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The 6th Central European Congress on Obesity (CECON) and The 15th Slovak Congress on Obesity 2017

October 5th – 7th, 2017
Bratislava, Slovakia

Abstract Book

63 years in the service of internal medicine

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Endorsed by the European Federation of Internal Medicine
Organised by the Czech Society of Internal Medicine

CONGRESS OF GENERAL INTERNAL MEDICINE

SELECTED TOPICS

- Atherosclerosis: Hyperlipidemia and Dyslipidemia
- Diabetes Mellitus: Metabolic and Cardiovascular Aspects
- Heart Failure: A Task for Internists
- Hypertension
- Metabolic Syndrome
- Atrial Fibrillation / Stroke: NOAC
- Endocrinology
- Gastroenterology / Hepatology
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- New Therapies
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New Topics

- Choosing Wisely: A New Topic by the European Federation of Internal Medicine and the American Board of Internal Medicine
- Education for Young Internists

Welcome Message

Dear Colleagues,

We are delighted to welcome you in the beautiful city of Bratislava in Slovakia at 6th Central European Congress on Obesity (CECON) and 15th Slovak Congress on Obesity 2017. CECON 2017 is being held in early October (5th–7th), when we can expect nice, sunny beginning of autumn in Bratislava, which we sometimes call Indian summer.

We are very excited to host this important conference in Bratislava. We hope to follow in the successful footsteps of the Central European region meetings in Karlovy Vary, Czech Republic (2008); Budapest, Hungary (2009, 2015); Olsztyn, Poland (2011) and Cluj-Napoca, Romania (2013). In 2017, CECON will offer excellent science and networking opportunities for all the colleagues from Central Europe and beyond.

The International Scientific and Local Organizing Committees and the Boards of Obesity Section of the Slovakian Diabetes Society have strived to create excellent scientific programme, integrating state-of-the-art research and current treatment modalities, including lifestyle interventions, metabolic surgery and pharmacotherapy. Meeting will provide maximum opportunity for interaction between delegates, experts and researchers to present their findings and to develop collaborations, hopefully leading to new knowledge helpful to the patients. The program was designed to provide diversity of insights for clinicians, health care practitioners, nutritionists, surgeons, psychologists, physical activity professionals, nurses, pharmacists and researchers.

We have created an attractive and diverse scientific programme but discussions could surely continue while enjoying coffee & vitamin breaks, lunches and receptions. You should not miss the opportunity to cruise the beautiful Danube river and to enjoy the dinner at the Bratislava Castle Restaurant with an amazing view.

Bratislava and its surroundings provide amazing places to visit, majestic churches, charming burgher houses and elegant palaces, tiny squares, romantic little streets, and towering over all this, the stately Castle, visible from afar. You can find everything here, on a small-scale and easily accessible.

We welcome you to Bratislava and to the 6th CECON and 15th Slovak Congress on Obesity!

With kind regards



Lubomíra Fábryová

Lubomíra Fábryová
President of 6th CECON and 15th Slovak Congress on Obesity
President Obesity Section of the Slovakian Diabetes Society



Pavol Holéczy

Pavol Holéczy
Vice President of 6th CECON and 15th Slovak Congress on Obesity
President of the working group Bariatric/Metabolic Surgery Obesity Section of the Slovakian Diabetes Society



Jozef Ukropec

Jozef Ukropec
Chair of scientific committee of 6th CECON and 15th Slovak Congress on Obesity
Member of the Physical Activity working group
Obesity Section of the Slovakian Diabetes Society

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ORAL PRESENTATIONS

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1. Monogenic diabetes and obesity in Slovakia

Klimes I, Stanik J, Gasperikova D

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Diabetes mellitus (DM) and obesity is generally a polygenic disease, but with the increasing progress of molecular biology there are identified more and more cases caused by a defect in a single gene. Until now we know several tens of genes whose mutations are responsible for monogenic diabetes (MDM) and obesity. The main goal of our study was to implement DNA testing of monogenic diabetes and obesity in Slovakia, with a focus on **Ad 1**. Identification of the prevalence and mutation spectrum of the most common genes responsible for MDM and obesity, **Ad 2**. Contribution to the knowledge of molecular-biological mechanisms of action of selected mutations and **Ad 3**. Verification of the applicability of the new clinical biomarkers for the differentiation of individual diabetes subtypes and **Ad 4**. Definition and adoption of genetic diagnostic criteria of monogenic diabetes. Since 2004, we have received in our Laboratory more than 1 000 patients with clinical suspicion for monogenic diabetes and more than 500 patients with clinical suspicion on monogenic obesity. Individual probands were analyzed for relevant genes according to their clinical phenotype. The establishment of a DNA banks of monogenic diabetes and obesity has led the following interesting results. **Ad 1**. On the basis of the information from the National registry of childhood diabetes, established since 1981, we identified for the first time the exact prevalence of permanent neonatal diabetes (PND). We have found that the prevalence of PND in Slovakia is 4 times higher than it was previously reported; we have identified the minimum prevalence of GCK-MODY and HNF1A-MODY and moreover we have identified 1.2 % prevalence of *de novo* mutations in the most common genes causing MODY diabetes in the so far the largest study counting 922 patients from Slovak and Czech MODY register; we have identified the minimum prevalence of MC4R mutation carriers in Slovakia; **Ad 2**. We have functionally characterized the molecular mechanisms of the 10 novel mutations in the glucokinase gene and the novel promotor mutations of the *HNF4A* gene; we have shown the digenic cause of combined clinical phenotype (insulin resistance and growth retardation), which arises from the heterozygote disruption of genes for insulin receptor and beta-2 chimerin; we have functionally characterized novel mutation in *EIF2S3* gene responsible for syndromic form of obesity. **Ad 3**. We have confirmed the usability of hsCRP as a clinically easily available biomarker for the differentiation of HNF1A-MODY diabetes from type 2 diabetes in the different European population; moreover, we have verified the changes in the glycan profile in the plasma of individuals with the mutation in the HNF1A gene, the specific DG9-glycan index is a usable marker in the resolution of the patients with HNF1A-MODY from patients not only with type 2 diabetes, but also from patients with type 1 diabetes; **Ad 4**. On the basis of our results, we were invited to the formation of molecular-genetic diagnostic guidelines for diabetes type MODY in Europe, which we have then, after the auspices of the Slovak Diabetes Association, implemented in Slovakia. In this way we have completed the effort in our Laboratory to fulfill the idea of medicine based on genetic makeup, which is a matter for all sectors of the medicine, including metabolic disorders.

OBESITY EPIDEMICS – PROBLEM OF CENTRAL EUROPE

2. Obesity in Europe 1986–2017 and EASO mission

Toplak H

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Obesity is probably the most emerging disease of the 21st century. Its prevalence has more than doubled since the 1980's when attention to it started to emerge. It is a gateway to ill health and plays a central role in the development of a series of other non-communicable diseases like diabetes, hyperlipidemia and hypertension – with the consequences of myocardial infarction and other atherosclerotic disease as well as cancer and many other health issues like osteoarthritis. The European Association for the Study of Obesity (EASO) is the scientific society generating scientific evidence and information, distributing education on all levels (doctors, other health care providers, politicians and the public) and serving as advocate of the patients with obesity. On 20th October 2016 released the latest *European Health Interview Survey* dealing with the weight situation in Europe. While 46.1 % of people above 18 were considered to be normal weight, 35 % were overweight (pre-obese) and 15.9 % were obese, only 2.3 % were underweight. The share of obesity ranged from below 10 % in Romania to 26 % in Malta (which is the country with the highest prevalence in children also). There is no systematic difference in obesity levels between *men and women*: the proportion of obesity was higher for men in half of the Member States, and higher for women in the other half. Within a Member State however, significant *gaps* can be observed, with the proportion of obese men being much higher than that of women in Malta (28.1 % for men compared with 23.9 % for women, or +4.2 percentage points – pp), Croatia (+3.9 pp), Slovenia (+3.6 pp) and Cyprus (+3.4 pp), and the percentage of obese women being much higher than that of men in Lithuania (19.9 % for women compared with 14.1 % for men, or +5.8 pp), Latvia (+4.4 pp) and the Netherlands (+3.6 pp). At EU level, the share of obesity was almost equal in 2014 between men (16.1 %) and women (15.7 %). In nearly all Member States, the share of obesity *increases with age*. The widest gaps between the proportion of young people (aged 18–24) and older persons (aged 65–74) being obese were recorded in Slovakia (33.0 % for people aged 65 to 74 compared with 2.7 % for those aged 18 to 24, or +30.3 pp) and Latvia (+29.3 pp), followed by Estonia (+26.4 pp), Lithuania (+25.3 pp), Poland (+25.1 pp), the Czech Republic and Hungary (both +24.5 pp). At EU level, a 16.4 percentage point gap is observed between young adults (5.7 %) and older persons (22.1 %) as regards obesity. In *brief*, about 1 young adult out of 10 is considered obese in Malta (12.0 %) and the United Kingdom (10.8 %), and about 1 in 3 older persons in Malta (33.6 %), Latvia (33.2 %) and Slovakia (33.0 %). In almost every EU Member State for which data are available, the share of obesity decreases with *education level*. In 2014, the largest difference in obesity between adults with a high educational level and those with a low educational level was observed in Slovenia (9.2 % for people with a high education level compared with 26.0 % for those with a low education level, or -16.8 pp), followed by Luxembourg (-14.5 pp), Slovakia (-13.9 pp), Spain (-13.0 pp), Croatia and Portugal (both -12.3 pp), France (-12.1 pp), Austria (-11.9 pp) and Cyprus (-11.8 pp). At EU level, an 8.4 percentage point gap is observed between high educated (11.5 %) and low educated adults (19.9 %) as regards obesity. **The European Association for the Study of Obesity (EASO)** – established in 1986, EASO is a federation of professional membership associations from 32 countries. It is in official relations with the WHO Regional Office for Europe. EASO is the voice of the European obesity community, representing scientists, health care practitioners, physicians, public health experts and patients. EASO promotes action through collaboration: in advocacy, communication, education and research. The **Objectives** of EASO are: to support the development of a unified evidence-based approach to tackling obesity across disciplines and countries; to advocate obesity as an urgent and relevant health priority to policymakers, NGOs, research funders, health professionals, media, industry and the public; to identify and articulate effective solutions to these stakeholders; to create and support active campaign groups; to support national advocacy, clinical, scientific, and patient communities; to provide knowledge, advocacy and training to improve the quality and availability of care; to provide a broad platform across stakeholder groups for sharing ideas and developing solutions. **Summary:** Obesity is exploding everywhere. If it continues like now we face the potential that obesity could be present in more than 30 % of the adult population by 2030. Consecutively one in 4 adults could be diabetic, the feared twin of obesity. That is the reason why we today frequently speak about DIABESITY. Being an individual problem people will have to care for their weight and health. But diabetes is also a societal problem and modern societies will have to act NOW. It is time for health in all policies, not only focusing on the health ministries – worldwide.

