less fat mass compared to WT with no significant effect on glucose tolerance. Further, Nox4<sup>-/-</sup> mice showed increased cortical thickness and decreased porosity in comparison to WT in chow and HFD. In addition, Nox4<sup>-/-</sup> mice manifested higher trabecular thickness in linear size accompanied with decreased BMAT volume in HFD Nox4<sup>-/-</sup> compared to WT mice. Moreover, downregulation of NOX4 in hBMSCs-TERT led to increased osteoblastogenesis and decreased adipogenesis suggesting its role in regulation of metabolism and differentiation of hBMSCs. Taken together, these data suggest an important role of NOX4 in regulation of bone-fat homeostasis in obesity.

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**Keywords:** NADPH oxidase 4, obesity, bone marrow adipose tissue, bone marrow mesenchymal stem cells, adipogenesis

## A broader context of obesity and other non-communicable diseases pandemic: focused on the gut microbiome

**Anna Zavadřáková** (Department of Public Health and Preventive Medicine, Charles University in Prague, Faculty of Medicine in Pilsen, Pilsen, Czech Republic)

The role of the gut microbiome in health has become increasingly apparent in recent years. It turns out that people living in industrialized countries suffer far more often from obesity, diabetes mellitus, cardiovascular disease, cancer and mental disorders, the so-called “non-communicable diseases”.

Till today we still cannot define a “healthy microbiome” and generalize it to the entire population. Apart from genetics and age, which we can hardly influence, dietary habits, lifestyle and environment, which we can pay attention to and influence, are important for cultivating microbiome diversity, stability and resilience.

The microbiome will be presented in the broader context. The influence of eating habits, physical activity and living and social environment on the gut microbiome and their connection with the development of lifestyle diseases will be discussed.

When looking for a solution to the increasing number of obese patients, it is necessary to take into account other comorbidities and non-communicable diseases and look at the patient comprehensively. Moreover, it is necessary to map not only the patient's diet and lifestyle, but also the environment where the patient lives, what he was raised in, and his genetic predispositions.

It is important to solve this population-wide problem systematically from a young age of children and to strengthen education not only about eating, but also about stress management, dealing with social pressure and how to be active in everyday life.

**Keywords:** gut microbiome, lifestyle diseases, non-communicable diseases



## Probiotics and Exercise: Which Affects More the Gut Microbiome in Context of Human Health and Obesity?

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Systematic and regular physical work and exercise are associated with a plethora of health benefits. Active lifestyle helps to sustain or even improve physical and mental functions, moods, and may be an interesting perspective for healthy intestinal microbiome, while negative shift of bacterial composition is observed in sedentary behavior and chronic diseases. The effects of athletic training, physical fitness, and probiotics on the microbial community has been widely published in humans and animal models. It seems that the short-lasting exercise training (<month) is insufficient stimulus on the changes of bacterial diversity in human. However, in randomized controlled trial on collegiate athletes we confirmed the positive effect of structured 7 weeks training program combined with the probiotics in dairy foods on gut microbiome  $\alpha$ -diversity. In addition, we have found positive effects of different types of physical exercise (e.g., strength training, endurance exercise) in young and elderly athletes, obese and chronic diseases patients. According to the findings of our recent studies, metabolomics and changes in gut microbiota may also be promising biomarkers of early Type 2 diabetes progression. Therefore, a novel strategy to treat severe obesity and related disorders involves non-invasively modifying the composition of the gut microbiota in obese patients through the adoption of a healthy lifestyle. Furthermore, we assume the physical exercise itself may be a low-cost available modulator of gut microbiome with overall health benefits.

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**Keywords:** butyrate, physical fitness, gut microbiota, type 2 diabetes, appetite



## Sleep disruption and obesity

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Unsufficient sleep is known as a risk factor for the development of obesity and type 2 diabetes mellitus<sup>1</sup>. It alters multiple components of energy metabolism and sleep behaviour. Sleep disruption leads to neurohormonal dysregulation and interfere with the satiety signals at the hypothalamic feeding circuits<sup>2</sup>. Also circadian misalignment increases the risk of obesity. It promotes hunger and energy intake.

In this review presentation, the authors summarize the known findings in this field so far.

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## SESSION 5: NEUROLOGICAL AND PSYCHOBEHAVIORAL ASPECTS OF OBESITY

### The role of emotional eating in the development of obesity

**Magdalena Olszanecka-Glinianowicz** (Health Promotion and Obesity Unit, Department of Pathophysiology, Medical University of Silesia, Katowice, Poland, Katowice, Poland)

The factors affecting the food intake are complex. The regulation of food intake is not limited to the feeling of satiety and hunger regulated by hypothalamic centers. Numerous neurotransmitters are responsible for the feeling of appetite, also called food craving, it is the need to eat food not to satisfy the feeling of hunger, but to feel pleasure and improve the mood. This aspect of the regulation of food intake is responsible for the mesolimbic dopaminergic system, named the reward system. Three components of reward are described as liking, wanting, and learning. Liking and wanting are responsible for the hedonic influence and reward motivation. In contrast, learning involves association and reward anticipation. Experimental studies conducted on animals have shown that endogenous opioids and the endocannabinoid system are responsible for the (hedonistic) aspect of liking, and dopamine is responsible for the willingness and learning aspect. The function of the reward system is regulated by cortisol which inhibits dopamine release and, in vulnerable individuals, promotes emotional eating (EE). EE, formerly called stress eating, is the propensity to eat in response to positive and negative emotions and not feeling hungry EE is a risk factor for the development of BED and addictive eating. EE is a way to deal with emotions, but this strategy is not effective.

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**Keywords:** reward system, stress, emotional eating, binge eating disorder, obesity



## Common pathomechanisms of metabolic and neurodegenerative diseases: the impact of regular exercise in patients with Parkinson disease

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Obesity and associated metabolic dysfunction contribute to neuroinflammation and may accelerate progression of neurodegenerative diseases, such as Parkinson's disease. Regular exercise has a potential to improve metabolism and clinical state of patients with Parkinson's disease.

The aim of this work is to investigate the effects of a 4-month supervised aerobic-strength training on anthropometric parameters, clinical state, cognitive functions, physical fitness and glucose metabolism in patients with mild to moderate Parkinson's disease.

Patients (M:F 9:8) aged  $61.1 \pm 8.8$  years; H&Y score I-III, BMI  $27.6 \pm 5.4$  kg.m<sup>-2</sup>, completed 4-month aerobic-strength training (3 x 1 h/week). United Parkinson Disease Rating Scale (MDS-UPDRS) was used to assess clinical state of the disease in ON and OFF (part 3) states. Cognitive functions (CogState) body composition and abdominal adiposity (BIA,MRI), VO<sub>2</sub>max (Rockport walk test), muscle strength and functional capacity (dynamometry, 10 m walking test), resting energy expenditure and substrate preference (metabolic flexibility) and insulin sensitivity (euglycemic hyperinsulinemic clamp) were assessed.

Training intervention reduced visceral adiposity and HbA1C levels and improved metabolic flexibility, several domains of cognitive functions, and all domains of MDS-UPDRS, as well as strength of the major muscle groups (all p<0,05).

Regular exercise reduces obesity and metabolic dysfunction which can have favourable disease-modifying effects in patients with PD. Long-term exercise intervention programs, ongoing in our Center, provide the effective tool to improve patients' clinical state and modulate progression of the neurodegeneration.

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## 40 years of experience of applying CBT in the prevention and treatment of obesity in the Czech Republic

*Iva Málková (STOB, Prague, Czech Republic)*

**Introduction:** Obesity represents a serious health and social problem in the Czech Republic. Primary health care alone cannot take long-term care of overweight and obese people who form half of the nation. Therefore, patient organization STOB represents a very important part of obesity management in the Czech Republic.

**Methodology:** STOB (STop OBesity) was established in 1990. STOB has developed a structured program based on cognitive-behavioral psychotherapy (CBT) and mindfulness. The philosophy has been the same for 40 years – to help people change inappropriate habits and improve their quality of life in a sensible and pleasant way. People can choose between in-person programs (weight reduction courses, individual counseling, exercise) or work through the Internet. The only change over 40 years is the increasing role of the Internet and the use of ICBT (internet-based cognitive-behavioral therapy).

STOBclub offers its nearly 200,000 registered users many tools depending on their readiness to change their habits – STOBwheel, interactive programs (Challenge 52), a self-coaching program, recipes, discussions and more. STOB offers brochure-based programs for brief intervention for health professionals. It also offers programs for children with parents, and we are currently using also therapy via the internet.

**Conclusion:** The role of the patient organisation, which may be largely self-funded, is to act as an intermediary between the lay offer, the general practitioner and the obesitologist. Activities include obesity prevention, weight reduction and, most importantly, weight loss maintenance.

**Keywords:** cognitive-behavioral therapy of obesity, STOB, mindfulness



## Cognitive-behavioural intervention in obesity management STOp Obesity

**Ivan Majercak** (*Obesity Treatment Center, Medical Faculty P.J. Safarik University Kosice, Slovakia, Medical group Kosice s.r.o., Kosice, Slovakia*), **Iva Malkova** (*STOB Praha, Czech Republic, Praha, Czech Republic*)

**STOB Society (STOp OBesity)** was founded in the Czech Republic in the year 1990 (Slovakia 2009) and it joins together psychologists, medical doctors, diet therapists, instructors and other professionals whose aim is to help people with obesity to manage their excess kilograms in a reasonable and pleasant way. Activities of the STOB Society are based on the method of **cognitive-behavioural psychotherapy**. In the foreseeable future we cannot change a toxic environment leading people to excess energy intake and reduction of physical activity but we can bring people to an active care for their health. In comparison with other weight reduction methods this methodology does not influence only a dietary regimen but lead to change inappropriate thoughts and emotions often dividing life of obese people to a slimming phase and a phase of gathering strength for another slimming during which they do not control their eating and regain weight. The methodology does not consider just what to eat but also how to deal with stress in other way than by food. Patients with obesity are trying to positively change their behavior, but very often unsuccessfully. Cognitive-behavioral therapy is most commonly used to lifestyle change, which aims to eliminate inappropriate eating and movement habits and teach a patient with obesity how to replace self-blaming with positive approach to a new lifestyle. Only a long -term lifestyle change will ensure weight loss maintenance. STOB was repeatedly awarded by EASO and ECPO Award for patient programmes (2018, 2020–2021).

**Keywords:** cognitive-behavioural psychotherapy, patient programmes, multidisciplinary care of patients with obesity, lifestyle change, weight loss maintenance

## SESSION 6: NONSHIVERING THERMOGENESIS & SYSTEMIC METABOLISM

### Nonshivering thermogenesis in skeletal muscle linked to obesity-resistance in mice

*Jan Kopecky (Institute of Physiology of the Czech Academy of Sciences, Prague, Czech Republic)*

Heat production (thermogenesis) is essential for maintaining a constant body temperature, and is an important component of energy balance. Well-described mechanisms involved in heat generation include muscle shivering or nonshivering thermogenesis (NST) in brown adipose tissue (BAT). Thermogenesis in BAT, which depends on UCP1, is the focus of interest for its potential use in the treatment of obesity. However, its activation in obesity remains problematic. Other mechanisms of NST exist and need to be better characterized. We have investigated heat generation in two different strains of laboratory mice (C57BL/6J and A/J) that differ in their susceptibility to obesity. In C57BL/6J but in A/J mice, obesity can be induced by a high-fat diet. Mice of both strains were able to acclimate to cold, initially using muscle shivering. Prolonged exposure to cold led to activation of thermogenesis in BAT in obesity-prone mice. Surprisingly, obesity-resistant mice failed to activate BAT but increased NST in skeletal muscle. The involvement of different thermogenic mechanisms in the two strains of mice could be related to the different susceptibility to obesity. The resistance of A/J mice to obesity is probably due to their ability to activate NST in muscle. These results also suggest a new possibility for obesity treatment by activating muscle NST. In the adult human, the capacity of skeletal muscle to burn fat energy stores is several fold greater than in BAT. Thus, only a relatively small increase in thermogenesis in muscle could significantly reduce adipose tissue deposition (see Janovska et al 2023).

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## Lactate promotes protein kinase A signaling and metabolic activity of brown adipocytes

**Miroslav Balaz** (*Biomedical Research Center of the Slovak Academy of Sciences, Bratislava, Slovakia*)

Cold exposure triggers a complex physiological response in our body, including mobilisation of energy substrates and activation of thermogenesis. The most obvious changes in plasma metabolome triggered by acute cold include an increase in free fatty acids, glycerol and lactate. The first two originate from lipolysis and fuel thermogenesis. However, it is not clear what is the function of lactate under cold. The aim of our study was to investigate the effect of lactate on metabolic activity of human brown adipocytes in vitro and energy expenditure in mice in vivo. We found that L-lactate treatment strongly promotes mitochondrial respiration in brown adipocytes, which was evident also in the presence of 2% BSA, suggesting that the observed phenotype is not driven by fatty acids. In fact, we found that administration of lactate has no effect on basal, but promotes forskolin-induced lipolysis in human brown adipocytes. The effect of lactate on mitochondrial respiration could not be prevented by siRNA mediated knockdown of LDHB, the enzyme converting lactate into pyruvate, or HCAR1, the so far only known lactate receptor. A kinase activity assay screen revealed that lactate promotes PKA signaling, and we could show also an increase in forskolin-induced cAMP levels. Treatment of obese mice with L-lactate caused a significant reduction of body weight, which was due to an increase in energy expenditure. In contrast, adipocyte-specific deletion of LDHA led to a significant reduction of energy expenditure under cold. Altogether, our data indicate that lactate plays an important role in thermogenesis.

## Effects of Fibroblast growth factor 21 (FGF21) on energy expenditure: Mechanism of action

**Petr Zouhar** (*Adipose Tissue Biology, Institute of Physiology, Czech Academy of Sciences, Prague, Czech Republic*)

Administration of FGF21 to mice reduces body weight and increases body temperature. The increase in body temperature is generally thought to be secondary to the increase in energy expenditure (heat production). Here, we examine an alternative hypothesis: that FGF21 increases body temperature independently of any effect on energy expenditure.

We found out that effect of FGF21 on energy expenditure is mediated by adrenergic system and dependent on uncoupling protein 1 (i.e. it could be blocked by adrenergic antagonist propranolol and was completely absent in UCP1 deficient mice). In contrast, the FGF21-induced rise in body temperature was observed even in UCP1 deficient animals. In these UCP1 deficient mice, FGF21 treatment transiently reduces temperature of tail surface which probably results in reduction of heat loss.

The effect of FGF21 on body temperature is independent of UCP1 and can be achieved in the absence of any change in energy expenditure by management of heat loss. Since elevated body temperature is a primary effect of FGF21 and can be achieved without increasing energy expenditure, only limited body weight-lowering effects of FGF21 may be expected.

*The project was supported by project no. 19-05356Y of Czech Science Foundation, and by National Institute for Metabolic and Cardiovascular Disease Research (no. LX22NPO5104) – funded by the European Union Next Generation EU.*

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**Keywords:** thermogenesis, body temperature, uncoupling protein 1, energy expenditure, brown adipose tissue

## Plasma leptin levels during postnatal surge as a biomarker of body weight gain in mice

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Various factors during perinatal period exert lasting effects on energy metabolism and the propensity to obesity. Leptin, secreted primarily by adipose tissue, represent a key signal of the nutritional status and a potential programming factor. Here, we aimed to learn whether leptinaemia during its postnatal surge could predict differences in body weight (BW) development.

Plasma levels of leptin and leptin gene (Lep) expression in adipose depots were evaluated at week 2 and 4 postnatally. Their relation to development of obesity induced by high-fat diet feeding between week 12 and 24 was assessed. Two inbred mouse strains, obesity-prone C57BL/6 (B6) and resistant A/J mice, were compared.

Plasma leptin levels decreased several fold between week 2 and 4 in both strains. The decline could not be explained by Lep expression in adipose tissue, suggesting a complex control of circulating leptin levels during postnatal surge.

Our results confirmed that postnatal surge of leptin can imprint propensity to dietary obesity in mice. Moreover, leptinaemia at 2 weeks predicts the BW gain during adulthood. Thus the leptin levels during postnatal surge represent a marker of BW development in mice.

*Supported by the Ministry of Health of the Czech Republic (NU20-07-00026).*

**Keywords:** leptin, obesity, postnatal imprinting

## VLDL expression is necessary for increased miR-122 levels in adipose tissue observed in an experimental model of NAFLD

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Nonalcoholic fatty liver disease (NAFLD) is considered the most prevalent chronic liver disease worldwide and four times more prevalent in obese patients. In obese individuals, a higher content of VLDL in the bloodstream is responsible for transporting mostly TG to extrahepatic tissues, and recently shown, miRNAs. miR-122, a liver-specific miRNA involved in lipogenesis silencing, is decreased in hepatocytes, and has increased circulating rates in the NAFLD experimental models. This study aimed to investigate a possible crosstalk between liver and adipose tissue mediated by VLDL through the transport of miR-122 in mice models. Results showed a negative correlation between miR-122 levels in liver (downregulation) and adipose tissue (upregulation) in adult male C57BL/6 mice with obesity and NAFLD induced by a high-fat diet. In VLDL receptor knockout mice (VLDLR<sup>-/-</sup>) fed a control diet, miR-122 was decreased in adipose tissue compared to WT. The conditioned medium (CM) of WT liver (ex vivo) treated with palmitate (PA, 750uM) showed higher miR-122 levels compared to the non-treated. A trend towards an increase in miR-122 levels in WT adipose tissue treated with CM was observed, but no differences were seen in VLDLR<sup>-/-</sup>/CM-treated adipose tissue. The study also detected miRNAs in VLDL isolated from WT mice, highlighting the role of VLDL in miRNA transport. In conclusion, miR-122 levels are increased in adipose tissue in NAFLD models, influenced by VLDLR expression. Our preliminary conclusion suggests that miR-122 in VLDL could be a potential mechanism for communication between the liver and adipose tissue.

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**Keywords:** microRNAs, fatty liver, miR-122, adipose tissue



## SESSION 7: PHARMACOTHERAPY AND NOVEL COMBINED APPROACHES

### Management of obesity in GP's office using GLP-1 agonists

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Obesity in the Czech Republic has significantly risen within the last decade and reaches to 25 percent of women and 22 percent of men among the adult population. In the GP's office, dealing with obese patients is a daily struggle, while obesity is so closely related to Hypertension, Diabetes, Dyslipidemia, Depression and other diseases. Most of the time, successful management of obesity brings restoring of health and reduction or drop off the medication for mentioned diseases. Obese patients can be referred to an expert physician such as internist or obesitologist, but more frequently is treated by their GP due to difficult accessibility. Management of obesity is offered to motivated patients and includes anthropometric measures, blood tests, nutrition and physical activity screening and advice and for selected patients also pharmacotherapy. Currently most frequently used drug is a GLP-1 agonist liraglutide 2.4 mg or 3 mg per day for minimum of 3 months. Since November 2021 until May 2023 we prescribed liraglutide to 30 patients. Among which 23 were women and 7 were men. Adherent to treatment and dietary advice were 50 % of them and the average loss of weight was 11 percent. The other 50 % lost minimum of weight for various reasons, such as side-effects (gastrointestinal), lost motivation or financial matters. Weight regain will be monitored, at the moment only one patient regained her weight back. We realize that prevention and treatment of obesity in the primary care sector is essential and complex therapy including GLP-1 agonists is very effective.

**Keywords:** Obesity management, Primary care, General practitioner, GLP-1 agonist, Liraglutide



## Engaging through the online Embla solution to reduce body weight and achieve clinically relevant endgoals (EMBRACE)

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**Background:** Digital weight management programs are widely available across Europe as purpose-built mobile applications provide a scalable and flexible solution for providers and patients.

**Objective:** The primary objective was to explore the impact of a digital multi-disciplinary obesity management program during a 40-week follow-up period (26 weeks is the primary follow-up) with respect to change in body weight and use of semaglutide.

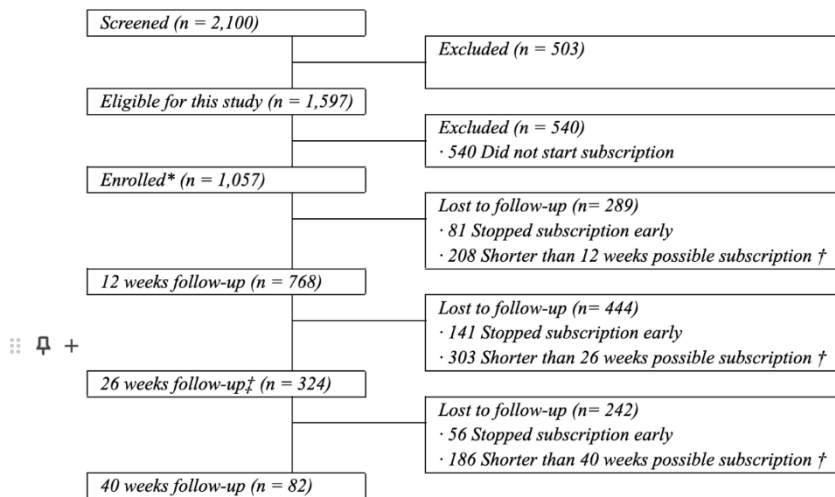
**Methods:** This study is a real-world, new-user cohort including individuals signing up for the weight management program no later than the 31st of March 2023. The program consisted of dedicated lifestyle intervention in combination with personalized dosages of semaglutide.

**Results:** As displayed in figure 1 a total of 1,057 participants were included, and after 26 and 40 weeks, respectively, 324 and 82 participants were still included. The program produced an average weight loss of 13.1% (95%CI, 12.8% to 13.4%) at week 26 (figure 2) with an average weight loss of 16.1% at week 40 (95%CI, 15.2 to 17.1).

The participants only used between 41 and 58% of the suggested cumulative dose. In addition, 96.9% of the participants had lost > 5% of their body weight and 79.4% had lost > 10% of their body weight at week 26. Analyses of participants' baseline BMI and use of semaglutide revealed no difference between the different BMI groups in terms of their achieved weight loss.

**Conclusion:** In conclusion, regardless of the participants' BMI upon enrolment they achieve a clinically relevant weight loss through a lifestyle intervention combined with semaglutide.

**Figure 1. Flow diagram**

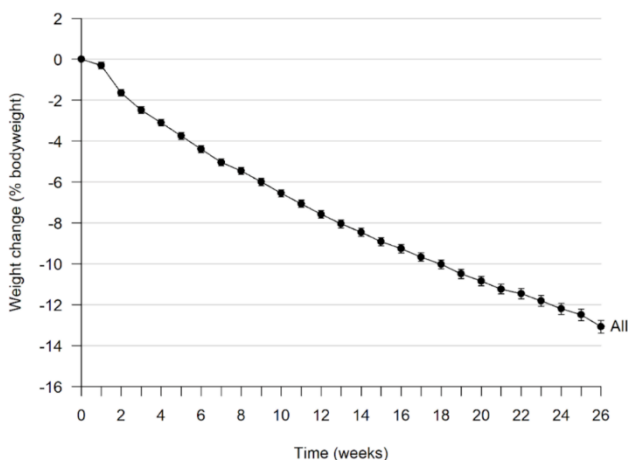


\*An individual is considered enrolled when the subscription to the weight loss programme is formally started (1<sup>st</sup> payment completed).

†Individuals starting their subscription less than 12, 26, or 40 weeks, respectively, before the 31<sup>st</sup> of March 2023.

‡Primary follow-up of this study.

**Figure 2. Weight loss over time from baseline to 26 weeks**



Weight change, as percentage of initial body weight, over time for all enrolled participants (panel A) and stratified by maximum medication dose used during the first 26 weeks (panel B). Error bars indicate 95% confidence intervals. Missing data were handled indirectly with the mixed model.

## Management of obesity yesterday, today, and tomorrow

**Dana Mullerova** (Charles University, Faculty of Medicine and Faculty hospital in Pilsen, Pilsen, Czech Republic)

35 years ago the reference method for measuring body composition was hydrodensitometry, completely uncomfortable for the patient; moreover, this method was mostly unavailable to standard obesitological workplaces. Back then, the treatment of obesity was directed towards patient's risk components of behavior. The patient was often considered to be the culprit of his/her obesity. Influencing the risk components of behaviour represented the absolute basis of the treatment because, for many years, antiobesity medications have been limited in number, often delivering meagre efficacy and raising numerous safety concerns. Today, we have a whole spectrum of diagnostic methods and commonly available devices for clinical practice at our disposal, as multi-frequency bio-impedances, calorimetry, spiroergometry, imaging methods like CT or MRI etc. We may remotely monitor our patients not only for cardiorespiratory functions, but also the monitoring of food intake, movement and exercise, which are essential. What is new today in management of obesity: First of all, there has been a major shift in our recognition and perception of obesity as a disease. Obesity is a chronic, progressive and relapsing disease and our understanding of neurobiology of this disease brings us the new possibilities of treatment. Glucagon-like peptide 1 receptor agonists such as liraglutide and semaglutide represents the first agents in a rapidly evolving, highly promising landscape of nascent hormone-based obesity therapeutics. The new horizons in pharmacotherapy based on nutrient stimulated hormone therapy have new potential candidates as tirzepatide, retatrutide, orfoglipton, and others. As well other directions of new pharmacotherapy development will be presented. Simultaneously, a novel less invasive bariatric procedures will be summarised.

## European Dietary guidelines for the Medical Nutrition Therapy (MNT) of adults and children with obesity

**Maria Hassapidou** (Nutrition and Dietetics, International Hellenic University (IHU), Thessaloniki, Greece)

The European Association for the Study of Obesity (EASO) in collaboration with the European Federation of the Associations of Dietitians (EFAD) published in 2023 two position papers, one on medical nutrition therapy (MNT) in the management of overweight or obesity in children and adolescents, and a second on MNT for adults living with overweight and obesity. They are based on the best evidence available from systematic reviews of randomized controlled trials on overweight and obesity treatment and other relevant peer-reviewed literature. Multi-component behavioral interventions are generally considered to be the gold standard treatment for people living with obesity. *MNT is an evidence-based nutritional therapeutic approach used in the nutrition care process (NCP) of treating and/or managing chronic diseases.* Individual MNT (IMNT) is usually conducted in clinical or primary care settings, and includes nutrition assessment, diagnostics, therapy and counseling. Medical Nutrition Therapy should be administered by trained dietitians as part of a multidisciplinary therapeutic approach, and should aim to achieve positive health outcomes, not solely weight changes. A diverse range of nutrition interventions are shown to be effective in the treatment of obesity and its comorbidities, and dietitians should consider all options and deliver personalized interventions. Although caloric restriction-based interventions are effective in promoting weight reduction, long-term adherence to behavioral changes maybe be better supported via alternative interventions based on eating patterns, food quality and mindfulness. All healthcare professionals should be aware of conscious and unconscious bias which may hinder access to, and effectiveness of, treatments.



## SESSION 8: PREVENTION

### Effect of COVID-19 on the prevalence of obesity and the mortality ratio in the Hungarian population by age and gender

**Eszter Halmy** (President, Hungarian Society for the Study of Obesity, Budapest, Hungary), **István Barna** (Hungary's Comprehensive Health Promotion Screening Program 2010-2020-2030, Budapest, Hungary), **László Gyula Halmy** (Hungarian Society for the Study of Obesity, Budapest, Hungary), **Gergely Dankovics** (Hungary's Comprehensive Health Promotion Screening Program 2010-2020-2030, Budapest, Hungary), **Tennó Daiki** (Hungary's Comprehensive Health Promotion Screening Program 2010-2020-2030, Budapest, Hungary), **András Paksy** (Hungarian Society for the Study of Obesity, Budapest, Hungary)

**Introduction:** Aim was to study the effect of COVID-19 between 2020–2022 on the obesity prevalence compared to 2010–2019, and what was the relation the diagnosed severe obesity above BMI 35 kg/m<sup>2</sup> on the total mortality ratio in COVID-19 infection.