3. Situation in the management of obese patients in the Slovak Republic

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Obesity is now recognised as the most prevalent metabolic disease world-wide, affecting not only adults but also children and adolescents. The World Health Organisation has long declared obesity a global epidemic impacting a huge burden on health and health costs. In the majority of European countries, overweight and obesity affect 50 % of the population and are responsible for about 80 % of cases of type 2 diabetes, 35 % of ischaemic heart disease and 55 % of hypertensive disease among adults, which together cause more than 1 million deaths. The situation in Slovakia is not different from the other European countries. 61.8 % of Slovak adult population is overweight and obese (based on data from 2012). 23.4 % has BMI ≥ 30 kg/m², 18.3 % from all adults (with predominance of males) has BMI 30–35 kg/m², about 4 % of the adult Slovak population (predominance of women) has BMI of 35–40 kg/m², and in the range of class III obesity BMI ≥ 40 kg/m² is more than 1 % of the adult population (predominate women). Despite steady progress in the management of obesity, its prevalence continues to rise, stressing the necessity for prevention and intervention strategies not only at the individual level but also at the communities and the population as a whole. Specialised obesity services, however, are not widely available in Europe, and obesity care can vary enormously across European regions. What is the current situation in order to prevent further increases in the prevalence of obesity in Slovakia? We really need functional national prevention programmes which should involve government organisations and the individual. Such programmes should include educational initiatives and local community activities. Organisations such as the healthcare system, food manufacturing and distributing companies, agricultural agencies, the media and organisations providing leisure activities should also be involved. Effective obesity management depends on healthcare providers who need unambiguous support from government and healthcare authorities. Obesityology Section of Slovakian Diabetes Society (OS SDS) have to work out on multilevel obesity management network: obesity management centers in major university hospital, obesity outpatient clinics led by obesity specialists, related specialists such as diabetologists, endocrinologists, psychiatrics, cardiologists, surgeons, dietologists, primary care physicians, weight reduction groups. The starting point for the obesity management is the training of obesity specialists (postgradual course). Subsequently obesity specialists should provide leadership and guidance for other physicians involved in obesity management. In order to facilitate knowledge of obesity monography Clinical Obesityology has been published by OS SDS in 2013. Since 2002 OS SDS has been organizing annually the Slovak Congress on Obesity with international participation focused on education obesity professionals (EASO Obesity Management Task Force course, 2016). The OS SDS aims to: create awareness of obesity-related issues at legislative and ministerial level; find appropriate financial resources for further development of the obesity management system, prepare appropriate conditions for increasing involvement of primary care physicians in the process of obesity management; evaluate the benefits of all long-term therapeutic strategies for weight loss and maintenance in terms of health risks, quality of life and cost-effectiveness.

4. Obesity management in Hungary. Hungarian comprehensive health tests program 2010–2020

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Introduction: The comprehensive health tests program in Hungary 2010–2020 supports the monitoring of the health status of the Hungarian adult population. The screening truck visits 125 locations yearly. In addition to screening the Program focuses on the prevention of the life–style related diseases health risks. The screening was made in first two years 2010, 2011 on 32,491 adults (female n: 18,667, median: 42 y, male n: 13,824, median: 39 y). **The aim** of the body composition analysis made by InBody 720 was to determine percent body fat (PBF) in connection with BMI. The CV risk factors were tested and blood pressure was measured. **Results:** Distribution of PBF in female was lower than normal (ref: < 28.9) 37.49 %, normal (28.9–33.3) 19.15 % and higher (> 33.3) 43.36 %, in male (< 18.65) 29.57 %, (18.65–23.15) 24.88 %, (> 23,15) 45.56 %. Mean of percent body fat by sex within BMI groups: in normal BMI (18,5–24,9 kg/m²) female 27.23 % male 17.03 %, overweight (25–29,9) female 34.81 %, male 23.25 %, obese (> 30)

female 40.80 %, male 30.32 %. Higher than normal percent body fat was found in normal BMI group female 6.7 % male 3.73 %, overweight female 18.32 % male 21.37 %. The tendency of prevalence of CV risk factors increased by terciles body fat percent subgroups but the final conclusion needs more analyses. The presentation will cover some of new results on 150,000 adults. **Conclusion:** Our results emphasize the necessity of prevention of obesity and cardiac disease in the case of normal or overweight BMI too.

BARIATRIC/METABOLIC SURGERY I.

5. Overview of new trends in bariatric and metabolic surgery

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Since early eighties, worldwide obesity prevalence has more than doubled. Today, in most countries across the continents, more people die from obesity than from being undernourished. Metabolic/bariatric surgery continues to be the most successful treatment for obesity, being responsible for substantial and sustained weight loss, resolution and/or significant improvement of comorbidities, and reductions in health care services utilization. Metabolic mechanistic studies conducted in animals and humans of the currently standardized surgical interventions have demonstrated the important role the gut plays in glucose homeostasis and appetite control. However, only a small percentage of potentially surgical candidates undergo established procedures. Patients and referring physicians alike often consider the established procedures too dramatic. Less invasive, potentially reversible procedures are needed to meet the needs of the growing T2DM and obese population. There are several emerging procedures and new trends which may fit into this rapidly growing concept of less invasive procedures. Among such procedures may be positioned i.e. so called partial jejunal diversion (PJD), performed laparoscopically, and/or endoluminally, involving a single anastomosis, a side to side jejuno-jejunostomy which offers promise as a less invasive, reversible procedure, namely for the management of T2DM and warrants further study. Endoluminal procedures, specifically those mimicking laparoscopic operations however performed with the means of gastroscopic and colonoscopic devices such as endoluminal gastric plication are another, low invasive, potentially reversible possibility. On the even less invasive end, there are available or at least emerging further treatment options, such as intragastric balloons, endoluminal barriers, gastric electrostimulation or so called transpyloric shuttle. Regardless the promising trends in this rapidly evolving field, multidisciplinary approach to patients, careful preoperative selection, standardized and consistent follow-up are the key contributors to long-term success.

6. Predictors of weight loss and weight regain after obesity surgery

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Bariatric surgery in obese patients is effective in producing sustainable weight loss and improvement in obesity-related co-morbidities. However, weight regain can be seen in a substantial number of patients following bariatric surgery. Dietary non-compliance, mental health disorders, physical inactivity, hormonal/metabolic abnormalities and surgery related issues are among the underlying etiologies contributing to weight recidivism. Current literature is comprised of numerous clinical trials studying predictors of weight outcomes after bariatric surgery. Binge eating disorder and loss of control of eating are among those that result in less weight loss and more weight regain. DNA sequence variations in eleven obesity candidate genes were tested to display the association with weight loss and weight regain in the Swedish Obese Subjects bariatric surgery cases. The analyses revealed that the single nucleotide polymorphism (SNP) in the Fat mass and Obesity associated (FTO) gene was associated with maximum weight loss after bariatric surgery. There was no evidence that obesity risk SNPs in FTO or other obesity candidate genes were associated with weight loss or weight regain over six years of follow up. In other studies night eating, depression, age and initial body mass index of the patient, surgical procedure, time since surgery, stoma diameter, nutritional counseling level and physical inactivity were shown to be the predictors of weight regain after Roux-en-Y gastric by-pass. A systemic review of studies assessing changes in leptin, ghrelin and insulin sensitivity during weight loss and testing the relationship between such changes and weight regain has concluded that these changes taken alone are not sufficient to predict weight regain following weight loss. Whatever predictors have been proposed so far for weight loss, maintenance and weight regain, patients' adherence to treatment and follow up programs remains to be essential.

7. Surgery for Diabetes and DSS-II guidelines

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Bariatric surgery is since half of the last century connected with surgical intervention for substantial weight reduction. Other medical benefits were supposed as effect of weight reduction. The introduction of laparoscopic surgery accelerated increase the numbers of surgical interventions for severe obesity worldwide. Only mild attention was dedicated to real metabolic consequences of surgical procedures. In 1978 Buchwald and Varco published nice book devoted to the effect of partial ileal bypass on triglycerides, and twenty years after Buchwald published the long-term results regarding levels of cholesterol. In 1995 Pories published results of surgical procedure on diabetes mellitus type 2 (DMT2). At the beginning of 3rd millenium Rubino and others focused attention of bariatric community on metabolic effect of surgery. Introduction of the fore gut and hind gut theory led many researchers to work hard on the topic of gut hormones and theirs interaction. The name "metabolic surgery" became more and more popular. There have been published very interesting studies regarding this topic. The positive effect of surgical treatment on comorbidities, especially on DMT2 became more and more apparent. The surgical community relatively early accepted this knowledge. But there was long way to go, to be accepted in diabetologic community and by government authorities, as well. An important step was the first Diabetes surgery summit on 2009. A lot of hard work of many researchers was completed in Diabetes surgery summit II. in 2015. The results of the consensus of 48 experts (more than 75 % non-surgical) titled: "Metaboilic surgery in the treatment algorithm for type 2 diabetes: A joint statement by international diabetes organisations" were published in 2016. Very soon this consensus was accepted in more than 50 professional communities worldwide. The Slovakian Diabetes Society and his Obesitology section has sign this document recently. As a result of scientific power of the consensus, American Diabetes Association introduced in 2017 surgery as integral part of DMT2 algorithm. A lot of energy must be spent in the future to share this knowledge to diabetologist and others communities, as well. There is the need to persuade also government authorities and health care payers to accept new indications for surgery. I hope that our effort will be successful not only in Slovakia.

8. Bariatric surgery in Poland. What's new?

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The population of Poland is 38.5 million. According to recent epidemiological studies performed in Poland, every fifth adult suffers from obesity. Among them, 300,000 are morbidly obese and more than a million patients meet the criteria for bariatric surgery due to complications related to obesity stage 2. According to the data presented by the International Diabetes Federation, diabetes was diagnosed among 2 million adults in Poland. Most of these cases (90 %) are type 2 diabetes. The first bariatric procedures were performed in Poland during the 70s in Poznan, Bytom, Warsaw, Gdansk and Lublin. The laparoscopic technique was introduced into bariatric surgery at the end of the 90s, when the first laparoscopic gastric banding and laparoscopic gastric bypass were performed in Zabrze. The Polish Association of Prevention and Treatment of Obesity has been a member of the International Federation of Obesity since 2001. The first conference in Poland dedicated to bariatric surgery was organized in 2002 and, since 2009, international conferences dedicated to metabolic and bariatric surgery have been organized every year in Poland. In 2003, the Bariatric Surgery Section (since 2009: the Metabolic and Bariatric Surgery Section) was founded in the Association of Polish Surgeons and a similar section was founded in 2009 in the Polish Association for the Study of Obesity. Unfortunately, for many years less than 1,500 patients with indications for bariatric and metabolic surgery underwent this type of treatment per year. Despite the fact that nowadays bariatric surgery is performed on a regular basis in 25 hospitals in Poland, and the number of bariatric surgical procedures doubled in 2015 and 2016, treating over 3,000 patients per year, still less than 1 % of patients are treated per year in accordance with indications. The Coalition against Obesity was founded in 2016 to look for new organizational solutions. The above coalition developed the "Polish Obesity Road Map" and has proposed its introduction into the system of health care in Poland. Simultaneously, at the beginning of 2017, in accordance with the evidence published in the HTA report dedicated to bariatric surgery and considering the condition of public health care in Poland, a new Diagnosis-Related Group: "Surgical Treatment of Obesity" was founded by the National Health Fund. We hope that the above solutions will help to treat, in the coming years, a larger group of morbidly obese patients in accordance with Evidence Based Medicine.