**Method:** Anthropometric parameters were measured; body composition analysis and body fat percentage were determined using InBody 720 bio-impedance method; total N=161047 (women: 86747, men: 74340). 2010–2014 N=44392 women, 36458 men; 2015–2019 N=31545 women, 28297 men; 2020–2022 N=10810 women, 9585 men. The COVID-19 mortality analysis was made on N=45652 (23.125 men and 22.527 women).

**Results:** The prevalence of obesity BMI ≥ 30 kg/m<sup>2</sup> and BFP men ≥ 23.15%, women ≥ 33.3% show an increasing trend with age in both genders, compared to the average of previous years, especially significant in age groups under 45y during the pandemic. We compared the rate of severe obesity among those who died of COVID infection by age, as well as BMI≥35 kg/m<sup>2</sup> cases in the population (2015–2019, data of 33.959 women and 29.788 men). In COVID mortality men under 45y and women 55y there were significantly higher ratio diagnosed severe obesity.

**Conclusion:** The significantly increased prevalence of obesity during the COVID-19 pandemic in the younger age groups between 18–45 years requires special attention. Further investigation is needed to determine the increased risk of severe obesity, which can also occur as an independent diagnosis in younger age groups.

**Keywords:** obesity, prevalence, mortality, COVID-19

## The prevalence and economic burden of obesity in Hungary

*Imre Rurik (Family Medicine, Semelweis University, Budapest, Hungary)*

**Introduction:** The prevalence of obesity is growing in Hungary. Obese patients usually need more health care services, requiring higher expenditures.

### **Methods:**

1. Anthropometric parameters were measured in primary & community care settings and in workplaces. Age, BMI, waist circumference, educational level, presence of hypertension or/and diabetes were analyzed statistically.
2. Yearly data of the Hungarian National Health Insurance Fund Administration (NHIFA) were collected, regarding finances of secondary care, hospital services and health insurance reimbursement for medications, based on the International Classification of Diseases (ICD) codes of selected morbidities considering linked to obesity.

**Results:** Data of 43,287 persons above 18y were registered in all geographical regions of Hungary. The overall prevalence rate of overweight among men was 40 %, while obesity 32 %, by women both was close to 32 %. Data are presented in age groups. The highest ratio of overweight was registered among men with the highest educational level, while highest ratio of obesity among women having the lowest education. Obesity according to BMI and abdominal obesity was the highest in the villages, especially among females.

The estimated total public health expenditures were 58,986 million HUF (190.3 million EUR) and the financial contribution of patients was calculated as 25,316 million HUF (82 million EUR). These data represent 9,3 % of the whole national health services budget and 30 % of the whole drug-reimbursement budget (296,024 million HUF – 955 million EUR).

**Conclusions:** Obesity means a serious medical, public health and economic problem, requires higher public awareness and political support.

**Keywords:** obesity, prevalence, economic burden, Hungary



## Changes in Body Mass Index Among Children and Adolescents During the COVID-19 Pandemic in Saudi Arabia

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**Background.** Several studies conducted during the first Covid-19 lockdown already found a decrease in physical activity levels, an increase in sedentary behavior, and changes in dietary intake, while also observing several differences between girls and boys.<sup>5,6</sup> This study aimed to assess the pandemic-related changes in body composition in school children and adolescents.

**Methods.** In a prospective cross-sectional study, using school health centers. all children and adolescents 3 to 17 years who attended a school health clinic at King Abdulaziz Housing of the Ministry of National Guard (Iskan), During the academic year 2018–2019 (n=2759), if they had at least one in-person visit with one BMI measure before the pandemic, and the academic year 2020–2021 (n= 3408) if they had at least one in-person visit with one BMI measure at the end of the pandemic,

**Results.** Children and adolescents were categorized into three age groups, 3–5 years “pre-school children”, 6–10 years “schoolchildren”, and 11–17 years “adolescents”. A significant increase in the mean BMI was detected after the pandemic for male adolescents (20.5±5.1 versus 21.6±5.9,  $t=3.54$ ,  $p<0.001$ ) and for female adolescents (21.3±5.3 versus 22.4±5.7,  $t=3.87$ ,  $p<0.001$ ).

**Conclusion.** The impact of Covid-19 pandemic on children and adolescents’ body composition was evident, however, there was discrepancy between sexes and age in such change. Effective policies and strategies to prevent and control childhood /adolescent obesity is a necessity.



## Key drivers of obesity in V4 countries – Visegrad Fund Project

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Behaviour, the product of individual or collective action, is a key determinant of people's health. Citizens in V4 countries have shorter life expectancy and worse health status than people in other EU countries. Adding years to life and life to years can be achieved by fostering healthier ways of life, reducing health inequalities and promoting healthy lifestyles. As part of the project implemented in all V4 countries, we investigated the risk factors of obesity, associated diseases, lifestyle, motivation to reduce weight, but also the choice of experts, including general practitioners and the reasons for this choice, as well as interest in counseling in the field of lifestyle change and reduction weight. The results of quantitative research showed that more than 50% of the population of all V4 countries suffer from overweight and obesity, women 4 times more often than men, they most often suffer from heart and vascular diseases in all V4 countries (approx. 30%), they sleep an average of 6.5 hours, regularly they play sports the most in Hungary, they smoke the most in Poland, they drink alcohol the most in the Czech Republic, during the pandemic, approximately 30% of respondents gained weight, and more than 50% of respondents in each country showed an interest in counseling in the field of overweight and obesity. The results helped us to understand the premise and importance of overweight and obesity as a societal problem with the need for early and long-term education, skills training and early intervention.

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**Keywords:** obesity, obesity risk factors, multidimensional approach, healthy lifestyle

## POSTERS

### Gut microbiota composition in obesity and diabetes

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Both obesity and Type 2 diabetes mellitus (DM2) are characterized by unfavorable changes in the gut microbiota, inflammation, and disruption of the intestinal barrier. Western type of diet in obesity leads to changes in gut microbiota and subsequently to dysregulation and changes in the secretion of intestinal microbial metabolites, triggering various potential mechanisms leading to insulin resistance (IR), dyslipidemia, and DM2. Many studies have shown that probiotics, e.g. traditional fermented milk products (yogurt, kefir, bryndza) can improve glycemic control in patients with Type 2 diabetes, improve the lipid profile, or adjust blood pressure. The positive effects of lactic acid bacteria (LAB) on the structure and modulation of intestinal microflora and metabolism are well known. Probiotic supplementation can increase the number of bacteria producing short-chain fatty acids (SCFA, e.g. Phascolarctobacterium and Butyricimonas). At the same time, it leads to the reduction of lipopolysaccharide (LPS)-producing bacteria, which can reduce the subclinical inflammatory process caused by LPS. Probiotics also reduce the number of opportunistic pathogens and thus also their production of metabolites such as pro-atherosclerotic trimethylamine oxide. Probiotics can also inhibit fat accumulation, reduce cholesterol, triglycerides, inflammation, and insulin resistance, and regulate neuropeptides and gastrointestinal peptides. Therefore, interventions aimed at reducing body weight with probiotics have beneficial effects on the composition of the intestinal microflora and derived metabolites.

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**Keywords:** obesity, gut microbiota, weight loss, probiotic therapy, diabetes

## Obesity paradox in cancer

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There is a common knowledge that excess adiposity, is associated with increased risk of several types of malignant tumours, as well as with reduced cancer survival. On the other hand, several studies demonstrated that overweight and early obese states may be associated with improved cancer survival. This finding belongs to the area of the “obesity paradox”. The obesity paradox first described more than 20 years ago in cardio-metabolic diseases, is a medical hypothesis that being overweight may grant some form of survival advantage in a wide variety of diseases. Obesity paradox is well recognized in the cardio-metabolic literature. However, it seems that overweight may have also a survival advantage in certain cancers. One of the most frequent obesity paradox observations is the paradoxical and controversial relationship between obesity and breast cancer. The relationship between overweight/obesity, and overall risk of the breast cancer appears to be highly dependent on menopausal status. Thus, obesity increases the risk of breast cancer in postmenopausal women but, conversely, it appears to be protective in premenopausal women. Factors potentially involved in this obviously contradictory relationship are attributed to oestrogens, mammogram density, adipokines, insulin-signalling pathway activation, and inflammatory status. Our presentation tries to summarize the epidemiological findings and biological, metabolic and endocrine mechanisms related to the obesity paradox in cancer.

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**Keywords:** obesity, breast, cancer, paradox

## Obesity and dyslipidaemia in Hungary's nationwide comprehensive health protection screening program in Hungary 2010–2022

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The “Comprehensive Health Screening Program of Hungary 2010–2020–2030” (MÁESZ) (<http://www.egeszsegprogram.eu>) is the only complex screening program in Hungary, during the period 2010–2021. The screening program was present at 2,212 locations nationwide and performed nearly 9 million screening tests for more than 261,540 citizens. In a specially designed filter truck, 40 tests give the individual an idea of his or her health status, current risks, and any unknown illness. An individual's screening time is 20 minutes, during which, among other things, anthropometric data collection, blood pressure measurement, blood sugar, cholesterol, and uric acid levels are performed. Results are expressed as mean and standard deviation. The data were stored and processed in the aLLCare-Stat database risk management program.

**Results:** The BMI value of the participants exceeded the normal value in 53.1 %, for women 46.9 %, for men 46.18 %. There was also a very close correlation between the abdominal circumference and age. In all age groups and in groups with elevated blood pressure in both sexes, higher body mass index and abdominal circumference values occur in greater numbers. The correlation of BMI and diabetes and high blood pressure with the amount of body fat was significant. (by chi2 test  $p < 0.001$ ). We found elevated cholesterol levels in 31.3% of those who appeared.

**Conclusion:** Elevated body mass index values are higher in all age groups and in both sexes with elevated blood pressure. In light of the statistics, it can be stated that a large proportion of the study participants belong to the high-risk group.

**Keywords:** screening program, cardiovascular risk, obesity, metabolic syndrome

## Psychiatric aspects of obesity

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Obesity without doubt represents a great problem worthy of general attention and increased vigilance. We are witnesses of an inexorable march of obesity but also of science. The WHO declared that obesity is a global epidemic and the new term of globesity created to describe the increase of excess weight and obesity in the world population. Slovakia is no exception. Despite the variety of available treatments, e.g. dietary, behavioural and pharmacological, the outcomes remain still unsatisfactory, due to high rates of nonresponse and relapse. Obesity is really not just an aesthetic problem. Being obese means being extremely vulnerable (e.g. obesity as a paradoxical state of malnutrition). Obesity is associated with a growing surge of myriad severe neuropsychiatric complications, certainly related to the pathogenesis of this condition. We can talk about neuroinflammation, neurodegeneration and neuroprogression. Obesity exhibits complex associations with mood disorders and affective temperamental dimensions, eating disorders, ADHD-related executive, emotional and motivational-addictive dysfunction. It is obvious that there exists “the vicious circle of obesity and neuropsychiatric consequences” which means stress can trigger a metabolic dysfunction and modify the eating behaviour; on the other hand individuals with obesity are more sensitive to stress. The core idea of my speech is to emphasise the devastating effect of obesity on the development and function of the human brain, which is already observed in obese children.

## Breast cancer chemotherapy and its effect on body weight

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Breast cancer (BC) and obesity are widespread health problems with increasing prevalence worldwide and the impact of the rising prevalence of obesity has been recognized as a proven issue and risk factor for BC development, outcome, and management. Association of BC and obesity is described as dependent of menopausal status of patient. Furthermore, obesity can affect the efficacy and side effects of multiple therapies, chemotherapy included. In the contrary, effect of chemotherapy on the body weight during treatment of BC has been studied as well and it was first mentioned in 1978. Even though side events of different types of chemotherapy mention lack of appetite and oral cavity pain, which could indicate weight loss, studies describe otherwise. Weight gain is observed in BC patients receiving chemotherapy and is a well-known complication that is commonly reported. Regarding adjuvant chemotherapy, several studies have reported significant weight increases in the majority of patients, with a mean body weight gain after chemotherapy between 1 and 6 kg. Populations at higher risk include women who are younger, closer to ideal body weight and who have been treated with chemotherapy. This increase seems to be independent of the menopausal status. Not only prognosis of BC is affected, weight gain has also confirmed negative consequences on quality of life and overall health. Our poster summarizes the research findings and describe effect of chemotherapy on body weight of patients diagnosed with BC.

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**Keywords:** breast cancer, chemotherapy, body weight

## Readiness to change for weight management

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**Aim** The individual's readiness to change is an important factor for predicting the long-term success of weight management. We aimed to assess readiness to change for weight management using the Trans-theoretical model in a sample of Slovak patients with overweight and obesity from primary care settings.

**Methods** A total of 147 people with overweight and obesity (63.94% female; mean age 47.83±15.09 years; body mass index (BMI) 31.04±7.44 kg/m<sup>2</sup>; mean waist to height ratio 0.62±0.10) were included in our observational, cross-sectional study. All participants completed the "Readiness to change" questionnaire. Participants were categorized into one of the four stages of readiness to change based on their achieved score. Correlation analyses were used to analyze the data using Analysis ToolPak.

**Results** Most respondents were in the maintenance stage (38.09%), followed by 27.89% of respondents in the action stage and 23.81% in the pre-contemplation stage. The lowest number of respondents was in the contemplation phase (10.20%). We found a significant association between higher BMI and contemplation phase ( $r=-0.26$ ;  $p<0.01$ ), and an association between higher BMI (0.22;  $p<0.05$ ), higher waist-to-height ratio ( $r=0.19$ ;  $p<0.05$ ) and low level of maintenance.

**Conclusion** Knowing the individual's level of readiness to change may help to set realistic goals for tailored weight loss interventions with a focus on maintenance in people with central and overall obesity. Behavioral counseling based on advice matched to the stage of readiness for change may encourage healthy lifestyles among people with overweight and obesity (Funding: VEGA: 1/0748/22).

**Keywords:** Obesity, Overweight, Weight management, Readiness to change, Trans-theoretical model



## HEAL ITALIA project: effects of polyphenol compounds on human adipose tissue biopsies from male and female obese patients undergoing bariatric surgery

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The HEAL ITALIA (Health Extended Alliance for Innovative Therapies, Advanced Lab-research, and Integrated Approaches of Precision Medicine) project of the extended partnership (PNRR) between Italian universities and clinical and research institutes is funded by the European Union-Next Generation EU. HEAL ITALIA aims at identifying innovative and effective therapeutic approaches for cardiovascular and metabolic disorders, delivering new cost-effective, faster, and more precise strategies.

The project as a whole interfaces biological, clinics and bioinformatics expertise and Spoke 7 focuses on the delivery of new prevention strategies by using a gender-specific approach based on environmental, lifestyle and clinical biometric data. The final aim will be to develop tools applicable to the population for prevention. Within the activities of the spoke, our specific task will study the effects and the mechanisms of specific polyphenols and environmental contaminants on adipose tissue (AT) of obese subjects, also evaluating the cross-talk with other organs, including the intestine and the brain.

Fifteen to forty grams of visceral adipose tissue have been collecting from age and sex matched obese subject undergoing bariatric surgery, to be cultured with or without polyphenols and/or environmental contaminants. Inflammatory pathways will be evaluated by Western blot and Elisa kits. Moreover, microglial and hypothalamic cell lines and reconstructed intestinal tissues will be incubated with AT supernatants to evaluate the possible cross-talk among AT and gut-brain axis.

The knowledge acquired through this project will help to define gender-specific targets for therapeutic and/or preventive interventions, also on a dietary basis, aimed at restoring normal tissue functions.

**Keywords:** adipose tissue, obesity, gender, polyphenols, environmental contaminants

## Girls and boys require gender-specific education interventions

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Promoting healthy diet, mainly in youth, is the best way to carry out effective prevention programs addressed to fight the spread of unhealthy lifestyles, such as physical inactivity, dietary excesses and nutrition imbalances. Sex/gender related factors influencing lifestyle and exposition to risk factors seem to play major roles in the rising prevalence of obesity. In particular, men and women may be differently exposed to nutritional risk factors. Several studies carried out in adults have shown, indeed, significant differences in food preferences and dietary behaviours between males and females. On the contrary, very few data are available to define whether such differences exist also between young girls and boys. Through the innovative education program MaestraNatura ([www.maestranatura.org](http://www.maestranatura.org)) developed to enhance knowledge and awareness about food and nutrition, the eating habits and the degree of adherence to the Mediterranean diet of 11-13 years old children and their parents were assessed. The data allowed the evaluation of possible influences of sex/gender and family context on the children's eating choices and behaviours. The questionnaires collected showed an average degree of adherence to the Mediterranean diet for both children and parents. Furthermore, the data revealed interesting differences between girls (F) and boys (M) in the daily consumption of fruit and vegetables (F>M), cereals (M>F) and carbonated/sweetened drinks (M>F). Thus, preventive nutrition education strategies specifically addressed to girls and boys, are needed to make children aware of the importance of a healthy lifestyle and to correct inadequate eating habits.

## The effects of prenatal and postnatal challenge with cafeteria diet on adult rat offspring behavior and metabolic status

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Maternal obesity contributes to the development of dysmetabolic syndrome in offspring. To mimic an unhealthy human diet, dams were fed before mating, during pregnancy, and lactation obesogenic cafeteria (CAF) diet. Control (CTRL) animals received standard chow. CAF dams had higher body weight during pregnancy and lactation than the controls. While the litter size did not differ, newborn CAF offspring had lower body weight and higher glycemia. At weaning, CAF and CTRL offspring showed similar body weights. Female CAF offspring displayed higher random glycemia. Weaned CTRL offspring continued on the CTRL diet; CAF offspring either continued on the CAF diet (CAF/CAF) or consumed a standard chow (CAF/CTRL). At 6 months, CAF/CAF offspring of both sexes showed higher measures of general and central obesity, lower insulin sensitivity, higher liver TAG and cholesterol content compared to CAF/CTRL and CTRL offspring. Female CAF/CAF offspring displayed higher blood pressure and lower HDL-C levels; CAF/CAF males had higher TAG levels than CAF/CTRL and CTRL groups. Kidney/body weight was lower in CAF/CAF animals of both sexes, but only females displayed lower creatinine clearance. Obese CAF/CAF animals showed lower plasma levels of advanced glycation end-products, while soluble RAGE levels did not differ significantly. In the open-field test, CAF/CAF animals traveled shorter distances. CAF/CTRL offspring showed higher short-term memory than their peers. Maternal obesity and exposure to an obesogenic diet during developmental plasticity caused mild impairment of the offspring's early development and metabolic status. Adverse health effects were not manifested in animals switched after weaning to the CTRL diet.

**Keywords:** cafeteria diet, prenatal challenge, obesity, behavioral tests, dysmetabolic syndrome

## Acute individualized aerobic training modulates key metabolic genes in liver and muscle of mice programmed by maternal obesity

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Maternal diet-induced obesity during critical developmental periods has been related to predisposition to metabolic issues in offspring through epigenetic modulations, such as the alteration of microRNAs. Early post-weaning exercise interventions have been shown to improve metabolic parameters in offspring. Thus, the aim of this study was to investigate whether acute aerobic exercise in offspring can improve metabolic parameters programmed by maternal obesity. Female Swiss mice received either a standard chow (SC) or a high-caloric diet (HC) and were then mated with male mice fed only SC. Offspring were weaned and underwent adaptation to the aquatic environment and later to an acute training session of one hour of swimming at 70% of the minimum Lactate. Offspring of obese dams (OO) had higher levels of fasting serum glucose and hepatic triglycerides, but the training session in offspring of obese dams (OO-T) restored both to levels similar to offspring of control dams (CO). Hepatic gene expression analysis showed that miR-122 was downregulated in OO, but restored in OO-T, accompanied by a decrease in the levels of its target gene, Agpat. OO showed higher miR-370 and lower Cpt1a target-levels, a gene involved in fatty acid oxidative status, but exercise restored both to CO levels, as well as improved Ptp1b that was upregulated in OO. In conclusion, a single session of physical exercise modulated the amount of transcripts involved in hepatic lipid metabolism and muscle glucose metabolism, indicating a tendency to partially reverse the consequences of metabolic programming in the offspring of obese dams.

**Keywords:** Acute exercise, Aerobic physical exercise, microRNAs, Maternal obesity, DOHaD

## Acute interesterified lipid stimulus modulates hypothalamic homeostasis

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Approximately 95% of dietary fat is composed of triacylglycerols (TAGs), in which the fatty acids located in the outer part of the TAG structure are called sn-1 and sn-3, while the fatty acid located in the center is sn-2. Interesterified fat is obtained by processing vegetable oils by chemical or enzymatic methods, which results in the rearrangement of the fatty acids in the glycerol molecule without changing their degree of saturation. Studies on the effect of acute stimulation of interesterified lipids on the CNS, specifically the hypothalamus, the region responsible for central control of food intake and energy expenditure, are unknown.

The aim of this study is to understand the effect of interesterified fat on cellular processes that control energy homeostasis in vivo.

Adult male mice were used for single intracerebroventricular (icv) hypothalamic injection of fatty acids by stereotactic surgery. They were divided into two groups: control, stimulated with palmitate (PA), a saturated fatty acid, and the treatment group, stimulated with monoacylglycerol (PG), a metabolite of interesterified fat, containing a palmitate at the central glycerol position (sn-2), 2-palmitoylglycerol. After stimulation, a 16-hour fast was performed, and then hypothalamic tissue was collected and analyzed. According to the results obtained by rt-qPCR technique, the PG group showed higher transcript content of *Cart*, *f4/80* and *Bcl2l1*, markers related to energy homeostasis, pro-inflammatory pathway and autophagic process, respectively.

Therefore, the hypothalamic effect of PG, after a single stimulus, seems to promote inflammation, modulate energy balance, and initiate autophagy at the central level.

**Keywords:** Interesterified lipids, Hypothalamus, Obesity

## Inflammatory process activates post-translational modification of $\alpha 7$ nAChR in hypothalamic cells

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Inflammatory processes play an important role in the development of metabolic disorders. Nicotinic acetylcholine receptors are widely expressed in the central nervous system and studies show that activation of  $\alpha 7$ nAChR result in inhibition of inflammatory cytokines expression. A study showed that the consumption of short term high-fat diet reduces the expression of the  $\alpha 7$ nAChR and make the hypothalamus more susceptible to inflammatory damage. The expression and activity of  $\alpha 7$ nAChR depends on several cellular mechanisms, such as the ubiquitin-proteasome system. We intend to investigate whether exposure to inflammatory conditions activates cellular mechanisms that act early and lead to reduced expression and/or presence of the  $\alpha 7$ nAChR receptor on the cell membrane. Microglia BV-2 cell line was treated with lipopolysaccharide and palmitic acid. mHypoA-POMC/GFP neuronal cell line was treated with LPS. After the inflammatory stimulus, *Chrna7* expression decreased, and pro-inflammatory cytokines increased. We investigated the involvement of the ubiquitin-proteasome system using bortezomib, an inhibitor of this system. After LPS stimulation, the protein content of  $\alpha 7$ nAChR and ubiquitin-binding proteins decreased and increased, respectively. Bortezomib, an inhibitor of proteasome, increased ubiquitinated proteins and  $\alpha 7$ nAChR, suggesting that its degradation was reduced. These results show a possible involvement of this post-translational mechanism through the activation of the ubiquitin-proteasome system.

**Keywords:**  $\alpha 7$ nAChR, inflammation, cell culture, epigenetic

## Damage to the cholinergic anti-inflammatory system by consumption of a hyperlipid diet in a model of colitis induced by dextran sulfate sodium (DSS) in mice

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**Introduction:** Activation of the  $\alpha 7$  nicotinic cholinergic receptor ( $\alpha 7$ nAChR) has been described as associated with inhibition of activation of the inflammatory pathway in disorders such as colitis. Our previous studies showed that HFD consumption reduces the expression of the  $\alpha 7$  nicotinic cholinergic receptor ( $\alpha 7$ nAChR). The present study proposes to investigate the inflammatory process of colitis and the modulation of  $\alpha 7$ nAChR expression in mice fed HFD.

**Methods:** Wild type C57BL/6J (WT) and  $\alpha 7$ nAChR knockout (KO $\alpha 7$ ) mice were fed chow diet (CT group) or HFD (45% kcal/lipids) for 4 weeks. Some mice of both groups were exposed to DSS (2.5%) added to drinking water for 7 days. Intestinal permeability was evaluated using FITC-dextran. Colon and isolated colonic epithelial cells (IEC) were collected to western blotting and RT-qPCR analyses.

**Results and Discussion:** HFD consumption reduced the expression Tjp1 and Occludin, reduced levels of junction proteins Claudin1, Claudin2, ZO-1 and Occludin and increases intestinal permeability associated with DSS.  $\alpha 7$ nAChR expression was significantly reduced WT-HFD mice. KO $\alpha 7$  fed HFD mice presented a shortening of the colon and reduced Claudin2 protein levels. These results suggesting that HFD consumption impairs  $\alpha 7$ nAChR expression and intestinal barrier proteins that can be associated with the development and worsening of IBD.

**Keywords:**  $\alpha 7$ nAChR, inflammation, hyperlipidic diet, colitis, intestinal permeability

## Short-term intranasal oxytocin treatment did not improve obesity-associated metabolic syndrome in aged female rats

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Obesity-associated metabolic syndrome (MetS) represents a risk for cardiovascular diseases. Increasing evidence has established the effects of oxytocin on food intake, energy expenditure, and metabolism. We investigated the effects of daily intranasal oxytocin treatment on cafeteria diet-induced obesity-associated MetS in aged female Wistar rats. 8-week-old female Wistar rats were divided into control (CTRL; n=10) and experimental cafeteria diet groups (CAF; n=10) with similar body weight. After 11 months, five CTRL and five CAF rats received intranasally administered oxytocin (1.25 IU/kg; OXT) or vehicle daily for 3 weeks. Before and after OXT treatment, morphometric variables, systolic blood pressure (SBP), concentrations of triacylglycerols, HDL-cholesterol, fasting glucose, and insulin were assessed. Index of insulin sensitivity (QUICKI) and continuous MetS score (a sum of SBP, QUICKI, waist/length ratio, triacylglycerols, and HDL-C (inverted Z-scores) were calculated). Before the initiation of oxytocin treatment, the CAF rats displayed higher body weight, waist/length ratio, SBP, and concentrations of HDL-cholesterol; and lower QUICKI compared to the CTRLs (all:  $p < 0.05$ ). The concentration of triacylglycerols did not differ. The MetS score was higher in CAF females compared to controls ( $p < 0.001$ ). Oxytocin treatment did not affect the caloric intake or body weight in either group ( $p = ns$ ). We neither observed a significant effect of oxytocin administration on waist/length ratio, SBP, the concentration of HDL-cholesterol, triacylglycerols, QUICKI, or MetS score, regardless of the diet as these variables remained similar to values obtained at baseline (all:  $p = ns$ ). Daily intranasal oxytocin administration did not improve components of MetS in cafeteria-diet-induced obesity-associated MetS in aged female rats.

**Keywords:** therapy, brain, western-diet, overweight, cardiometabolic syndrome



## Multidisciplinary care of patients with obesity in Brno, Kardiovize obesity center

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**Introduction:** Obesity is a chronic disease characterized by abnormal accumulation of adipose tissue and contributes to other metabolic disorders. Aim of treatment is to achieve and maintain substantial weight reduction. We created a multidisciplinary team (internist, nutritionist, psychologist and bariatric surgeon) to treat patients with obesity. To monitor the effectiveness of treatment approaches a perspective follow-up (Registry) was introduced in June 2022.

**Methodology:** Registry is a base for a prospective cohort study enrolling adult subjects with BMI  $\geq 30$  kg/m<sup>2</sup>. In RedCap database<sup>1,2</sup> we are collecting demographic data, personal and family history, smoking status, data from questionnaires: physical activity (IPAQ)<sup>3</sup>, sleep (Berlin, PSQI)<sup>4,5</sup>, alcohol consumption, eating habits<sup>6</sup>, assessment of quality of life (WHOQOL)<sup>7</sup>, anxiety, depression and personality (GAD-7, BD I-II, SCL-90)<sup>8,9,10</sup>, cognition (MOCA)<sup>11</sup>, clinical examination including measurement of BP, heart rate, ECG, anthropometry, body composition and laboratory analyses.