PHYSICAL ACTIVITY IN THE TREATMENT OF OBESITY, DIABETES, AND OTHER COMORBIDITIES

9. Physical activity in the treatment of obesity or future is in the muscle

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Physical activity plays probably the most important role not only during weight reduction itself, but also in treatment of comorbidities associated with overweight and obesity. Physical activity alone is not effective for weight reduction. But we have a lot of evidence about the effect of physical activity on various diseases that ultimately lead to more mild morbidity and mortality. We can find a lot of prospective studies on hypertension, diabetes, dyslipidemia, ischemic heart disease or depressive disease associated with physical activity as “drug of choice”. For many years, there have been no clear mechanisms as it is possible for physical activity to have effects of seemingly unrelated organs and systems. The discoveries of myokines as active substances produced by the working muscle are gradually explaining most of the effects. Myokines appear to be a future not only as future drugs, but above all as a necessary proof to preserve movement already in prevention. In the Czech Republic, the number of obese patients does not appear to increase in recent years. However, the number of people regularly moving is still falling. This means that the physical fitness of the population is likely to decrease, however, the last data on the population’s fitness has been in the 70’s within the IBP program. But lower fitness in adolescents is unquestionable by performance tests at elementary schools. The $\dot{V}O_2$ max parameter is the strongest predictor of cardiovascular mortality over 60 years of age. It is undeniable that by improving fitness we improve the prognosis of patients regardless of the presence of any disease. Physicians, for example, physicians are prescriptions of “training” patients in collaboration with a specialist in the subject. The main problem is so often insufficient too low the intensity or frequency of physical activity for our patients and thus the failure to achieve the expected effect. Only after the decision about regular time for physical activity can we discuss the type (aerobic, resistance training or a combination of both, etc.). It is a big misconception to say that the movement brings joy for all patients. For example, non-depressive patients may have depressive symptoms after exercise. Consequently, we must avoid the greatest mistakes in prescribing and strictly individualize our recommendations, not only for associated illness but also for the possibilities and feelings of obese patients. Each of us has a muscle pharmacy that just needs to be used. It is very cheap and relatively one. I know that often one-off procedures have incredible effects.

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10. The effects and mediators of acute and regular exercise on glucose metabolism, cognitive and motor functions in middle-aged sedentary and elderly individuals

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Obesity and sedentary lifestyle increase the risk of both metabolic and neurodegenerative diseases. On the other hand, regular exercise has a substantial potential to slow down or even reverse the progression of early stages of chronic diseases. Evidence suggests that many of regular exercise-induced health benefits are mediated by bioactive molecules, released from contracting skeletal muscle, such as myokines and microRNAs. In our studies, we have observed improved motor and cognitive functions, muscle strength and physical fitness as well as selected metabolic parameters and skeletal muscle phenotypes in different patients’ populations. Improvements in clinical and muscle phenotypes were associated with shifts in selected bioactive molecules, supporting their role in the

adaptive response to exercise. Our results support the role of regular exercise as a supportive treatment of chronic metabolic and neurodegenerative diseases.

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11. High-intensity interval training as a therapy for type 2 diabetes?

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High-intensity interval training (HIIT) is characterized by high intensities close to or above an individual's maximum oxygen uptake ($VO_2\text{max}$) and short recovery phases between these high intensity phases. Although this training modality has long been known in a slightly modified form as interval training in elite sports, HIIT has only recently found its way into recreational sport as well as preventive and rehabilitative medicine. But how does HIIT work? Does HIIT live up to its promises? And most importantly, can we use this promising training strategy to provide an increasingly obese and sedentary population with the amount of physical activity indispensable for metabolic health? Numerous studies have shown that many adaptive processes of HIIT-sessions are comparable to those of time-consuming conventional endurance training regimes – despite a significant reduction of time requirement with the former. This also includes promising effects on metabolic health, particularly in those at risk of or with type 2 diabetes by improving important endpoints such as glucose regulation, insulin resistance, $VO_2\text{max}$ and some cardiometabolic risk factors. HIIT is a novel time-efficient training paradigm that can be used as a strategy to mediate health-protective effects and reduce metabolic risk factors in sedentary populations who otherwise would not adhere to time-consuming conventional endurance training regimes.

12. Does fat loss require fat burning? Role of exercised skeletal muscle

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Exercise training as an effective intervention to lower visceral obesity has been supported by numerous evidence. Since exercise is seen as an energy-consuming behavior, fat burning concept has been widely used to explain its fat loss outcome. This concept is predicated by a believe that the most important way to lose abdominal fat is the conversion of fatty acid to carbon dioxide during and after exercise. This intuitive thought is further strengthened by the evidence of increased plasma glycerol concentration during exercise together with elevated oxygen consumption. Despite most of exercise physiologists understand that carbohydrate, not fat, is the main fuel supporting fast muscle contraction, fat burning concept remains not much questioned in the past. The major challenge against the fat burning concept comes from the following key evidence. First, exercise training at various forms (low intensity aerobic exercise, high intensity anaerobic exercise, resistance exercise) does not actually elevate 24-h fat oxidation based on reliable data from several whole-room indirect calorimetric studies, demonstrating that exercise is not fat burning. Second, exercise training combined with hypoxia recovery effectively decreases fat mass. If visceral fat loss must rely on fat burning, hypoxia should prevent fat loss simply because fatty acid oxidation cannot occur without oxygen. We have previously found that a small decreases in blood oxygen saturation under hypoxic conditions (blood oxygen saturation decreased to 93 %) increases blood distribution toward skeletal muscle under glucose ingested condition, suggesting a shift of more circulating glucose and insulin to skeletal muscle under systemic hypoxia. This implicates that carbon-source redistribution among tissues in the body is more important than fat burning for abdominal fat loss. Third, high-intensity sprinting training (anaerobic-based exercise) decreases body fat more effectively than steady state moderate intensity exercise training (aerobic-based exercise) when overall energy expenditures of both are similar. In conclusion, exercise challenges skeletal muscle, which in turn increases its capability to attract more carbon-source than adipose tissues. High intensity exercise recruits greater muscle fibers, depletes more carbon fuel, and causes greater damage in skeletal muscle than low-intensity exercise. This fat burning-independent scenario increases its demand on postprandial carbon sources, insulin, stem cells, and neutrophil/macrophage leading to a reciprocal size change between muscle and fat.

13. Effectiveness of complex non-pharmacological treatment of obese patients in Bardejov Spa

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Introduction: Obesity significantly increases morbidity and mortality, impairs quality of life and brings serious socio-economic problems. **Aim of the research:** Evaluate the effectiveness of non-pharmacological treatment of obesity in patients who underwent the two-week reduction stay in Bardejov Spa a.s. in years 2012–2016. We intended to find out whether the non-pharmacological treatment of obesity will positively affect values of total cholesterol (CHOL), triglycerides (TG), HDL cholesterol (high density lipoprotein), LDL-cholesterol (low density lipoprotein), uric acid (KM) and glycemia and whether the changes reach statistical significance. We have also been interested in the question of possible correlation between severity of obesity and the presence of liver fibrosis. **Methodology:** Bardejov Spa a. s. has developed a complex specialized two-week spa stay aimed at weight reduction, which was put into practice in May 2012 (Belovicova M, Belovicova L, Svirikova H, Niemasikova G, Bachulak V, Nikulin A). During this stay clients gain new knowledge regarding proper diet and physical activity while being under medical supervision. During the stay they undergo testing for early detection of cardiovascular disease and liver diseases. Clients also undergo an ultrasound scan of the abdominal cavity and examination on Fibrosan 502 touch device, which uses painless non-invasive methods (transient elastography – TE) to measure stiffness of the liver tissue. **Results:** 184 clients has completed the weight reduction stay. For evaluation purposes, we did not include into this file clients who underwent the weight reduction stay repeatedly. Average weight loss after completing the course was 3.8 kg (3.78739 kg). Waist circumference was reduced by an average of 5.5 cm (5.49727 cm). The values of weight loss and waist circumference reduction were highly statistically significant ($p = 0.001$). Transient elastography was applied on clients at the beginning of the course. It could be realized with 165/184 clients, which represents 89.6 % of the group. We conducted a correlation analysis of the relation of BMI and the degree of liver fibrosis. The degree of fibrosis – liver damage – increases with the increasing degree of obesity. With the consent of the clients, we took them control samples at the end of their weight reduction stay. Average CHOL decrease was 0.72 mmol/l (0.72840), average TAG decrease was 0.4 mmol/l (0.39699), average LDL decrease was 0.6 mmol/l (0.62987, average Gly decrease was 0.7 mmol/l (0.71083). The values of decrease in total cholesterol, TAG, LDL, and blood glucose levels were highly statistically significant ($p = 0.001$). Changes in the levels of HDL and of uric acid (KM) were not statistically significant (HDL $p = 0.627$, KM $p = 0.076$). **Conclusions:** The most effective method in the prevention of obesity is targeted intervention aimed at improving dietary habits, increasing physical activity and overall change of ones' lifestyle. We see the contribution of our weight reduction courses in their complexity (diet, physical activity, education, motivation and psychological support) and in the presence of feedback (we communicate with the course participants even after its completion).

14. Prevention of type 2 diabetes through diet and physical activity: the PREVIEW study

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Introduction: Type 2 diabetes is one of the growing disease which takes epidemic proportions throughout the world. The aim of the PREVIEW trial (**PRE**vention of diabetes through lifestyle **I**ntervention and population studies in Europe and around the **W**orld) was to assess which is the best diet in combination with physical activity to prevent the development of type 2 diabetes in a population at risk. **Materials and methods:** The project is a 3-year multi-centered randomized controlled trial in adults. Eight intervention centers were involved (Denmark, Finland, UK, the Netherlands, Spain, Bulgaria, Australia, New Zealand). The enrolled subjects were pre-diabetic overweight/obese individuals from both genders randomized to different dietary and physical activity groups. The intervention started with an 8-week on a low-calorie diet (Cambridge Weight Plan[®]) followed by a randomized 146-week weight maintenance intervention in 4 dietary arms (high/low protein content and high/moderate glycemic index in combination with high/moderate physical activity intensity). Data were collected at different time points for blood, urine, faeces, anthropometric and body composition measurements, blood pressure, pulse, accelerometers, different questionnaires, 4-day food diaries. **Results:** 2,300 subjects were eligible for inclusion to the study. Of these, 2,224 (1,504 women; 720 men) started the 8-week low calorie diet. At the end of the 8 week, 2,020 completed the weight reduction period. Women lost 10.2 ± 0.4 kg compared to men -11.8 ± 0.5 kg with a mean difference of -1.6 ± 0.1 kg ($P < 0.001$). Then, they followed the 146-week weight maintenance intervention. **Conclusion:** The PREVIEW study is the largest, multinational study for prevention of type 2 diabetes among pre-diabetic individuals with a combination of diet, physical activity and behavior modification.