**Results:** So far 61 subjects were enrolled, median age 47 years, median BMI 42.5 kg/m<sup>2</sup>, 57.4 % of women. Currently, we can demonstrate results of treatment after 6 months for 24 subjects (median BMI 40.6 kg/m<sup>2</sup> at baseline). The median change of weight was 18.2 kg, BMI decreased by 5.8 kg/m<sup>2</sup>, (p < 0.001). The weight reduction of 10 % was reached in 30.8 %



of subjects treated conservatively, as compared with 90.9 % of subjects after bariatric surgery. The changes are statistically significant.

**Conclusion:** After 6 months of treatment, 75 % of patients enrolled in our registry reached substantial weight reduction ( $\geq 5$  %). Systematic follow-up is needed to provide data about long-term weight management and to establish association with specific treatment methods.

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**Keywords:** multidisciplinary care, obesity, registry, weight reduction



## The effect of 3-month dietary and training intervention on body composition, dietary habits and metabolic parameters in adults with obesity

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**Introduction:** Obesity is increasing worldwide and is considered a major health problem due to increased risk of related diseases. Evidence shows that combination of hypocaloric diet and regular exercise can improve body composition, however, the implementation in clinical practice is challenging. The aim of our work was to implement complex lifestyle intervention in patients with obesity.

**Methods:** Sedentary adults with obesity (F/M 16/11, BMI 33.3±4.3 kg/m<sup>2</sup>, aged 38.3 ± 5.4 years) completed 3-month intervention, including supervised aerobic-strength training, dietary intervention based on nutritional consultations, dietary plan, reporting dietary intake using application and cognitive-behaviour coaching. Before and after intervention, anthropometric and metabolic parameters as well as 3-day dietary records were assessed.

**Results:** Combined intervention resulted in the reduction in body weight, BMI, WHR, total and visceral fat, and an increase in muscle mass (all p<0.0001) in patients with obesity. In addition, systolic (p=0.004) and diastolic blood pressure (p<0.0001) were reduced. Due to dietary modification, there was a reduction in energy intake (p=0.0017) as well as intake of total fat (p=0.0019), saturated fat (p=0.0029), saccharides (p=0.0122) and sucrose (p=0.0035).

**Conclusion:** Modification of eating habits combined with regular training and psychological coaching significantly impacted body composition and cardiometabolic parameters as well as eating habits of middle-aged sedentary adults with obesity.

**Funding:** APVV 20-0466, VEGA 2/0076/22, Obesity ITMS: 313011V344

**Keywords:** complex lifestyle intervention, dietary habits, aerobic-strength training, obesity management

## The effects of a 6-month aerobic-strength training program on metabolism, cardiorespiratory fitness, and cognition in testicular cancer survivors

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**Background:** Obesity is a risk factor for several types of cancer. Cancer survivors with metabolic dysfunction and impaired cardiorespiratory fitness often suffer from chemotherapy-related toxicity. We hypothesize that regular exercise has the potential to improve cardiorespiratory fitness, metabolic health and alleviate chemotherapy-related toxicity in cancer survivors. Our study aims at evaluating effects of intensive aerobic-strength training on energy metabolism and aerobic fitness ( $VO_2\max$ ) in testicular germ cell tumor (TGCT) survivors.

**Methods:** Twenty middle-aged TGCT survivors ( $40.5 \pm 7.6$  yrs) were subjected to a 6-month supervised aerobic-strength training intervention (strength  $2 \times 1$  h/week, aerobic  $1 \times 1$  h/week) ~6 years after cisplatin-based chemotherapy and were compared to eight control non-exercising survivors ( $46.1 \pm 7.2$  yrs, ~15 years following treatment). Body composition (bioimpedance), fasting glycemia, insulinemia, lipid profile, hormone profile, albumin, HbA1C and liver function markers, muscle strength (dynamometry) and aerobic fitness ( $VO_2\max$ , spiroergometry) were determined before and after the 6-month intervention. Cognitive functions were evaluated using Rey auditory verbal learning test.

**Results:** While the intervention did not lead to any significant changes in body weight & composition (muscle, fat, visceral fat), significant difference in triglycerides, AST and ALT was found between intervention and control group at the post-intervention stage. Compared to controls, aerobic fitness ( $p < 0.01$ ), muscle strength (MVC knee flexion,  $p < 0.01$ ; leg press,

p<0.01) and cognitive functions (30 minutes delayed recall, P0.04) were improved in the intervention group.

**Conclusion:** Aerobic-strength training improved metabolic health, cardiorespiratory fitness, muscle strength and cognitive functions in TGCT survivors. Our results support the positive role of regular exercise in the complex management of TGCT survivors

**Keywords:** testicular germ cell tumor, chemotherapy-related toxicity, Aerobic-strength training

## Adherence to the Mediterranean Diet and Lifestyle Changes among Tunisian Adults during COVID-19 Lockdown: Implications for Obesity and COVID-19 incidence

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The Mediterranean diet (MD) is a plant-based diet associated with a reduction in the risk of developing COVID-19 comorbidities. The COVID-19 pandemic and subsequent lockdowns have affected people's eating habits and lifestyles, necessitating an analysis of the healthiness of new consumption patterns. A survey of Tunisian adults (n=1082) including pre obese (31.1 %) and obese (14.5 %) subjects was conducted to assess lifestyle changes and adherence to the MD during the lockdown period. Poor overall adherence to MD was observed (mean MEDAS score 6.5, SD 1.74 for normal weight participants, score 6.7, SD 1.65 for pre-obese and obese subpopulation) with a preponderance of the mid-MD adherent subgroup (71.2 %) for the whole surveyed population. Unsurprisingly, respondents with high MEDAS scores had positive health outcomes. Most importantly, binary logistic regression showed that risk of COVID-19 infection decreased as MEDAS score increased for unvaccinated obese participants (OR = 0.63; confidence interval (CI) 0.4–0.98; p = 0.045). Regardless the body weight status, confinement had contributed to an overall reduction in cigarette consumption, sleeping hours, and physical activity. In conclusion, the survey demonstrated poor adherence to the MD among normal weighted, overweighted and obese Tunisian adults during the lockdown period, with location and income being significant determinants of adherence. Besides, the findings suggest that for obese subpopulation adhering to the MD may be a protective factor against COVID-19 infection.

**Keywords:** COVID-19, MD adherence, Lifestyle, Obesity, Tunisian adults

## Circulating extracellular vesicles are modulated by acute and regular exercise in individuals with obesity

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**Introduction:** Circulating extracellular vesicles (EVs), released in response to exercise, transport a spectrum of bioactive molecules, potential mediators of exercise-induced adaptive response. Here we investigate the effect of acute exercise and 3-month complex lifestyle intervention on plasma EVs dynamics in adults with obesity.

**Methods:** Individuals with obesity (n=25, M/F 11/14, age 36±5.9 yrs., BMI 35 ± 3.5 kg/m<sup>2</sup>, VO<sub>2</sub>max 23±6 mlO<sub>2</sub>/kgBW/min) underwent 3-month complex lifestyle intervention (supervised aerobic-strength training, individualized dietary and psychological counselling). Plasma was obtained before/after 3-month intervention at (i) baseline, (ii) immediately after, (iii) 60 minutes after acute exercise (40 minutes on a stationary bike, 60–70%HRmax). EVs were isolated by size exclusion chromatography (SEC, IZON). Concentration and size of EVs was assessed using Nanoparticle Tracking Analysis (NTA, Nanosight).

**Results:** Three-month intervention increased physical fitness (+14.8%, 23±6 ml/kg/min vs 27.2 ± 6.1 ml/kg/min), and induced average weight loss of 8.5% (ranging from 1.4–17.2 kg[BU1]). Lifestyle intervention increased [BU2] fasting plasma EVs concentration (50–120 nm by 33%, p<0.05). Acute aerobic exercise increased the numbers of the broad range of EVs (50–130 nm by 20%, p<0.05) specifically in patients after 3-month complex intervention.

**Conclusion:** Complex lifestyle intervention, associated with weight loss and increased physical fitness, modulated the number of circulating EVs and their dynamics in response to an acute bout of endurance exercise in individuals with obesity. Modifications of EVs could represent an important adaptive mechanism of systemic response to acute exercise and complex lifestyle intervention in patients with obesity.

**Keywords:** circulating extracellular vesicles, Nanoparticle Tracking Analysis, obesity, lifestyle intervention



## High levels of fetal n-6 resulting from maternal high-fat diet consumption may negatively modulate neuropeptides and hypothalamic factors involved in appetite control in mice

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**Introduction:** Consumption of a high-saturated fat diet may affect the composition of circulating fatty acids (FAs), promoting appetite dysregulation. Maternal intake of a high-fat diet may negatively impact the offspring's satiety control through changes in the expression of neuropeptides and hypothalamic factors.

**Aim:** To investigate whether the hypothalamic neuropeptides alteration on HF offspring could be a consequence of fetal FA profile modulation.

**Methods:** C57 females were fed with control diet (CT; 10% fat; n=27) or high-fat diet (HF; 45% fat; n=23). Maternal serum FA profile (GC-MS) were evaluated on gestational day 20. Fetal serum and hypothalamic FA profile (n=6-10/group), gene expression (qPCR), and protein content (WB, IF) of the hypothalamus were analyzed at e20 and approved by CEUA n. 5639-1/20. Hypothalamic neuronal lineage (mHypoA-POMC/GFP2) was treated with linoleic acid (LA: 100mM). Student's t-test was used (p≤ 0.05).

**Results:** HF dams showed an increase in serum omega-6 (n-6). Higher n-6 and LA concentrations were observed in HF fetuses. Increased levels of C20:2n-6 in the hypothalamus of HF female fetuses was observed. Higher hypothalamic expression of Npy, reduced NGN3 protein content, and a trend towards reduced POMC were observed in HF male fetuses. HF female fetuses had reduced POMC staining, lower POMC and NGN3 protein content. Treatment with LA reduced Pomc and promoted a tendency towards decreasing Ngn3.

**Conclusion:** Maternal consumption of HF diet modified the profile of FA and fetal neuropeptide expression. We believe that the increase in n-6 may explain the alteration of neuropeptides associated with satiety in HF fetuses

**Keywords:** High-fat diet, Hypothalamus, Fatty acids, Metabolic programming, Obesity

## Cardiometabolic health and regional body composition in young women newly diagnosed with Polycystic Ovarian Syndrome (PCOS) in Mauritius

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**Introduction:** Caucasian women with polycystic ovary syndrome (PCOS) have increased cardiometabolic risks centred upon insulin resistance and central adiposity. Yet, it is unknown whether same applies to Mauritian women – a population with an inherently high predisposition to central obesity and cardiometabolic diseases. This study in Mauritian women of Indian descent explored potential body composition differences in women with PCOS ( $n=25$ ) vs Controls ( $n=154$ ), and investigated whether differences in cardiometabolic health markers between the two groups may be explained by their differences in body fat distribution pattern.

**Methods:** The PCOS subjects (aged 19–42 y) were newly diagnosed. After an overnight fast, the following were measured: blood pressure, anthropometry, body composition by Dual Energy X-Ray Absorptiometry (DXA), and blood assays for glycaemic and lipid profiles, and inflammation status. Wilcoxon Rank Sum test was used to examine between-group differences. The Analysis of Variance and Covariance was applied to examine the extent to which any between-group difference for a given cardiometabolic parameter is altered after adjustments for potential anthropometric and body composition covariants.

**Results:** The PCOS women had higher DXA-derived fat mass, trunk fat, visceral fat and android-to-gynoid fat ratio. They also showed higher values for insulin, HOMA-IR index and C-reactive protein than Controls; these differences being either abolished or markedly reduced after adjusting for their more android pattern of fat deposition.

**Conclusion:** Mauritian women with PCOS show a BMI-independent (intrinsic) android pattern of adiposity characterized by higher visceral fat associated with insulin resistance, hyperinsulinemia and low grade inflammation.

**Keywords:** PCOS, cardiometabolic diseases, body composition, visceral fat, Indian

## Impaired metabolic phenotyping in mice with deletions of GPR10 and NPFFR2 receptors: Implications for lipidized PrRP analog therapy in obesity

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Obesity is a growing global health concern with limited treatment options. Prolactin-releasing peptide (PrRP) is a neuropeptide that can reduce food intake when administered centrally, but loses this effect when given peripherally. However, lipidization of peptides can enhance their stability and efficacy after peripheral administration. Our previous work showed that lipidized PrRP analogs effectively reduced food intake and body weight in mice. PrRP binds to its GPR10 receptor and with high affinity to neuropeptide FF receptor type 2 (NPFFR2), both of which are involved in regulating food intake and energy homeostasis. Palmitoylation of PrRP31 improved its binding and agonist activity for both receptors. In this study, we investigated the metabolic effects of deleting GPR10, NPFFR2, or both receptors in mice. Deletion of GPR10 resulted in increased food intake, elevated insulin levels, impaired glucose tolerance, and altered lipid metabolism gene expression. NPFFR2 deletion led to impaired glucose tolerance on a high-fat diet. Deletion of both GPR10 and NPFFR2 caused sex-specific and diet-dependent metabolic changes, including impaired glucose tolerance and hyperglycemia on a high-fat diet, indicative of prediabetic symptoms. Our findings suggest that targeting GPR10 and NPFFR2 receptors with lipidized PrRP analogs could be a promising therapeutic approach for obesity and related metabolic disorders.

**Keywords:** prolactin-releasing peptide, GPR10, NPFFR2, knock-out mice, obesity



## Teachers' views on obesity and obesity intervention in the curriculum at selected high schools in the City of Tshwane

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Obesity is a global health concern that is not limited to the adult population. There is a growing prevalence among children from different parts of the world regardless of the age group or gender with the prevalence rate at 100%. Lifestyle modifications, particularly among urban dwellers, that often depend on “junk” food rather than eating healthy food may contribute to the incidence of obesity. School-based interventions are identified to address increasing rates of childhood obesity through physical activity and education about healthy food choices. Increased adolescent obesity is attributed to the increased intake of energy-dense foods that are high in fat; increase in physical inactivity due to the increasingly sedentary nature of many forms of work, changing modes of transportation, and increasing urbanisation. Enhanced acceptability and feasibility of school-based efforts should be designed within the school infrastructure with flexibility in timing of the intervention and personnel involvement.