CO-MORBIDITIES OF OBESITY

15. Obesity – risk factor of cancer?

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Cancer is leading cause of death worldwide and the prevalence of obesity has more than doubled over the past 40 years. Numerous meta-analyses support the link between excess body weight and increased risk of developing and dying from several types of cancer. The reported associations may be causal or some malignancies, but they may be flawed owing to inherent biases that exaggerate the effect of obesity on cancer incidence and mortality. Excess body weight is associated with increased risk of developing and dying from many diseases including cancer, type 2 diabetes and cardiovascular disease. Obesity has become a major public health challenge; its prevalence worldwide has more than doubled among women and tripled among men in the past four decades. The number of overweight and obese people has risen from approximately 857 million in 1980 to 2.1 billion in 2013. Several meta-analyses support the link between obesity and cancer, but substantial heterogeneity exists between studies. A recent umbrella review found that despite strong claims of a statistically significant association between type 2 diabetes and several cancers only a fraction (14 %) of the 27 studied associations were supported by robust evidence without any potential bias. The strong evidence to support the positive association between obesity was found in 11 of the 36 cancer sites and subtypes that were examined, predominantly comprising cancers of the digestive organs and hormone related malignancies in women. Substantial uncertainty remains for the other cancers. To draw firmer conclusions we need prospective studies and larger consortiums with better assessment of the changing nature of body fatness and with comprehensive standardized reporting of analyses. As obesity becomes one of the greatest public health problems worldwide, evidence of the strength of associations between obesity and cancer may allow finer selection of people at high risk, who could be selected for personalised primary and secondary preventive strategies.

16. Obstructive sleep apnoea and endocrinology

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Research in obstructive sleep apnoea syndrome (OSA) requires wide interdisciplinary approach. Pathophysiological mechanism in OSA, which can cause severe health consequences are very complex and need to be elucidated. OSA is considered as important factor disturbing sleep and circadian rhythm, not only in snorers, but also in bed partners. Intermittent hypoxia, sleep fragmentation, excessive daytime sleepiness (EDS), obesity, hypertension, atherosclerosis, cerebral strokes, cardiac arrhythmias, hyperglycaemia, insulin resistance, polycystic ovary syndrome and impaired hormonal secretion can be found in OSA patients. Also endocrine diseases itself may disturb breathing during sleep and decrease sleep efficiency. For example acromegaly, hypothyreosis, hypercortisolism. Neuroendocrine mechanism play a role in control of breathing as well as during initiation and sleep maintaining. Level of melatonin, testosterone, signalling molecules, adipose tissue hormones (leptin, adiponectin), free fatty acids, pro-inflammatory cytokines, interleukins IL 1, IL 6, TNF alpha in the blood are involved. Secretion of some hormones differ during slow wave and REM stages of sleep. The deep sleep phase in the first part of the night are characterized with minimum cortisol and maximum of growth hormone concentration. Decreased glucose consumption in non-REM and increased in REM can be observed. In obese patients hypothalamic cortico-liberin (CRH) hypofunction plays a major role in pathogenesis of sleep apnoea, sleepiness and cardiovascular comorbidities. This paper maps and summarizes recent opinion and hypothesis, which links patho-mechanism in OSA with endocrinology. Some of them look bizarre or hardly probably at the first view, however in the future could be used for development of new drugs or treatment.

17. Excessive daytime sleepiness in acute ischemic stroke; association with obesity, diabetes mellitus, restless legs syndrome and sleep-disordered breathing

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Background: The prevalence of sleep-disordered breathing (SDB), excessive daytime sleepiness (EDS), and restless legs syndrome (RLS) is ranging among stroke survivors up to 91 %, 72 % and 15 % respectively. Obesity is considered to be one of the most important mechanisms underlying SDB. Although the relationship between EDS and SDB is well described, there are insufficient data regarding the association of EDS with RLS. The aim of this study was to explore the association between EDS, SDB, RLS and other clinical characteristics including obesity in acute ischemic stroke. **Methods:** We enrolled 152 patients with acute ischemic stroke. Epworth Sleepiness Scale (ESS) was used to assess EDS. SDB was assessed using standard overnight polysomnography. All patients filled in a questionnaire focused on RLS. Clinical characteristics and medication were recorded on admission. **Results:** EDS was present in 16 (10.5 %), SDB in 90 (59.2 %) and RLS in 23 patients (15.1 %). Presence of RLS (beta = 0.209; p = 0.009), diabetes mellitus (beta = 0.193; p = 0.023) and body mass index (beta = 0.171; p = 0.042) were the only independent variables significantly associated with ESS in multiple linear regression analysis. **Conclusion:** Our results suggest significant association of EDS with RLS, diabetes mellitus and body mass index in patients with acute ischemic stroke. RLS, obesity and metabolic factors seem to be the most important variables associated with the measures of EDS, while the role of SDB seems to be minor.

18. Importance of different grades of abdominal obesity on testosterone level, erectile dysfunction, and clinical coincidence

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The aim of the current study was to investigate the influence of different grades of abdominal obesity (AO) on the prevalence of testosterone deficiency syndrome (TDS), erectile dysfunction (ED), and metabolic syndrome (MetS). **Material and methods:** In a cross-sectional descriptive study, a total of 216 males underwent a complete urological, internal, and hormonal evaluation. Males were divided according to waist circumference into five groups: less than 94 cm [Grade (G) 0], 94 to 101 cm (G1), 102 to 109 cm (G2), 110 to 119 cm (G3), and more than 120 cm (G4). Incidence of ED, TDS, and MetS was compared in these groups and in participants without AO. **Results:** Some degree of ED was identified in 74.7 % of males with AO. In G1, there were 61 % of males with ED, in G2 68 %, in G3 83 %, and in G4 87 %. A strong correlation between testosterone (TST) level and AO was identified. Ninety-eight out of 198 (49.5 %) males with AO and 1/18 (5.5 %) males without AO had TDS. There were significant differences between individual groups. In the group of males with AO G4 (more than 120 cm), 87.1 % had TDS. MetS was diagnosed in 105/198 (53.0 %) males with AO, but in G4, 83.9 % of males with AO had MetS. **Conclusion:** Males older than 40 years of age with AO have a higher incidence of ED, TDS, and MetS. Dividing males into five groups according to waist circumference seems to be reasonable. With growing AO, there were significantly more males with ED, TDS, and MetS.

19. Higher estrogen level is associated with depression in obese men

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Background: Depression is one of the most commonly occurring, serious disorders associated with increased morbidity and mortality. The association of depression with obesity has been shown in several studies, although the underlying factors of that contribute to establishing and maintaining depression in obese are not clearly understood. Hormonal changes, mostly changes in sex hormones related to obesity, are among them. The aim of this study is to investigate the association of BMI and sex-hormone levels in men and to explore whether these alterations are associated with depression in men. **Patients and methods:** Data were obtained from the LIFE-Adult-Study, a population-based cohort study. A total of 3,925 men, 2,244 younger than 60 years (mean age 47.6 ± 8.0 years, mean BMI 27.1 ± 4.3 kg/m²) and 1,681 men older than 60 years (mean age 68.9 ± 5.1 years, mean BMI 28.2 ± 3.9 kg/m²) were included into analyses. Associations of anthropometric, hormonal parameters and depression symptoms according to CES-D score were evaluated using t-test, Pearson's correlations, multiple linear regression analysis and logistic regression analysis. **Results.** In younger men, we found a significant decreased sex hormone-binding globulin (35.4 ± 14.1 nmol/L, $p < 0.001$ in overweight and 31.8 ± 14.3 nmol/L, $p < 0.001$ in obese), total testosterone (15.8 ± 5.2 nmol/L, $p < 0.001$ in overweight and 12.6 ± 4.7 nmol/L, $p < 0.001$ in obese) and free testosterone (300.8 ± 78.6 nmol/L, $p < 0.001$ in overweight and 249.0 ± 73.9 nmol/L, $p < 0.001$ in obese) levels compared to normal weight males. In older men we observed a decreased sex hormone-binding globulin (47.9 ± 18.8 nmol/L, $p < 0.001$ in overweight and 45.2 ± 20.0 nmol/L, $p < 0.001$ in obese), total testosterone (15.9 ± 5.4 nmol/L, $p < 0.001$ in overweight and 13.8 ± 6.9 nmol/L, $p < 0.001$ obese), free testosterone (217.8 ± 71.2 nmol/L, $p < 0.001$ in obese), and an increased estradiol (90.1 ± 41.0 pmol/L, $p = 0.005$ in overweight and 97.3 ± 43.0 pmol/L $p < 0.001$ in obese) compared to normal weight males. In logistic regression analyses, increased estradiol ($\Delta R^2 = 0.003$, OR = 0.318, $p = 0.013$) was associated with positive depressive symptomatology in men up to 60 years. **Conclusions:** BMI was strongly associated with sex hormone levels, while certain differences can be seen between younger and older men. Among all tested sex hormones, we found an association of increased estradiol level with positive depressive symptomatology in younger, but not in older men.

ROLE OF SGLT-2 INHIBITORS IN THE TREATMENT OF DIABETIC PATIENTS

20. Patophysiology of cardiovascular and renal benefits of SGLT-2 inhibitors and its implications for clinical practice

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The inhibition of sodium-glucose cotransporter-2 (SGLT-2) in the kidney proximal tubules is a new therapeutic approach in prevention of atherosclerosis in patients with type 2 diabetes. SGLT-2 inhibition is a mechanism in diabetes treatment independent of insulin resistance, insulin secretion or incretin effect. The primary aim of the treatment is the inhibition of compensatory increased glucose reabsorption in kidneys, which leads to increased glucose and sodium elimination by kidneys and subsequent improvement of glycemic control, weight reduction and blood pressure decrease. SGLT-2 inhibitors are alternatively called gliflozins. At the present time, three drugs from the mentioned group are available – dapagliflozin, empagliflozin and canagliflozin. So far, only one study of cardiovascular safety and efficacy has been finished in patients with diabetes, specifically with empagliflozin (EMPA-REG OUTCOME). Those patients with type 2 diabetes were included who had with previous cardiovascular disease and also a wide use of lipid-lowering, blood pressure-lowering and anti-platelet treatment. The study observed a significant effect of empagliflozin treatment on primary composite outcome which incidence was reduced significantly by 14 %. At the same time there was a significant reduction in cardiovascular mortality by 38 % and overall mortality by 32 %. Among the other endpoints a 35 % reduction in incidence of hospitalizations for heart failure and a 39 % reduction in the progression of diabetic nephropathy was observed. Meta-analyses of the studies with dapagliflozin observed also a significant reduction in incidence of hospitalizations for heart failure, in incidence of myocardial infarction, as well as in incidence of major cardiovascular events. In the present time, the studies of cardiovascular safety and prevention with canagliflozin (CANVAS) and dapagliflozin (DECLARE) are on the way. The patients included in the mentioned studies have type 2 diabetes and similar or lower cardiovascular risk in comparison with those included in EMPA-REG OUTCOME. The decreases in blood glucose, body weight and blood pressure do not fully explain the effect of gliflozins on the cardiovascular mortality. Further potential mechanisms are investigated and it seems that the benefit of SGLT-2 inhibitors is related mainly to its effect on heart failure by more effective use of energy by the myocardium as a result of ketoacids utilisation. Renal protective effect of gliflozins is explained by their protective effect on renal damage by the restoration of decreased tubuloglomerular feedback resulting in reduction of the glomerular filtration pressure. Further possible mechanisms of cardiovascular and renal protection are currently under investigation both in animal models, in healthy subjects and in the subjects with type 2 diabetes. The implications for clinical practice include the widening in the spectrum of gliflozin indications from antidiabetic treatment only to the prevention of cardiovascular events, heart failure and the progression of nephropathy.