Purpose was to explore the views of teachers on obesity and obesity intervention content in the curriculum at selected high schools in the City of Tshwane. The qualitative research method was used. Research strategy was exploratory and descriptive. Population was teachers at selected high schools. Purposive sampling was used to sample for focus group interviews. Content analysis was utilised. Trustworthiness was ensured.

Two themes emerged which were: obesity as a content in the curriculum, lifestyle and obesity interventions at school.

Findings guided the development of an adolescent obesity intervention programme through curriculum involvement at high schools in the City of Tshwane

## Parental education as a determinant of obesity in children

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This cross-sectional study aims to investigate the influence of parental education on children's health-related behaviours and obesity risk status using the data on children aged 7 years and their families living in Macedonia and participating in the 5<sup>th</sup> round of the WHO European Childhood Obesity Surveillance Initiative.

Overall 31.6 % of the children were overweight and 15.3 % living with obesity, with little difference between genders. The results showed that the prevalence of overweight and obesity was higher among children whose parents had a medium level of education (36.1 %) with a small difference between low (34.3 %) and high level (32.4 %) of parental education. A high level of parental education was associated with "healthy" behaviours in children, who were more likely to eat daily breakfast, fresh fruit and vegetables, had less frequent consumption of soft drinks (less than three times a week), and were more likely to practice sport at least two hours a week compared to children whose parents had a low level of education. However, sedentary behaviour in children measured as at least two hours of screen time daily was more prevalent in children of parents with a high level of education.

These findings indicate that parental education should be considered in population-based interventions design, although comprehensive research and approach are needed in evaluating the family environment to better address obesity drivers in children.

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**Keywords:** childhood obesity, parents' education, determinants of obesity

## Obesity and its temporal trajectory in acutely hospitalized seniors and in the ambulatory practice of a diabetologist

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**Introduction:** The permanent rise in obesity is a major problem worldwide. The aim of our work was to point out the increasing prevalence of obesity both in the group of acutely hospitalized patients (part A) and in diabetics monitored on an outpatient basis (part B).

**Methods:** A retrospective cohort study (Part A) aimed at analyzing the incidence of obesity over a 27-year period. Between 1995 and 2022, we treated a total of 29,435 people (18,758 women of an average age of  $81.7 \pm 7.7$  years and 10,685 men of an average age of  $79.0 \pm 7.6$  years).

In 2022, 2,398 individuals of an average age of  $70.7 \pm 10.9$  years were permanently diagnosed with DM2T in our diabetes office (part B). We analyzed the occurrence of obesity in the years 2011-2022.

**Results:** Obesity (BMI  $\geq 30$ ) shows an obvious upward trend for both sexes (part A) in the mentioned period – almost threefold (for men and women – from 12 to 13% in 2011 to 30 to 35% in 2022). In the outpatient group of long-term diabetics (part B), there were 1,316 obese people with a BMI  $> 30$  (54.9%) in 2022. Here, too, we can note a significant rise in obesity II. and especially III. degree in 2011-2022 (in 2011, 2016 and 2022 it was 5.4-6.6-8.8%).

**Conclusion:** The ever-increasing prevalence of obesity should become an alarming challenge for the application of intervention measures to reduce it not only for the health sector, but for the entire society.

## Prevention of sarcopenia in patients with obesity after bariatric and metabolic surgery: the effect of programmed training on the muscle tissue and anthropometric functions – pilot study (SarxOb)

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Obesity is a serious metabolic disease. Sarcopenia is an independent risk factor for morbidity and mortality in obese patients that increases health risks and is associated with cardiac, respiratory and other diseases. Bariatric and metabolic surgery (BMS) leads to significant changes in body composition. Bariatric patients are at risk of sarcopenia after BMS. This finding led to the hypothesis that the exercise plan in the experimental group will lead to postural stabilization and a lower decrease in muscle homotopy. The aim of this study is to investigate the effect of programmed aerobic and strength training on muscle function, volume and morphology in post-BMS patients. This is a prospective, single-center clinical trial following sleeve gastrectomy. The experimental group perform targeted physical activity once a week for 12 months. The pilot data includes a comparison of 6 control's (100 % women, baseline BMI  $45.1 \pm 5.9$  kg/m<sup>2</sup>) and 7 intervention's probands (57 % women, baseline BMI  $45.5 \pm 4.6$  kg/m<sup>2</sup>). Variables such as BMI, muscle mass, appendicular index, percentage of fat mass, fat mass in kilograms (densitometer), hand grip strength (Kern MAP 80K1 dynamometer), number of steps per day, heart rate, exercise intensity (Fitbit Charge 4) and their changes over the 6 months after the intervention will be assessed.

The protocol article for this study is already available (SarxOb study protocol), DOI: 10.17305/bjbms.2022.7786.

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**Keywords:** bariatric and metabolic surgery, bariatric patient, physical intervention, sarcopenic obesity, sleeve gastrectomy

## Levels of miR-17-5p, miR-20a-5p in circulating extracellular vesicles are associated with fat mass, liver fat content and insulin sensitivity in premenopausal women

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**Aim:** miRNAs transported in extracellular vesicles (EV) probably play an important role in the regulation of metabolism and inter-organ communication. In EV isolated from plasma of obese and lean premenopausal women, we analyzed a panel of miRNAs related to liver function and correlated the levels of these miRNAs with total adiposity, hepatic fat content (HFC), and insulin sensitivity.

**Methods:** 20 lean (age 35±7.15, BMI 21.49±1.89) and 18 obese (age 36.49±7.3, BMI 33.7±4.4) women were tested for body composition (DEXA) and insulin sensitivity (HOMA-IR and Matsuda index derived from OGTT). In a subgroup of 10 lean and 10 obese women, HFC was measured by MRI. The size and amount of EV were verified by NTA analysis and Western blot (CD81, CD9). After the exclusion of hemolytic samples (lean, n=3, obese, n=5) 84 miRNA levels were quantified by qPCR using Human Liver miFinder Focus Panel (QIAGEN).

**Results:** Compared to lean, obese had higher HFC and lower Matsuda index as could be expected. The most significant difference between the groups was in miR-17-5p, miR-20a-5p ( $p<0.001$ ), miR-7b-5p, miR-93-5p ( $p<0.01$ ) and miR-107 ( $p<0.05$ ), whereas the level of these miRNAs was lower in women with obesity. miR-17-5p and miR-20a-5p strongly correlated with insulin sensitivity, HFC and fat mass. miR-107 specifically correlates with HFC but not with fat mass.

**Conclusion:** The analysis of miRNA in circulating EVs of premenopausal women revealed miR-17-5p, miR-20a-5p and miR-107 as potential players in metabolic health and obesity.

*The study was supported by Czech Health Research Council grants NU20J-01-00005, AZV NV19-01-00263.*

**Keywords:** miRNA, extracellular vesicles, obesity, hepatic fat content



## Introduction of clearing protocol for 3D visualisation of vascularization and innervation of adipose tissue

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Vascularization and innervation of adipose tissues influences adipocyte function, adipogenesis, transport of nutrients, oxygen, growth factors and hormones, and activation of metabolism. White and brown adipose tissue depots (BAT and WAT, respectively) can undergo hyperplastic or hypertrophic growth and subsequently any quantification of vascular or nervous network becomes increasingly difficult. 3D as compared to 2D projection of tissue brings the possibility to better characterize network characteristics, such as the density, length and branching of capillaries and nerves. To avoid problems with light scattering on the surface of lipid droplets, we aimed to introduce a technique of clearing the tissue of lipids and subsequent scanning.

There are many clearing methods, usually developed to display whole brain samples. We employed TClear and AdipoClear methods, with the latter bringing better optical clearing of adipose tissue samples. We compared tissues only fixed, or fixed and immunostained, or fixed, delipidized and immunostained, or fixed, delipidized, cleared and immunostained. For detection of vascular and sympathetic nervous network isolectin IB4 and anti-tyrosin hydroxylase antibody were used, respectively. Visualization of samples using optical tomography did not bring sufficient resolution, while visualization using light-sheet microscope Stellaris was able to distinguish thicker nerves and vessels in a larger size of sample. Sufficient resolution was achieved only using 2-photon microscope Bruker, but only smaller areas could be scanned.

To sum up, clearing protocol for adipose tissue visualization was successfully introduced together with immunostaining of target structures.

*This project is supported by Czech Science Foundation (21-03691S).*

**Keywords:** adipose tissue imaging, AdipoClear, light-sheet microscopy, 2-photon confocal microscopy

## Real-world use of semaglutide in obese patients – prospective observational study

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**Introduction:** Obesity is one of the most serious medical problems in the world and it's predicted that 12 % of the world's population will be obese by 2025. It is assumed that 17% of cardiovascular deaths are directly associated with obesity. The anti-obesity drugs have been so far relatively limited mainly due to the adverse effects. Glucagon like peptide-1agonists in patients with obesity significantly reduced weight and had relatively few adverse events. Aims

**Aim:** The aim of this prospective study was to assess the efficacy of semaglutide in real-world clinical practice in patients with obesity.

**Patients and method:** We demonstrated pilot, prospective, observational clinical trial in patients with obesity (BMI  $\geq 30$  kg/m<sup>2</sup>). We enrolled 46 patients (35 women, 11 men) with average age  $46 \pm 13$  years. Patients were treated with initial semaglutide dose 0.25 mg with up-titration every month (target dose of semaglutide 2.0 mg). Average initial body weight in followed patients was  $111.2 \pm 14.5$  kg and BMI  $39.6 \pm 4.9$  kg/m<sup>2</sup>. Subsequently, after 6 months of semaglutide therapy and lifestyle change, we observed significant reduction of body weight ( $111.2 \pm 14.5$  kg vs.  $93,6 \pm 23,1$  kg,  $p \leq 0,05$ ; and BMI  $39.6 \pm 4.9$  kg/m<sup>2</sup> vs.  $33.2 \pm 7.7$  kg/m<sup>2</sup>,  $p \leq 0,05$ , respectively).

**Conclusion:** We observed significant reduction of body weight in patients with semaglutide therapy and with lifestyle modification.

**Keywords:** semaglutide, obesity

## Perception of own body size by Polish medical, exact sciences and humanities students

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**Background:** The aim of the study was to assess own body size by Polish medical, exact science and humanities students.

**Material and methods:** From November 2016 to December 2018, a survey was conducted among 1,202 students. This group included 401 students of humanities (201 women and 200 men), 401 of exact sciences (201 women and 200 men) and 400 of medical sciences (296 women and 104 men). The accuracy of the assessment of own body size was assessed on the basis of the figure assessment scale in Stunkard's adaptation. Weight and height were measured and BMI was calculated.

**Results:** An accurate assessment of own body size was most often made by female and male students of exact sciences than humanities and medical sciences (30.4% vs. 25.4% vs. 25.0% and 37.5% vs. 33.5% vs. 34.6%, respectively). Humanities and medical male students more often than female students accurately assessed own body size (33.5% vs. 25.4% and 34.6% vs. 25.9%, respectively). There were no statistically significant differences in the distribution of differences between the own body size assessment and the actual BMI, between the fields of study among women ( $p = 0.73$ ) and men ( $p = 0.73$ ).

**Conclusions:** Regardless of the field of study, only a small percentage of students accurately assess own body size. Male sex seems to be a factor increasing the accuracy the assessment own body size.

**Keywords:** body size, students, field of study



## Perception of obesity by Polish medical, exact sciences and humanities students

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**Background:** Perception of obesity can be modified by gender and type of education. Therefore, the aim of the study was to assess the figure representing obesity by Polish medical, exact science and humanities students.

**Material and methods:** From November 2016 to December 2018, a survey was conducted among 1,202 students. This group included 401 students of humanities (201 women and 200 men), 401 of exact sciences (201 women and 200 men) and 400 of medical sciences (296 women and 104 men). The accuracy of the assessment of the figure corresponding to obesity was assessed on the basis of the figure assessment scale in Stunkard's adaptation.

**Results:** The accurately assessment of the first figure corresponding to obesity was made by 28.7% of humanities, 29.2% of exact sciences and 29.5% of medical students. Statistically significant differences in the distribution of the assessment of figure corresponding to obesity between the female students of humanities, exact sciences and medical science (21.4% vs. 27.9% vs. 29.4%;  $p < 0.05$ ), but not between male students (36.0% vs. 30.5% vs. 29.8%;  $p = 0.65$ ). In addition, women less often than men accurately assessed figure representing obesity among students of the humanities, only (21.4% vs. 36.0%;  $p < 0.01$ ).

**Conclusions:** Regardless of the field of study, nearly one-third of respondents correctly assessed figure corresponding to obesity. The female gender had a negative impact on correct assessment of the obese figure.

**Keywords:** perception of obesity, students, fields of study

## Disulfiram Mitigates Adverse Metabolic and Transcriptomic Consequences of High-Fat Diet in a Rat Model of Metabolic Syndrome

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Disulfiram (DSF), a conventional therapeutic agent for alcohol dependence, was recently shown to modulate facets of metabolic syndrome. This study aimed to explore the impact of DSF on metabolic parameters and gene expression in adult male rats of the model PD strain.

The rats were allocated to one of the following diets: a standard diet (STD), a high-fat diet (HFD, ssniff E15186-347), or a high-fat diet supplemented with DSF (HFD + DSF, at a dosage of 0.25 g/kg). After seven weeks, we comprehensively evaluated each group's morphometric and metabolic profiles. The transcriptomic analysis utilized the Affymetrix Genechip Rat Gene 2.1 ST array, focusing on liver and visceral fat samples.

The HFD regimen predictably resulted in a marked elevation in weight and adiposity, deterioration of glucose tolerance, increased plasma and liver tissue triacylglycerol (TAG) concentrations, higher insulin and leptin levels, and decreased HDL-cholesterol. The co-administration of DSF with HFD led to the normalization of body weight, TAG, total plasma cholesterol, and fasting insulin levels. Although glucose tolerance, leptin levels, and TAG concentrations in liver decreased compared to the HFD group, they remained significantly higher than those in the STD group. We identified the most significant differences between the effects of HFD and HFD + DSF compared to the control group in the pathways of xenobiotic metabolism by cytochrome P450, fatty acid oxidation, and the most significant regulatory nodes were *PPARA*, *PPARD*, and *PXR*.

Disulfiram significantly mitigated the adverse metabolic effects of high-fat diet administration in an inbred model of metabolic syndrome.

## Diagnosis of gestational diabetes in women with obesity and chronic thyroiditis in Armenia

*Lusine Aghababyan (endocrinology, Elit med center, Yerevan, Armenia)*

**Background:** GD is one of the most common complications in overweight women. Timely diagnosis and management of patients enables the birth of a healthy child and does not harm the mother.

**Methods:** We examined 42 patients/age 21-34/ with II-III obesity, pregnant at 18–25 weeks. Conducted OGGT, monitoring of blood sugar and glucose levels. Heredity and other risk factors for the development of the GD were taken into account. Armenia is endemic area, that's why they were examined for problems with thyroid gland too / TSH, T4 free, T3 free, ATTG, ATTPO /, ultrasound of the gland.

**Results:** In this study, gestation diabetes was detected in 11 women, of which 7 plus Hashimoto's thyroiditis with hypothyroidism. In 8 women, was found impaired glucose tolerance, of which 2 had Hashimoto's thyroiditis; 2 patients had impaired fasting glycemia, 9 patients had Hashimoto's and nodular goiter without dysfunction, 4 patients had hypothyroidism. All women with GD were prescribed treatment – metformin, glargine, humalog / as needed /, diet therapy. For impaired fasting glycemia and glucose tolerance was prescribed diet therapy. For hypothyroidism, hormone replacement therapy has been added to achieve target TSH levels.

**Conclusion:** The study showed that /in the conditions of Armenia/ it is necessary to examine pregnant women with obesity for diabetes and dysfunction of the thyroid glands.

**Keywords:** gestation diabetes, obesity, pregnancy



## **Stevia rebaudiana Bertonii: a natural alternative sweetener and its benefits on glycemic response of type 2 diabetic patients**

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**Objective:** Stevia (*Stevia rebaudiana*) is a natural and healthy alternative sweetener to sugar and artificial sweeteners, which has become important for human diets and food manufactures.

Herbal sweeteners such as stevia (*Stevia rebaudiana*) are known as natural alternatives to artificial sweeteners, especially in management of insulin sensitivity and type 2 diabetes. In this study, the effects of stevia or sucralose as tea sweeteners on glycemic and lipid profile of type 2 diabetic patients were investigated.

**Materials and Methods:** A double-blind clinical trial was carried out in 34 type 2 diabetic patients. These patients were assigned into two groups of stevia (n=15) (received 1 cup of 2% stevia extract-sweet tea in three meals) and non-stevia (n=19) (received one tablet of sucralose sweetener) daily for eight weeks. Glycemic response and lipid profile of the participants were assessed. Furthermore, height, weight and body mass index (BMI) of the participants were measured as well as their dietary intakes at the baseline and at the end of the study.

**Results:** Findings showed no significant differences in fasting blood sugar (FBS) levels between the base line and after two hours, in participants. In addition, no significant differences in insulin, glycosylated hemoglobin (HbA1C) and lipid levels were found between the two groups.

**Conclusion:** Results of the current study showed that the highlighted doses of stevia in sweetened tea could be an alternative to sucralose in diabetic patients with no effects on blood glucose, HbA1C, insulin and lipid levels.

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**Keywords:** Stevia, Sucralose, Type 2 diabetes, Glycemic response, Lipid profile

## Soluble apoptosis markers in obese patients with food intolerance

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**Background:** Apoptotic processes have their own features in obese patients with food intolerance.

**Methods:** For the soluble apoptosis markers study 151 patients with obesity (92 women and 59 men) aged between 18 and 63 years were examined. Food intolerance was identified in 36.4 % of obese patients and was basically determined by proteinaceous food products. Four groups of patients were formed: three groups of patients with obesity stage 1, 2 and 3, respectively, and with food intolerance, and a group of obese patients without food intolerance (control group). Obese patients with food intolerance received standard version of hypocaloric diet with the exception of specific food allergens. Duration of observation was 39-43 days.

**Results:** Soluble apoptosis markers sCD153, sFas-L, Caspase- 9 and Caspase- 8 were significantly higher in stage 3 obesity patients compared obese patients without food allergy ( $0,123 \pm 0,010$  vs  $0,025 \pm 0,002$  ;  $0,120 \pm 0,030$  vs  $0,035 \pm 0,010$ ;  $13,2 \pm 3,2$  vs  $5,9 \pm 0,4$ ;  $1,4 \pm 0,18$  vs  $0,6 \pm 0,24$  ng/ml respectively). Positive dynamic of sFas-L, Caspase- 9 and Caspase- 8 ( $0,120 \pm 0,030$  vs  $0,052 \pm 0,030$ ;  $13,2 \pm 3,2$  vs  $7,7 \pm 2,2$ ;  $1,4 \pm 0,18$  vs  $0,4 \pm 0,18$  ng/ml respectively) in patients with obesity stage 3 and intactness sCD153 during diet therapy course were revealed. Significant differences for only Caspase-9 in patients with obesity stage 2 were obtained.

**Conclusion:** The data obtained are considered as normalization of apoptosis due to hypoallergenic nutritional correction of immunological disorders.

**Keywords:** Apoptotic processes, Obese patients



## Changes in body composition and diabetes risk factors due to an mHealth-based intervention in overweight women

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Number of adults with diabetes has tripled in 20 years. Genetic predisposition contributes to the risk of type 2 diabetes (T2D), but the disease is closely linked to obesity and lifestyle factors. The aim of this study was to assess the risk of T2D evaluated within 10 years in Hungarian overweight women and reduce the risk by improving body composition through a 12 week long mobile app-based lifestyle intervention. Body composition was assessed using the InBody 720 and diabetes risk was evaluated with the Finnish Diabetes Risk Questionnaire. The programme was fulfilled by 48 subjects. The intervention group (OG) used Yazio app as mHealth tool, the control group (CG) received only printed advice on lifestyle changes. The study was approved by the Hungarian University of Sports Science ethical committee (TE-KEB/No33/2020). Statistical analyses were performed using TIBCO Statistica 13.40.14, significance level 5%. According to our results, the self-reported app resulted significant effects on body composition, body mass index ( $28.0 \pm 2.5$  kg/m<sup>2</sup> vs  $25.8 \pm 4.3$ ,  $p=0.00$ ) waist circumference ( $100.8 \pm 7.2$  vs  $94.7 \pm 8.2$  cm,  $p=0.00$ ), body fat ( $37.5 \pm 6.3$  vs  $34.1 \pm 5.9\%$ ,  $p = 0.03$ ) and visceral fat ( $124.0 \pm 29.2$  kg/m<sup>2</sup> vs  $109.0 \pm 24.6$   $p=0.04$ ). Regarding the risk of T2D we did not find a significant difference between the groups but the value of the risk score improved in both (online -1.39 / control -0.69). We conclude that the risk of T2D can be modified by an interactive web- based weight loss program for adults. Significant decreases in lifestyle-related diabetes risk factors, namely body fat, BMI, waist circumference, visceral fat were observed.

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**Keywords:** mHealth, intervention, weight loss, diabetes, body composition

## The importance of vitamin supplementation before and after a bariatric surgery. Wernicke encephalopathy after a sleeve gastrectomy A case report

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Bariatric surgery has been associated with postoperative nutritional deficiencies after rapid weight loss.

**Introduction:** The criteria for bariatric surgery includes patients who suffer from massive obesity (BMI  $\geq 40$  kg/m<sup>2</sup>) or severe obesity (BMI  $\geq 35$  kg/m<sup>2</sup>) when associated with at least one complication that can be improved with surgery (DT2, HTA, SAOS).(1)

Wernicke encephalopathy is an acute neurological condition characterized by ophthalmoplegia, ataxia, and confusion. WE is caused by thiamine deficiency (vitamin B1), which primarily affects the peripheral and central nervous systems.(2)

**Case presentation:** A 27 years-old man with history of hypothyroidism, morbid obesity (BMI:46.6). Our patient was hospitalised 4 weeks after the surgery due to an episode of vomiting, dehydration, buccal mycosis. Intravenous BionolyteG5 and antifungal treatment was administrated. He lost 23 kg, BMI 36.4.

He was rehospitalised 6 weeks post sleeve gastrectomy at the neurology department following: diplopia, headaches, dizziness, balance disorders, nystagmus, and no ataxia.

Intravenous thiamine (vitamin B1) was administrated immediately.(3) Magnetic resonance imaging (MRI) showed bilateral hyper intensities in the area of mammillary bodies, and around 3rd ventricle on FLAIR imaging.

A search for combined medial multiple sclerosis was performed, spinal-cord MRI showed no abnormality. He was discharged with oral thiamine, and multivitamin supplementations. It was determined that WE were likely correlated to the recent sleeve gastric surgery.

**Conclusion:** The postoperative risk of WE could have been reduced with vitamin supplementation before and after the bariatric surgery.

Intravenous NaCl and thiamine should be initiated in patients with gastrointestinal distress symptoms after bariatric surgery.

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**Keywords:** Bariatric surgery, obesity, Wernicke's encephalopathy

## 20 instructions for a patient with DM2 how to reduce body weight

**Linda Bukova** (Clinic of Internal Medicine, Outpatient Department for Diabetes, Faculty Hospital FD Roosevelt, Banska Bystrica, Slovakia)

**Introduction:** Permanent reduction of body weight can be difficult, therefore it is important to provide guidance during education: 1. the principle of a properly divided plate 2. the optimal ratio of individual nutrients in the diet 3. carbohydrate units and the glycemic index of foods 4. qualitative composition of the diet 5. appropriate order of meals and their appropriate combination 6. individual basal metabolism 7. frequency of food intake 8. dining culture 9. sleep regulation 10. avoid alcohol 11. regular weight control so that there is no yo-yo effect 12. regular appropriate physical activity 13. do not smoke 14. sufficient drinking regime 15. hardening 16. avoid fast food eating 17. avoid preservatives, additives 18. functional teeth 19. support of healthy microbiota 20. model of a suitable menu.

**Objective of the case report:** Evaluation of the effect of an initial 45-minute education after 12 years in a 63-year-old female patient with no history of other diseases. Methodology: We evaluated fasting blood glucose, HbA1c, BMI, body weight of the patient in the first and twelfth year of control.

**Results:** At the time of the initial examination in 4/2010, HbA1c DCCT 7.5%, fasting blood glucose 10 mmol/l, BMI 31.3 kg/m<sup>2</sup> and body weight 80 kg. In 9/2022, HbA1c DCCT 5.4%, fasting blood glucose 6.6 mmol/l, BMI 25.6 kg/m<sup>2</sup> and body weight 65.5 kg. She temporarily took metformin for one year.

**Keywords:** education

## Real life experience with liraglutide treatment in adolescents

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Liraglutide, a GLP-1 analogue, was approved for the treatment of obesity in adolescents (12-17 years) in 2021. In clinical trials, Liraglutide resulted in a 4.6% decrease in BMI in adolescents. After almost 2 years of Liraglutide treatment option, we evaluated the effect of this therapy in our patients.

Thirteen patients (3 girls and 10 boys) were treated with Liraglutide at the Pediatric Clinic of the University Hospital in Motol in the period from September 2021 to May 2023. In all patients, the decision to treat with Liraglutide was based on the inadequate effect of conservative therapy. In three patients, the treatment was started recently therefore, we do not include their results in the overall evaluation. Ten patients (9 boys and 1 girl) aged 12 -16.5 years (median 15 years) with initial weight of 74 to 188 kg (median 123 kg) and BMI ranging from 30.7 to 65.9 kg/m<sup>2</sup> (median 38.6 kg/m<sup>2</sup>) started treatment with gradual increase of Liraglutide as recommended. The long-term dose (median 2.4 mg/day) was established according to weight reduction. During 4-20 months of treatment (median 9.6 months), BMI decreased by a mean of 4.2%. In 2 patients, treatment was discontinued after 12 weeks of maximum dosing of liraglutide due to noncompliance and inadequate effect. Another patient voluntarily discontinued treatment for financial reasons. Adverse effects in all patients were minimal.

Our evaluation of Liraglutide treatment confirms the results from clinical trials. With compliance with conservative therapy, Liraglutide may contribute to weight loss in adolescents.

### References:

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**Keywords:** Liraglutide, adolescents, therapy, effect

## BMI-related quality of life in patients with ankylosing spondylitis

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**Introduction:** In patients with ankylosing spondylitis commonly co-occurring overweight & obesity are associated with increased inflammatory state, higher disease activity scores, and cardiometabolic risk, as well as lower physical mobility, and clinical outcome. The hypothesis was to assess the impact of overweight & obesity on the health-related quality of life (HRQoL) in men and women with ankylosing spondylitis.

**Methods:** The study enrolled 52 patients (38.5% women) with ankylosing spondylitis (AS), in mean age:  $39 \pm 13$  yrs.; of them 53.8% overweight or obese. The HRQoL was assessed with the Short Form Health Survey (SF-36), the Manchester-Oxford Foot Questionnaire (MOxFAQ), and the Oswestry Low Back Disability Questionnaire (ODQ).

**Results:** There were no significant differences between groups (overweight & obese and sex as factors) in the MOxFAQ walking/standing and pain domains. However, overweight & obese women had lower social functioning (MOxFAQ) and a higher sense of disability than overweight & obese men. In the SF-36 questionnaire, overweight & obese women had lower role physical values than normal-weighted women, and overweight & obese men had lower values of role emotional, mental health and mental component summary.