21. SGLT-2 inhibitors and cardiovascular risk

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Cardiovascular (CV) disease represents the major cause of morbidity and mortality of patients with type 2 diabetes mellitus (DM2T). The risk of CV incidents is not only 2–3 times higher than in non-diabetic population, but they also have worse prognosis and requires more complex treatment. Moreover, the try to normalize plasma glucose levels in CV high risk patients was associated with increased risk of mortality. Increased risk of heart failure (HF) and CV mortality was also observed in association with treatment with some antidiabetic drugs (glitazones, some sulphonylureas, some gliptins) and very high dosage of insulin, as well. The recent RCT and RWE studies focused on CV safety of new class of antidiabetic drugs – inhibitors of SGLT-2 cotransport (empagliflozin, dapagliflozin, canagliflozin) revealed not only CV safety of these drugs but also CV and renal benefits such as reduced risk of CV mortality, reduced hospitalization due to HF or slowing of progression of diabetic nephropathy. Moreover, the mechanism by which these drugs reduce plasma glucose is independent from insulin secretion and insulin sensitivity. Drugs also reduce body weight and visceral adiposity, blood pressure, triglycerides, uric acid, arterial stiffness, have

diuretic effect. Effect of improving energetic metabolism of failing myocardium is also considered. Thus, after the years of some disappointments and embarrassment in treatment of DM2T, these studies brought a convincing evidence of CV and renal benefits, reviewed our current view on treatment goals, and indicated the new trends in treatment of DM2T. These findings were very promptly introduced also into the treatment algorithms of ADA/EASD as well as national treatment recommendations, including Slovak diabetes association.

CHILDHOOD OBESITY I.

22. Preventing childhood obesity in Hungary – the GYERE® program

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Objective: Obesity is a growing public health issue, what affects 67 percent of the adults and more than 20 percent of the Hungarian children population. To overcome the obesity epidemic the WHO recommends to improve lifestyle by promoting healthy eating habits and physical activity in all socio-economical settings. The GYERE (“Children’s Health”) program aims to prevent childhood obesity by acting on the behavior of the whole family, changing its environment and community norms. The first GYERE pilot program has initiated by the Hungarian Dietetic Association in 2014. The three years program is rolled-out in partnership with the Semmelweis University, Faculty of Health Sciences, the National Institution for Health Development and the State Secretariat of Health. **Method:** The GYERE program adopts the EPODE four pillars approach (public-private partnerships, political commitment and support, social marketing techniques and evaluation) for early engagement of children, involvement of all stakeholders, including families and communities. As part of the health education several thematic campaigns were carried out on healthy eating and active lifestyle. The program is using various communication channels (e.g. lectures, drawing and recipe competition, GYERE menu in school canteens, Facebook posts, educative articles) involving all of the children below 18y and their families in Dunaharaszti. **Results:** To measure impact of the health intervention anthropometric data of 6–12y children are collected at baseline and after the three years intervention. N = 1,421 (51.1 % boys, 48.5 % girls in 2014), 1315 (50.3 % boys, 49.7 % girls in 2017). Mean BMI of the total sample from 2014 is significantly higher than the mean BMI in 2017 ($p = 0.000$). Mean BMI of 8–10y boys, 7–8y girls and 11–12y girls is significantly lower in 2017 vs. 2014 ($p = 0.000$). Prevalence of overweight has decreased by 5 % and obesity by 2 % between 2014 and 2017. **Conclusion:** Our findings show that implementation of community based interventions has a potential to improve health behavior, therefore to reduce obesity prevalence.

23. Setting up obesity school programs: Challenges & Examples

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A common component of prevention and treatment concept of obesity in childhood is teaching nutrition-related knowledge, as it is necessary to adopt healthy behaviours. Due to the existing infrastructure, school staff, facilities, policies, and environments, the school setting provides a logical choice as a context for implementing interventions to promote a healthy lifestyle. Additionally, building healthier food environments in and around schools may further improve healthier eating habits. Consequently, a combination of health promotion and health promoting school environment are warranted. The Austrian *Special Institute for Preventive Cardiology And Nutrition (SIPCAN)* has set itself the target of improving nutrition education and the school environment e.g. cafeteria and vending machines. The school program includes three educational interventions (“Drinking & snack license”, “Movement is fun”, and “Smart drinking”) and three environmental interventions (“Vending machine check”, “School cafeteria check”, and “Lunch check”). The education is delivered by a teacher with whom the school children are familiar and it is also aimed to reach the school children’s parents, to reinforce healthier lifestyle also in the home environment. Therefore, no specially trained professionals are required. Additionally, such interventions require a minimum of money, effort, and school time and contain practical lessons regarding healthy nutrition and physical activity. In addition, by e.g. optimizing the vending machine, a reduction in the total mean sugar content of the beverages within the vending machine and therefore the school environment is a feasible intervention. Consequently, a complete package of school-based education and optimizing the school environment is able to increase nutrition-related knowledge, dietary behaviour with decreases in the consumption of unhealthy food and with healthy choices but without bans.

24. “Obesity reduction program – School of Obesity” and utility of non-traditional risk factors and biomarkers in cardiovascular disease risk assessment

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Childhood obesity is one of the most serious public health challenges of the 21st century. The atherosclerotic process, as evidenced by functional and morphological changes in the heart and blood vessels, begins early in childhood. In our study on 224 randomly selected students (17.72 ± 1.20 years of age, 120 female) from 7 high schools in Kosice we confirmed high prevalence of overweight/obesity (24 %), hypertension (9.3 %), and insulin resistance (14 %), obesity-related GH deficiency and the relationship between Adv36 infection and non-traditional cardiovascular risk factors, including leptin and UA. The current study results emphasize the importance of stratification of non-traditional CV risk factors and biomarkers in the paediatric population besides of stratification traditional CV risk factors. The treatment of childhood obesity and prevention of its related CVD being vital in to addressing rising levels of non-communicable diseases, with specific emphasis on childhood obesity. At Department of Paediatrics and Adolescent, Faculty of Medicine, Pavol Josef Safarik University in Kosice the management of obesity includes hospitalization to exclude secondary causes of obesity, and outpatient program. Our highly specialized *Clinic for preventive cardiology* focuses on group outpatient therapy of obesity, and also on cardiovascular risk stratification in children and adolescent. Organized team of specialists (cardiologist, nephrologist, endocrinologist, psychologist) is working on interdisciplinary outpatient program – “Obesity reduction program – School of Obesity”, which is under the patronage of the president of Slovak section for Atherosclerosis of Slovak Society of Clinical Biochemistry (member of IAS) – *Assoc. prof. Ingrid Schusterova, MD, PhD*. This program is focused on the same sex/age groups of children and adolescent and their parents. The goal of this program is to win the fight against obesity – prevention of cardiovascular disease associated with obesity, and treatment of childhood obesity by new way.

25. Risk factors of cardiovascular and metabolic diseases in Slovak adolescents: association with obesity

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Objective: It is now widely believed that adolescence levels of cardiovascular and metabolic risk factors predict early cardiac and vascular pathology. We found obesity/prehypertensive parameters in a considerable group of primary school children (Conference on Pre-Hypertension 2011, Vienna). Universal screening of total cholesterol is performed at age 11 and 17 yrs in Slovakia, but data on blood lipid profile and insulin resistance risk parameters of general population Slovak adolescents are not available. **Methods:** Respect for Health is a crosssectional study of the major cardiometabolic risk parameters -hypertension, dyslipidaemia, insulin resistance – and their association with obesity in a representative sample 2,767 healthy Bratislava region secondary school students aged 15–19, in school milieu. **Results:** Obesity (BMI > 97th percentile of representative age/gender specific population) was found in 17,6 % boys and 10 % girls. Mean **blood pressure** is significantly higher in obese than at normal weight (systolic + 8 mm Hg boys, + 7 mm Hg girls) (diastolic + 4 mm Hg boys, + 3 mm Hg girls). The prevalence of **high blood pressure** in obese boys and girls is 26.2 % and 13.5 %, versus 8.8 % and 2.7 % in normal weight, odds ratio (OR) = 3.69 $p \leq 0.05$ and OR = 5.71 $p < 0.05$. **Dyslipidaemias:** the average **cholesterol (TC)** of obese, compared to normal weight boys is significantly higher by 0.38 mmol/l. The **risk level TC** ≥ 5.181 mmol/l occurred in 7.6 % obese, compared with 2.2 % normal weight boys, OR = 3.69 pHD-cholesterol (HDL-C) is significantly lower by 0.12 mmol/l and 0.19 mmol/l in obese boys and girls compared to normal weight. The prevalence of **risk level HDL-C** < 1,036 mmol/l in obese boys and girls is 28.9 % and 10.8 % vs. 14.2 % and 2.3 % in normal weight, OR = 2.45 $p \leq 0.05$ and OR = 5.05 pLDL-cholesterol (LDL-C) is significantly higher in obese compared to normal weight boys and girls, by 0.33 mmol/l and 0.16 mmol/l. The **risk level LDL-C** $\geq 3,368$ mmol/l occurred in 6.2 % of obese, compared to 2.3 % in normal weight boys, OR = 2.82 pnon-HDL-cholesterol (non-HDL-C) in obese compared to normal weight boys and girls is significantly higher by 0.49 and 0.21 mmol/l. The **risk level non-HDL-C** $\geq 3,756$ mmol/l occurred in 12.4 % of obese compared with 2.8 % in normal weight boys, OR = 4.86 $p \leq 0.05$. The mean **triacylglycerols** are significantly higher by 0.36 mmol/l and 0.11 mmol/l in obese compared to normal weight boys and girls. The **risk triacylglycerol level** $\geq 1,467$ mmol/l occurred in 22.2 % and 12.2 %

obese, compared to 3.8 % and 7.7 % normal weight boys and girls, OR = 7.26 $p < 0.05$ and OR = 1.67 $p < 0.05$. **Insulin resistance:** Mean fasting insulin and HOMA-IR in obese boys are two-fold, in obese girls 1.5-fold higher, QUICKI significantly lower than with normal weight. The prevalence of **risk level QUICKI** $\leq 0,305$ in obese is 26.7 % and 17.6 % compared to 2.9 % and 3.5 % in normal weight boys and girls OR = 13.07 $p < 0.05$, and OR = 5.84 $p < 0.05$. **Conclusions:** A great proportion of healthy Slovak adolescents carry substantial burden of cardiovascular and metabolic risk factors, significantly more expressed in obese and male gender.