**Conclusions:** In ankylosing spondylitis, overweight & obese women had impaired social functioning as well as a higher sense of disability than overweight & obese men. Moreover, they had limitations in various roles including work and daily activities than normal-weighted women. On the other hand, overweight & obese men in comparison to normal-weighted had greater role limitations due to mental health difficulties and lower levels of physiological well-being.

**Keywords:** ankylosing spondylitis, health related quality of life

## Balneotherapy as a complementary treatment of children with obesity

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In Czech Republic we have a possibility to insert 4-5 weeks programme once a year as a part of therapy of children with obesity. It is a very intensive and complex intervention to a patient's lifestyle. The emphasis is put not only on physical exercise, but also for education of nutrition, physiotherapy and reduction of the screen time. We also screen sleep apnoea syndrome including night monitoring. We offer psychologic intervention if necessary. 4–5-week stay is convenient for patients with no access to the outpatient care as same as for patients from obesitology outpatient clinics to enhance the effect of therapy. Although the effect of the stay is transient, in case of repeated hospitalisation it has better outcomes. During therapeutic stay, patients undergo complementary balneotherapeutic procedures such as sauna, swimming, whirlpool, pearl baths and Kneips sidewalk. These procedures improve cardiovascular system parameters.

**Conclusion:** Obesity is a chronic disease and it requires a complex approach. Despite the new possibilities of pharmacotherapy, physical activity and education of healthy lifestyle is inherent part of the treatment of children with obesity. Repeated balneotherapeutic stay can increase the motivation and adherence to the weight loss behaviour.

## LATS Kinases as Key Regulators of Adipose Tissue Function and BAT-Brain Crosstalk

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Brown adipose tissue (BAT) activation is a promising approach to combat obesity by increasing energy expenditure. Our previous research identified transcriptional co-regulators YAP1 and TAZ as essential for BAT function. Their activity is regulated by LATS1 and LATS2 kinases, which play key roles in oncogenic and tumor-suppressive pathways, including the Hippo signaling pathway controlling cell proliferation and apoptosis.

To investigate the role of LATS kinases in adipose tissue, we conducted a study using mice with inducible adipocyte-specific knockout of LATS1 and LATS2 (*Lats1<sup>f/f</sup>* x *Lats2<sup>f/f</sup>* x *Adip-CreERT2*). Severe lipodystrophy and increased mortality were observed already five weeks after tamoxifen administration, but no tumors developed. Interestingly, mice with LATS1 and LATS2 depletion specifically in brown and beige adipocytes (*Lats1<sup>f/f</sup>* x *Lats2<sup>f/f</sup>* x *UCP1-CreERT2*) did not show increased mortality and were resistant to diet-induced obesity both at room temperature and thermoneutrality. Glucose tolerance was maintained even on a high-fat diet. However, energy expenditure was reduced in LATS1 and LATS2-knockout mice, suggesting that the body weight phenotype is not mediated by increased activation of BAT. Food intake was also decreased, indicating potential interplay with the central nervous system regulating feeding behaviour. Circulating levels of leptin, an anorexigenic adipokine, were not affected.

To gain further insights, transcriptomic analysis of BAT samples revealed differential expression of 191 genes. Currently we are searching for a BAT-secreted protein mediating the inhibitory effect on food intake.

In conclusion, our findings highlight LATS kinases as crucial regulators of adipose tissue function affecting the crosstalk between BAT and the brain.

**Keywords:** obesity, brown adipose tissue, LATS kinases, food intake

## The effect of endocrine-disrupting chemicals 2,2-bis (4-chlorophenyl)-1,1-dichloroethylenedichlorodiphenyldichloroethylene (p,p'-DDE) and bisphenol S (BPS) on mitochondrial respiration, adipocyte differentiation and lipid accumulation *in vitro* and *in vivo*

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Obesogens, environmental endocrine-disrupting chemicals, are likely to have contributed to the increase in obesity worldwide in the past 40 years. Persistent organic pollutants, including the insecticide DDT and its metabolite p,p'-DDE (2,2 bis(4-chlorophenyl) 1,1 dichloroethylene), can still be detected in the environment and therefore in animal and human tissues. BPS has been used as a replacement for bisphenol A and can be contained in polycarbonate plastic and epoxy resin (used e.g. for food packaging), thermal paper, or textiles.

In an experiment on human adipose-derived mesenchymal stem cells committed to adipogenesis, we determined the impact of p,p'-DDE on cell differentiation, lipid accumulation and mitochondrial respiration. We proved a dose-dependent impact of p,p'-DDE on adipocyte differentiation. Lower concentration (1 µM) induced an increase in the mitochondrial membrane potential, basal and ATP-linked mitochondrial respiration, and higher proliferation and viability of adipocytes. The higher concentration (10 µM) slowed down the differentiation process.

In an experiment on male mice, we studied the effect of postnatal exposure to BPS (from birth to weaning) on the adipose tissue of adult mice fed a standard or high-fat mice chow. Male offspring were exposed to BPS via breast milk of dams who were given bisphenol in their drinking water (0,375 ng/ml), and from the post-natal day 15 also directly via drinking water until weaned on postnatal day 21. Exposure to BPS resulted in changes in mitochondrial respiration, adipocyte size and a visible trend of increased volume fraction of lipid vacuoles in adipose tissue in adult mice fed a high-fat diet.

**Keywords:** obesogens, p,p'-DDE, bisphenol S, adipogenesis, mitochondrial respiration



## Hypoxia impairs metabolic pathways of de novo lipogenesis during adipocyte differentiation

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Obstructive sleep apnea syndrome, manifested by hypoxia, is causally linked with the development of metabolic diseases. Despite the epidemiological evidence, the molecular mechanisms mediating the adverse metabolic effects remain unclear. Hypoxia might modulate the utilization of glucose and acetate or activate the reverse tricarboxylic acid cycle (rTCA) in immature adipocytes leading to increased de novo lipogenesis (DNL) and excessive fat accumulation. The aim was to investigate whether hypoxia modifies the sources for DNL during adipocyte differentiation.

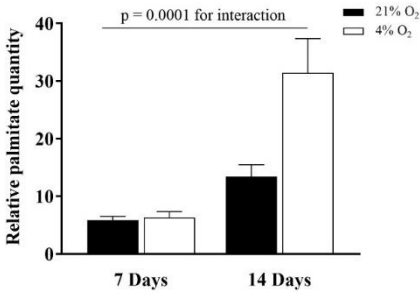
**Methods:** 3T3-L1 cells were differentiated into adipocytes for 7 days (early adipocytes, EA) or 14 days (late adipocytes, LA) and exposed to normoxia or hypoxia. <sup>13</sup>C-glutamine was used and analyzed via gas chromatography-mass spectrometry to assess the contribution of rTCA to DNL. The contribution of glucose and acetate to DNL was assessed using radioactively labelled carbons. Statistical significance was assessed by 2-way ANOVA. Data are presented as means ± SD, N=9.

**Results:** Hypoxia increases in EA the utilization of glucose (by 209,98% vs control) and acetate (by 198,43% vs control) and activates rTCA (by 42,2% vs control) to contribute to DNL. Whereas, in LA the hypoxia stimulates only the incorporation of acetate into lipids (by 247,41% vs control).

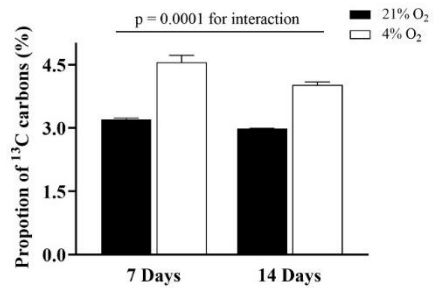
**Summary:** Hypoxia initially increased glucose and rTCA utilization for DNL in immature adipocytes. During differentiation, both sources were reduced to the control level while the significance of acetate increased. Hypoxia modifies the metabolic pathways in differentiating adipocytes leading to fat adipocytes.

**Funding:** GAUK 294822 and AZV project NU21-01-00259

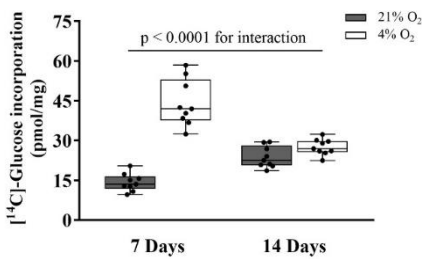
### A) Intracellular palmitate



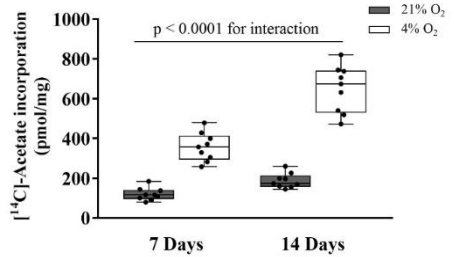
### B) <sup>13</sup>C<sub>5</sub>-Gln incorporation into palmitate



### A) <sup>14</sup>C-glucose incorporation into lipids



### B) <sup>14</sup>C-acetate incorporation into lipids



**Keywords:** Obstructive sleep apnea syndrome, Hypoxia, Obesity, De novo lipogenesis

## OBESITY – topic in Health Education subject

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In our work we would like to point out the problem of obesity in the age group of high school students, i.e. students from 15 to 19 years. We asked this research sample, namely students of our secondary medical school in Děčín, in the form of an anonymous questionnaire whether they know their BMI, what are the principles of healthy nutrition, whether they are aware of the effects of obesity on human health. The results from this survey, which we present to you, were used in the student's educational goals. We have prepared several lessons for the Health Education subject that are interesting to our students and evoke emotions, both positive and negative. An example of lesson preparation, in accordance with the school curriculum, will also be presented. The aim of our work is to highlight the importance of teaching the subject of Health Education, especially towards the prevention of obesity.

**Keywords:** Obesity, Health education, Prevention, Students, Tuition



## The role of polyphenolic substances in overweight and obesity

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Polyphenols refer to a vast group of non-nutritive natural compounds of plant origin with a known multisystemic benefits in promoting health and prevention of many diseases. They show positive effects not only in relation to overweight and obesity, but they have also other multisystemic effects, including the digestive system – the impact on enteroendocrine secretion, gut barrier function and gut biome; the effect on glucose homeostasis; the vascular action mediated by NO; and the effect on the brain and mental health, not limited to the gut- brain axis. Mechanisms are discussed in detail below. The effect on mitochondrial function is considered the key element. Polyphenols influence both physical and mental health, which is often very important in connection with overweight or obesity. The multisystemic effects suggest the usage of polyphenols in adjuvant care in overweight and obesity, but especially in their prevention. That is why plant sources in the form of fruits and vegetables as well as non-alcoholic drinks from natural sources, including tea and coffee, should be abundantly represented in the diet. However, in accordance with WHO recommendations, alcoholic beverages cannot be recommended.

**Keywords:** polyphenols, nutrition, prevention of overweight and obesity



## High-fat diet-treated C57BL/6J and A/J mice manifest different impact on bone and metabolic parameters

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Obesity-associated bone fractures are metabolic complications which affect the quality of life for many individuals and they are classified as metabolically healthy obese (MHO). MHO represents 10–30 % of obese individuals as a transient phenotype to the development of metabolic diseases, including bone fractures and diabetes. However, the molecular mechanisms behind a link between obesity and bone diseases are not well described.

We investigated the impact of obesity on bone and bone marrow stromal stem cells (BMSCs) in obesity-prone C57BL/6J (B6) mice and obesity-resistant A/J mice treated for 3 months with high-fat diet (HFD). B6 mice manifested weight gain and had impaired glucose tolerance, while A/J mice did not worsen their glucose metabolism. Further,  $\mu$ CT analysis of tibia manifested HFD-induced trabecular bone loss and increased bone marrow adiposity along with increased PPAR $\gamma$  induction, which was not revealed in such extent in A/J mice. Moreover, gene expression of enzyme involved in glutamine metabolism (*Gpx1*) was decreased in BM of HFD B6 mice, which was not changed in A/J mice. In addition, measurement of oxygen consumption rate of primary BMSCs showed increased maximal respiration in HFD B6 mice compared to HFD A/J mice.

Taken together, our findings show that HFD condition induces an opposite impact on bone and fat metabolism in B6 and A/J mice. Moreover, decreased maximal respiration in A/J BMSCs suggests slowing down of their metabolic activity, which may contribute to prevention of HFD-induced bone loss in A/J mice. However, further analyses are needed to uncover the mechanism behind this phenomenon.

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**Keywords:** obesity, bone fractures, HFD-induced bone loss, bone marrow adiposity

## The key to weight loss maintenance: Exploring mechanisms of metabolic adaptation in a Göttingen Minipig model of obesity

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Significant weight loss can be achieved in most patients living with obesity by intensive lifestyle, pharmacological, or surgical interventions, but sustaining weight loss over time remains a challenge. Metabolic adaptation, a greater-than-expected decrease in energy expenditure with weight loss, may limit the size of the weight loss and impair long-term weight loss maintenance. This study aims to investigate the presence of metabolic adaptation after pharmacological or diet-induced weight loss in obese Göttingen Minipigs as a model of human obesity.

A total of 24 animals, fed a high-fat diet (HFD) to induce obesity, were divided into three treatment groups: 1) Vehicle-treated and fed *ad libitum*; 2) glucagon-like peptide 1 (GLP-1) analog treated and fed *ad libitum*; 3) Vehicle-treated, diet-restricted and weight-matched to the GLP-1 group. The animals were on a ten-week intervention, during which food intake, body weight, body composition and energy expenditure were assessed at baseline and end study.

As expected, both GLP-1 treatment ( $p < 0.0001$ ) and diet restriction ( $p < 0.01$ ) lead to significantly smaller fat mass gain compared to *ad libitum* vehicle treatment. Interestingly, GLP-1 treatment helped preserve the lean mass compared to the diet-restricted weight-matched group ( $p < 0.05$ ). A significant decline in whole-body EE was observed in diet-restricted weight-matched controls ( $p < 0.01$ ) compared to their own baseline, but not in GLP-1-treated animals.

The results indicate that GLP-1 treatment has favorable effects on body composition compared to diet-restricted weight-matched animals, and the only significant decrease in whole-body energy expenditure was found in the diet-restricted group. Further analysis is needed to evaluate metabolic adaptation.

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