26. Epicardial adipose tissue and cardiometabolic risk factors in overweight and obese children and adolescents

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Background: Epicardial adipose tissue (EAT) is the visceral fat deposit around the heart and is commonly increased in obese subjects. EAT is related to cardio metabolic risk factors and non-alcoholic fatty liver disease (NAFLD) in adults, but this relationship is not well known in children. **Objectives:** The aim of our study was to assess by echocardiography the EAT in overweight and obese children and its relationship to cardio metabolic risk factors, insulin resistance, NAFLD markers and hyperuricemia. **Study group and methods:** In 25 (mean age 13.0 ± 2.3) overweight and obese subjects and 24 lean controls, blood pressure (BP), WC, fasting plasma glucose and insulin, lipids, uric acid and hepatic enzymes were established and EAT thickness measured by transthoracic echocardiography. **Results:** In overweight and obese subjects, EAT was significantly higher compared to normal weight children. Overweight and obese children had significantly higher body mass index (BMI), WC, BP, triglycerides (TAG), low-density lipoprotein and total cholesterol, hepatic enzymes alanine aminotransferase (ALT) and g-glutamyl transferase, and lower high-density lipoprotein cholesterol (HDL-C). EAT correlated significantly with BP, TAG, uric acid, HDL-C, Apo protein B and ALT. Correlation coefficients were similar or better than for WC, but similar or lower than for BMI. **In conclusion** EAT thickness in children is associated with an unfavorable cardio metabolic risk profile including biochemical signs of NAFLD and hyperuricaemia, but is not a stronger indicator than BMI.

27. What is the influence of a weight loss program on cognitive functions in obese adolescents?

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Introduction: Obesity is a global health problem in today's society often due to sedentary behaviour. In adolescents with uncomplicated obesity, subtle structural changes were found in the brain, accompanied by reduced overall intellectual functioning, reduced mental flexibility and attention impairments. In obese adults, a relationship was already found between increased BMI and decreased cognitive function, in adolescents data are limited. This research studies the effect of a multidimensional weight loss program on body composition and cognitive functions and determines whether these structural brain abnormalities and cognitive decline are reversible through lifestyle changes and weight loss. **Methods:** A total of 48 obese adolescents 15.8 ± 1.8 years old were included in a 30-week multidisciplinary inpatient weight loss program (Belgium). Parameters were assessed at baseline and after the intervention. BIA was used to determine body composition parameters (fat mass and fat percentage). Stroop Test (selective attention), Continuous Performance Test (sustained attention) and Ray Auditory Verbal Learning Test (short term memory) were used to determine cognitive functioning. Additionally, self-perceived fatigue was evaluated as a possible explanatory parameter. **Results:** Significant reductions in weight, BMI, fat mass and fat percentage was found after the intervention program (all $p < 0.01$). Improved reaction time for Stroop test and Continuous Performance Test was found (all $p < 0.01$), but accuracy for these tests did not change. Short term memory improved for total score and recall ($p < 0.01$) recognition showed a trend to improvement ($p = 0.06$). Self-perceived fatigue decreased significantly ($p = 0.04$) after the intervention. Improved reaction time was independent of improved fatigue, BMI, fat mass and fat %. Lower fatigue was related with positive evolution in short term memory. **Conclusion:** After a weight loss intervention, improved cognitive functioning, weight status and fatigue was found. These improvements in cognitive functioning was not linked with decreased fat mass or fat % like expected, enhanced short term memory was influenced by reduced fatigue. Further research is needed to determine explanatory parameters for improved cognitive functioning.

ADIPOSE TISSUE, THERMOGENIC AND METABOLIC ORGAN

28. Identification of the brown and brite adipocyte signature in mice and men

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Recruitment and activation of classical brown and inducible brite/beige adipocytes has received increasing attention in recent years as a strategy to improve systemic metabolic control. Nevertheless, the origin and expression signatures of brown and brite/beige adipocytes are still under debate, mainly due to the complexity of tissue biopsies. To study different adipocyte types in detail, we generated pure samples of brown, brite/beige, and white mature adipocytes by fluorescence activated cell sorting. Employing a machine learning approach for paired analysis of transcriptional data of pure mouse brown, brite/beige and white adipocytes and human brown and white whole adipose tissue obtained by PET-CT-guided biopsies, we were concomitantly able to identify a gene signature that can classify brown and white adipose tissue depots both in rodents as well as in humans. Thus, using the newly developed algorithm, we were able to predict the brown adipocyte content in a mixed population of adipocytes from different human biopsies that can be used for in-depth characterization of complex tissue samples from adipose tissue and might therefore support the development strategies to increase brown adipocyte formation in humans.

29. Metabolic and thermogenic activity of brown fat and obesity-related metabolic disease in men

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There are two major types of adipose tissue in mammals, white and brown. While white adipose tissue provides energy storage/mobilization compartment, brown adipose tissue contains cells specialized to turn chemical energy to heat by uncoupling proton gradient at the inner mitochondrial membrane from ATP production or by utilizing other futile cycling mechanisms. These mechanisms are always physiologically important and under some circumstances they could become energetically very inefficient. Brown fat cells of small mammals use uncoupling protein 1 (thermogenin) to protect from cold. However, alternative UCP1-independent mechanisms of heat production could operate in parallel to boost the acute cold exposure-induced response, or to modulate energy metabolism in response to energy intake. These mechanisms seem to play an important role in human physiology. It is important to note that brown or brown-like adipocytes, with the potential thermogenic capacity in humans are interspersed (possibly generating a functional net) within the specific (perivascular) white adipose tissue depots. Cold-induced activation of brown adipose tissue effectively increases energy expenditure and improves glucose metabolism, directly targeting the basic pathophysiological component of obesity and type 2 diabetes development. Molecular mechanisms of brown fat metabolic/thermogenic activation and their physiological significance in humans are being extensively studied. This research is expected to provide clinically relevant tool to increase energy expenditure, enhance response of our body to exercise and dietary lifestyle changes and minimize thus obesity and associated health risks.

30. Identification of novel targets with potential to promote brown adipocyte function

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Prevalence of obesity and metabolic syndrome is increasing worldwide and is reaching pandemic proportions in developed countries. This is mainly due to consumption of high-calorie food in combination with sedentary lifestyle. Activation of brown adipose tissue has received a lot of attention in recent years as a promising strategy to increase energy expenditure and improve systemic metabolic control. Several promising molecules with potential to promote brown adipocyte function and white adipocyte browning were identified to date. However, none of them was shown to be effective and produce significant health benefits in clinical trials. Therefore, it is important to search for alternative mechanisms of brown fat activation in adult humans. The aim of our study was to identify novel target genes and mechanisms with potential to promote brown adipocyte function and formation. We collected and analyzed transcriptome and proteome of paired deep neck brown and subcutaneous white adipose tissue samples from 10 patients undergoing neck surgery, as well as transcriptome of PET/CT-guided biopsies of supraclavicular brown adipose tissue and adjacent subcutaneous white adipose of 7 healthy young volunteers. We also analyzed human multipotent adipose derived stem (hMADS) cells differentiated into white and brown adipocytes. By cross-analyzing transcriptomes of whole adipose tissue biopsies and *in vitro* differentiated adipocytes, we were able to identify 742 genes, which are differentially regulated between brown and white adipose tissue/adipocytes, 118 of them by more than 2-fold ($P < 0.05$). Interestingly, UCP1, the main functional effector of uncoupled respiration, was the most highly enriched transcript in brown adipose tissue (437-fold); followed by HMGS2 (391-fold), the rate-limiting enzyme of ketogenesis; and mitochondrial creatine kinases CKMT1A (188-fold) and CKMT1B (160-fold). In addition, the differentially expressed genes were mainly related to mitochondrial translation, fatty acid metabolism and cellular respiration, based on GO enrichment analysis. Significant differences between brown and white adipose tissue/adipocytes were detected also at the level of proteome. Majority of the 318 proteins with increased abundance in brown adipose tissue was associated with mitochondrial metabolism and confirm the increased oxidative capacity of brown fat cells. In addition to UCP1, we also detected the mitochondrial creatine kinases (CKMT1A/B, CKMT2); as effective modulators of coupled respiration, to be exclusively expressed in brown fat. Our in-depth analysis of human brown and white adipose tissue transcriptome and proteome identified several interesting candidates. Understanding their role in regulation of adipocyte physiology might support development of novel strategies to increase brown fat activity and energy expenditure.

31. Dietary n-3 fatty acids as phospholipids improve insulin sensitivity of the liver and skeletal muscle in dietary obese mice

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Introduction: Nutrition could aid in the prevention of obesity and associated metabolic comorbidities. Previous studies in rodent models of obesity indicated that dietary n-3 fatty acids (Omega-3), namely EPA and DHA, could exert beneficial effects on metabolism, while their phospholipid (PL) form might be more effective than fish oil, i.e. triacylglycerols (TG). Here, we compared the TG and PL form regarding their effects on glucose homeostasis in obese mice. **Methods:** Male C57BL/6N mice ($n = 7-10$) were fed for 8 weeks a corn oil-based high-fat diet (lipids ~32 wt %; CHF) supplemented with the Omega-3 concentrate either as TG (Epax 1,050 TG from Epax AS; Omega-3 TG) or PL (Krill oil from Olympic Seafood AS; Omega-3 PL) at a dose ~30 g EPA+DHA per kg diet. Glucose homeostasis was assessed by means of glucose tolerance tests and hyperinsulinemic-euglycemic clamps using D-[3-³H]glucose as a tracer. Comparisons were judged to be significant at $p \leq 0.05$ (t-test). **Results:** Compared to CHF, both Omega-3 TG and Omega-3 PL reduced body weight by 8 and 26 %, and hepatic steatosis by 30 and 64 %, respectively. However, only Omega-3 PL reduced fasting blood glucose and plasma insulin by 18 and 59 %, while improving glucose tolerance, i.e. reducing AUC by 38 %. Clamp studies showed elevations of glucose infusion rate, glucose turnover, as well as whole-body glycolysis and glycogen synthesis by 303, 198, 177, and 299 %, respectively, and reductions in hepatic glucose production by 54 %, in the Omega-3 PL group. In contrast, Omega-3 TG only increased whole-body glycogen synthesis by 172 %. Moreover, Omega-3 PL increased the rate of glycogen synthesis in quadriceps muscle by 286 %. **Conclusion:** Our data confirm the superior efficacy of the PL form of Omega-3 regarding the effects on hepatic steatosis and glucose homeostasis, and provide a rationale for the preferential use of Omega-3 PL in clinical practice.

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32. Noninvasive MRI and MRS based approaches to study metabolism in obesity

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Assessment of the tissue metabolism gained a new opportunity with advent and dissemination of the in vivo magnetic resonance spectroscopy (MRS) and imaging (MRI) methods. Skeletal muscle, liver, myocardium and fat tissue are easily accessible for investigation. MRI allows for the assessment macroscopic fat distribution, while MRS applications allows for the quantification of ectopic of fat compartments and their saturation profile. Characterization of glucose fluxes from biopsy specimen could have been replaced by ¹³C and ³¹P MRS, which was able to quantify defects of glucose metabolism in both skeletal muscle and liver in diabetes and other insulin resistant states. Basal and stimulated intracellular energy metabolism can be monitored by ³¹P MRS and combination of spectroscopy and imaging examinations of the skeletal muscle function and energetic metabolism can help to identify the links between impaired metabolism and function. Selected issues with respect specific organs, and research as well as clinical applications will be presented and discussed.

33. Treatment of osteoarthritis with freshly isolated stromal vascular fraction cells from adipose and connective tissue

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Degenerative osteoarthritis affects more than 50 % of people older than 50 years. People with obesity or overweight suffer most frequently. Therapy of osteoarthritis relies on non-steroid analgesics, chondroprotectives and in late stages total joint replacement is considered a standard of care. We performed a pilot study using novel stem cell therapy approach that was performed during one surgical procedure. It relies on abdominal lipoaspiration and processing of connective tissue to stromal vascular fraction (SVF) cells that typically contain relatively large amounts of mesenchymal stromal and stem cells. SVF cells are injected immediately to the target joint or to the connective tissue of the target joint. Since 2011, total of 1,128 patients have been recruited and followed for up to 42 months to demonstrate the therapeutical potential of freshly isolated SVF cells. At the same time, one to four joints (knees and hips) were injected with SVF cells per patient. A total number of 1,856 joints were treated. Clinical scale evaluation including pain, non-steroid analgesic usage, limping, extent of joint movement and stiffness was used as measurement of the clinical effect. All patients were diagnosed with stage II–IV osteoarthritis using clinical examination and X-ray, in some cases MRI was also performed to monitor the changes before and after stem cell therapy. After 12 months from SVF therapy, at least 50 % clinical improvement was recognized in 91 %, and at least 75 % clinical improvement in 63 % of patients, respectively. Within 1–2 weeks from SVF therapy 72 % of patients were off the non-steroid analgesics and most of them remain such for at least 12 months. No serious side effects, infection or cancer was associated with SVF cell therapy. In conclusion, here we report a novel and promising therapeutical approach that is safe, cost effective, and relying only on autologous cells.

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GENETICS OF OBESITY AND DIABETES

34. Pharmacogenomic aspects in the treatment of type 2 diabetes

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The introduction of several new drug groups into the treatment of type 2 diabetes in the past decades leads to increased requirement of the individualized treatment approach. A personalized treatment is important from the point of view of both the efficacy and safety. The recent guidelines are based mainly on entirely phenotypic characteristics such as diabetes duration, presence of the macrovascular complications, or the risk of hypoglycemia with the use of the individual drugs. So far, the genetic knowledge is used to guide treatment in the monogenic forms of diabetes. Oral antidiabetic drugs are used for more than a half century in the treatment of type 2 diabetes. Only in the last five years intensive research has been conducted in the pharmacogenetics of these drugs based mainly on the retrospective register studies, but only a handful of associations detected in these studies were replicated. The gene variants in *CYP2C9*, *ABCC8/KCNJ11* and *TCF7L2* were associated with the effect of sulfonylureas. *CYP2C9* encodes sulfonylurea metabolising cytochrome P450 isoenzyme 2C9, *ABCC8* and *KCNJ11* genes encode proteins SUR1 and Kir6.2, respectively. Those proteins constitute the ATP-sensitive K⁺-channel which is a therapeutic target for sulfonylureas. *TCF7L2* is a gene with the strongest association with type 2 diabetes that influences insulin secretion. *SLC47A1*, *ATM* and *SLC2A2* gene variants were associated with the response to metformin. *SLC47A1* and *SLC2A2* encode MATE1 metformin transporter and GLUT2 glucose transporter, respectively. The function of a gene variant near *ATM* (ataxia-telangiectasia mutated) gene is probably related to activation of AMPK. In the recent years, the first studies related to the pharmacogenetics of response to DPP-4 inhibitors were published, although none of them was replicated so far. Among identified genes are *TCF7L2*, *CTRB1/2* encoding chymotrypsinogen, and *GLP1R* encoding the downstream therapeutic target for gliptins – GLP-1 receptor. Whilst at present there is no convincing clinical role for genotype led prescribing in type 2 diabetes, the evidence is starting to accumulate to sufficient level to justify a genotype led clinical trial that should include at least 1,000 patients. Establishment of diabetes pharmacogenetics consortia and reduction in costs of genomics might lead to some significant clinical breakthroughs in this field in a near future. With the accumulating pharmacogenetic evidence in type 2 diabetes there are reasonable expectations that genetics might help in the adjustment of drug doses to reduce severe side effects, as well as to make better therapeutic choices among the drugs available for the treatment of diabetes.

35. Genetics of obesity: consequences for personalized medicine

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Twin and family studies suggest that up to 80 % of human variance in body weight is attributable to genetic factors. Along with variants in genes predicting monogenic obesity (e.g. *LEP*, *MC4R*, *POMC*), more than 100 loci associated with common polygenic obesity have been identified to date in large-scale genome-wide association studies (GWAS). The most prominent candidate genes within these loci appear to be involved in central nervous system including neuronal regulation of feeding (e.g. *BDNF*, *MC4R*, *NEGR1*), but also insulin and adipose biology (e.g. *FTO*, *IRS1*, *MAPK3*). Despite the large number of potential candidate genes rendering rather moderate contribution to the disease, the heritability of obesity is still far from being completely understood. Nevertheless, there is increasing interest in understanding not only the molecular mechanisms explaining the observed associations between genetic variants and obesity, but also their predictive value and eventually the potential to develop novel and effective personalized treatment strategies. Therefore, studies beyond associations of genetic variants with cross-sectional measures of overall obesity will be inevitable. Not less important is testing gene x environment interactions which may help to stratify patients into most effective treatment regimes. These strategies are crucial as there is emerging evidence for the role of genetic variants in modulating the response to therapeutic options such as lifestyle intervention, pharmacotherapy and bariatric surgery. The most prominent gene associated with obesity is *FTO*, which has been shown to modify the response to lifestyle intervention (e.g. physical activity). But also defects in genes such as *MC4R* or *POMC* significantly affect the response to interventions including exercise, as well as nutritional and behavioral therapy. Moreover, bariatric surgery outcome appears to be modulated by these genes

too. So far, the main research approaches have been focusing on established candidate genes/polymorphisms which have been shown to be associated with overall obesity. Large-scale GWAS targeting dynamic changes of body weight following therapeutic approaches including lifestyle interventions will be desirable to path new avenues in developing novel and more effective preventive and treatment strategies in obesity. Such studies have recently revealed polymorphisms in *MTIF3* whose carriers seem to benefit more from intensive lifestyle intervention than noncarriers. Moreover, a recent GWAS pointed to a new locus near *ST8SIA2* and *SLCO3A1* significantly associated with weight loss after Roux-en-Y gastric bypass (RYGB). In conclusion, whereas genetic testing of patients with syndromic forms of obesity definitely facilitates early diagnosis and personalised medicine, common genetic variants only explain a small proportion of the heritability and so, their predictive values is limited. In the future, understanding interaction of genetic variants with lifestyle will ultimately help to improve their clinical impact in regard to personalised medicine.

36. Development of adipose tissue in childhood obesity in children and relation to comorbidities

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The development of obesity begins early in life. The period between 3–6 years of age appears critical and once established, childhood obesity regularly persists into adulthood. In normal weight children the expansion of fat mass is characterized by hypertrophy and hyperplasia of adipose tissue, both being exaggerated with development of obesity. In addition to the mere expansion of fat mass, there are alterations in adipose tissue function associated with adipocyte hypertrophy, inflammation and fibrosis in adipose tissue depots, and an imbalance in adipokine secretion. As for adults, genetic associations have been identified with childhood obesity and the major predisposing genes confer an increased risk for early onset obesity as has been shown for *FTO*, *TMEM18* and others. While most obesity driving factors are supposed to acted centrally in the CNS by affecting food intake and energy balance, for some of them have functional effects on the adipose tissue itself. Although the consequences of obesity are generally recognized in adults, this early emergence of obesity and hence prolonged exposure not only to increased fat mass but also adipose tissue dysfunction drives the early development of obesity-related comorbidities.

37. A genome-wide association study using a custom genotyping array identifies variants in *GPR158* associated with reduced energy expenditure and increased BMI and body adiposity in American Indians

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Introduction and Aim: Pima Indians living in Arizona suffer from a high prevalence of obesity, and we have previously shown that a relatively lower energy expenditure (EE) predicts weight and fat mass gain in this population, implying that energy metabolism may contribute to the pathogenesis of human obesity. Heritable factors are estimated to explain 40–70 % and 10 % of the inter-individual variance in body weight and EE, respectively. The aim of this study was to identify genetic variants that affect EE and thereby influence BMI and body fatness in Pima Indians. **Methods:** Data from 491,265 tag variants (minor allele frequency ≥ 0.05 , $r^2 \geq 0.85$) derived from whole-genome sequence data of 266 Pima Indians (40 × coverage) were genotyped using an Affymetrix Axiom Custom Array in a population-based sample of 7,701 Pima Indians. Genotypes were analyzed for association with two measures of EE when subjects were non-diabetic: resting metabolic rate (RMR) after overnight fasting measured by a ventilated hood system (n = 507) and 24h EE measured in a whole-room calorimeter (n = 419). Variants associated with both measures of EE were analyzed for association with maximum lifetime BMI (n = 5 870) and percent body fat (PFAT) (n = 912). Results were adjusted for age, sex, body composition, heritage, family membership and genomic control. **Results:** Rs11014566 (A/G), located in *GPR158*, nominally associated with both measures of EE and both measures of adiposity. The G-allele associated with lower 24-h EE ($\beta = -33$ kcal/day per copy, $p =$

1.7×10^{-3}), lower RMR ($\beta = -31$ kcal/day, $p = 9.9 \times 10^{-3}$), higher BMI ($\beta = +1.7$ % ≈ 0.6 kg/m², $p = 4.7 \times 10^{-4}$) and higher PFAT ($\beta = +0.9$ %, $p = 2.9 \times 10^{-3}$). Frequency of the G allele in Pima Indians = 0.60 is much higher than in Europeans < 0.001. Rs11014566 tags 3 other variants, rs144895904, rs34673593, and rs16925884 ($r^2 = 0.86-0.99$) localized in intron 4 of *GPR158*. Experimental testing of these variants by *in vitro* dual-luciferase reporter assays showed that rs144895904 affects promoter function. *GPR158* encoding the G protein-coupled receptor 158 which is highly expressed in brain cells and interacts with two other genes *CACNA1B* (N-type voltage-gated calcium channel) and *RGS7* (regulator of G protein signaling 7), both known to affect obesity in knock-out mice. **Conclusions:** Our results suggest that common ethnic-specific variation in *GPR158* may influence EE and predispose Pima Indians to obesity. Identification of novel genes/gene pathways that influence EE and BMI in humans may lead to a better understanding of the complex pathophysiology of obesity.

38. EIF2S3 mutations are associated with X-linked MEHMO syndrome

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Aims/hypothesis: Impairment of translation initiation and its regulation within the integrated stress response (ISR) and related unfolded-protein response has been identified as a cause of several multisystemic syndromes. Here, we link MEHMO syndrome, whose genetic etiology was unknown, to this group of disorders. MEHMO is a rare X-linked syndrome characterized by obesity, profound intellectual disability, epilepsy, hypogonadism, microcephaly, and diabetes. **Methods:** Blood samples of both probands and their parents were obtained. DNA analysis by the whole exome sequencing approach was performed. The identified new variants were functionally characterized. **Results:** We have identified novel C-terminal frameshift mutation (Ile465Serfs) in the *EIF2S3* gene in three families (two Slovak and one German) with MEHMO syndrome and a novel maternally inherited missense *EIF2S3* variant (c.324T > A; p.Ser108Arg) in another male patient with less severe clinical symptoms. The *EIF2S3* gene encodes the γ subunit of eukaryotic translation initiation factor 2 (eIF2), crucial for initiation of protein synthesis and regulation of the ISR. Studies in patient fibroblasts confirm increased ISR activation due to the Ile465Serfs mutation and functional assays in yeast demonstrate that the Ile465Serfs mutation impairs eIF2 γ function to a greater extent than tested missense mutations, consistent with the more severe clinical phenotype of the Ile465Serfs male mutation carriers. **Conclusion:** We propose that more severe *EIF2S3* mutations cause the full MEHMO phenotype, while less deleterious mutations cause a milder form of the syndrome with only a subset of the symptoms.

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39. Unweighted gene score as a BMI predictor in Czech males

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Purpose: The role of the single nucleotide polymorphisms in obesity development is well established in populations around the world; however, simultaneous effect of more variants is not often studied. The objective of our study was to analyse the effect of gene score constructed from four common polymorphisms within the genes for *FTO* (rs17817449), *NYD-SP18* (rs6971019), *MC4R* (rs17782313) and *TMEM18* (rs4854344) in the population of Slavic men. **Subjects:** Adult population sample based on the post-MONICA study (1,191 males, aged). **Outcome Measures:** BMI; *FTO*, *MC4R*, *TMEM18* and *NYD-SP18* polymorphisms have been genotyped. **Methods:** Individuals have

been examined three times within the 9 years; polymorphisms have been genotyped using PCR-RFLP. Based on the presented numbers of risky alleles, gene score was created and the associations with BMI values have been analysed. **Results:** Genotype frequencies of all analysed SNPs in Czech males are similar to the other populations. All four polymorphisms exhibit significant effect on BMI values, with the strongest effect observed in the case of *NYD-SP18* rs6971019 SNP ($P < 0.001$) and the weakest effect was found for *TMEM18* rs4854344 polymorphism ($P = 0.05$). For 1,142 subjects, all four SNPs of interest have been successfully genotyped and the obtained range of unweighted gene score values was between 1 and 8 points. There was a strongly significant ($P < 0.00005$) linear trend of BMI values from subjects with score values 1 + 2 ($N = 36$; $BMI = 27.2 \pm 5.2 \text{ kg/m}^2$) until subjects with the highest gene score 7 + 8 ($N = 202$; $BMI = 29.1 \pm 4.1 \text{ kg/m}^2$). Similar results have been detected in examinations 2 and 3. **Conclusions:** Results suggest that unweighted gene score constructed from four polymorphisms within the genes for *FTO*, *NYD-SP18*, *TMEM18* and *MC4R* is a strong predictor of BMI values in males.

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MANAGEMENT OF OBESITY AND ITS COMORBIDITIES

40. Clinical evaluation of the obese patient

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European guidelines on obesity management recommend to establish multidisciplinary teams and multilevel obesity management networks that include obesity specialists. However, all physicians should be able to clinically assess an obese patient, identify potential genetic, behavioral and environmental factors that may have contributed to the development of obesity and screen for obesity-related complications. More specifically, the physician should be aware of important elements from the family and personal history of the obese patient, as well as of clinical signs that may provide clues as to the aetiology of obesity. A biochemical and hormonal screening is also essential both to identify potential contributing factors and to document the presence of metabolic complications. The presence of other complications of obesity should also be actively explored (e.g. sleep apnea, musculoskeletal problems, psychological symptoms, reproductive disturbances, etc.). Further, it is important that the physician gains the trust of the obese patient by acknowledging the problem and avoiding wording that may be offensive to the patient in order for any intervention to be successful in the long-term. Finally, we should all recognize that obesity is a complex, adiposity-based chronic disease, where management targets both adiposity and weight-related complications in order to improve overall health and quality of life. Individualization of care is essential as well as optimization of health outcomes and safety.

41. Very low energy diets: the past and presence

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Failure to achieve appropriate weight loss, particularly in severely obese patients, by traditional low calorie diets led to implementation of strict calorie restrictions in the weight management. Serious health hazards including sudden deaths associated with semi-starvation and the use of liquid protein diets in the past led to development of very low energy diets (VLEDs). VLEDs were prepared by using proteins of a high biological quality as that of milk or egg white. The whey protein represented the main source of supplied proteins in the first Czechoslovak VLED (Redita[®]) prepared in the late eighties. Currently used VLEDs are characterized by energy intake about 3500 kJ and provide an appropriate supply of proteins incl. all essential amino acids, minerals, vitamins and trace elements. Amount of fat is substantially reduced and is mainly represented by essential fatty acids. Daily supply of carbohydrate in VLEDs is reduced to 30–80 g. High protein intake and mild ketosis exert protein-sparing and satiating effects. The rapid weight loss, approximately 10 kg after one month of VLED administration, is mainly due to fat loss. In severely obese patients weight loss of 20–25 kg is observed after 4 months of VLED treatment. VLEDs are primarily indicated for weight management, particularly in severely obese, in whom weight loss before surgery is recommended or who cannot undergo bariatric surgery. In addition VLEDs have also been proved an efficient approach to treat type 2 diabetes (T2D), obstructive sleep apnea, arthritis, and non-alcoholic fatty liver disease. VLEDs rapidly reduce cardiometabolic health risks: improve lipid profile and glucose homeostasis, reduce blood pressure and visceral fat. Improvements in steroid profile and SHBG levels were observed after the treatment with Redita[®]. Some VLEDs significantly reduce carbohydrate intake which leads to a more profound improvement in insulin sensitivity and glucose homeostasis. VLEDs mimic the early beneficial effect of gastric bypass on insulin sensitivity and beta-cell function in T2D. Reversal of T2D in youth who adhered to a VLED was demonstrated. VLED-induced weight loss is associated with improved insulin signaling and with a decrease in intramyocellular lipid content. Replacement of 1–2 daily meals with portion/s of VLED is one of the most effective tools for weight loss maintenance. Look AHEAD trial conducted in overweight/obese patients with T2D clearly demonstrated that the degree of weight loss after 1 year of intensive lifestyle intervention was dependent on the number of daily consumed portions of VLED. Effects of meal replacement (MR) are mostly due to the controlled energy content and to the high protein vs. low fat content. MR also contributes to a more appropriate intake of essential nutrients. Use of VLEDs both as a sole source of nutrition and as MR should be initiated by a physician who should take into account indications and contraindications in individual patients. VLEDs should be included into long-term weight management programs with

diet, increased physical activity and cognitive behavioral intervention. During the follow-up dietitians or trained nurses/counselors may be responsible for the weight management while physicians might play only advisory role.

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42. The renaissance of obesity pharmacotherapy

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The treatment of overweight and obesity is a difficult and lengthy process, requiring both correctly identified causes of these diseases, and implementation of methods, which are adequate to the patient’s health status. The mainstay of treatment is lifestyle change leading to a negative energy balance (change in eating habits and increased physical activity). However, many patients in order to facilitate the implementation of recommendations for lifestyle changes require the pharmacological or psychotherapeutic support and a part also surgical procedure. The possibility of using pharmacologic agents to treat obesity is very limited. Orlistat is the only medicinal product, which has been available on the European market for the last 6 years. Mysimba[®] was authorized by the EMA in March 2015. Mysimba[®] has been available on the European market since 2016. Mysimba[®] is a fixed dose combination medicinal product which contains two active substances, bupropion hydrochloride and naltrexone hydrochloride. Due to the additive effect of these active substances in the central nervous system in the arcuate nucleus of the hypothalamus (satiety stimulation) and in the limbic area where the reward system is located (appetite suppressing) the drug raises the hope for increasing efficacy in the treatment of obesity. Clinical studies confirmed efficacy and safety this medicinal product. It should be noted that combination bupropion and naltrexone improves control of eating. The results of LIGHT study confirmed safety use of this medicinal product in the patients with high cardio-vascular risk. The unique mechanism of action this medicinal product is chance for improvement of obesity treatment among subjects with eating disturbances such as binge eating syndrome, night eating syndrome and addictive food consumption.

43. Is obesity a real cardiovascular risk factor?

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The prevalence of weight excess is increasing worldwide and pose serious burden to healthcare systems. It seems to be that obesity is the epidemic of the 21st century. Obesity has strong relationship to hypertension, diabetes, hyperlipidemia, atrial fibrillation, heart failure and OSA. Thus, obesity is a negative determinant for longevity. On the contrary, numerous publications reported better survival among obese patients suffering from heart failure or ischemic heart disease as compared to normal weight patients. This phenomenon is called “obesity paradox”. Furthermore, it still exists the term of “healthy obesity” without risk factors and cardiovascular diseases. Long-term observation describes the future outcome of this subjects. Some data suggest that body weight and fat distribution are related to arterial stiffness and early vascular changes. In our earlier observation, an increased arterial stiffness was demonstrated by echocardiography among patients with obesity even in young adults. Increased arterial stiffness is an important risk factor and predictor of cardiovascular mortality. In conclusion, obesity and cardiovascular diseases have strong relationship and these disorders should be considered and treated together.

44. Management of arterial hypertension in obese patients

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Obesity is an epidemic of the XXI century. In 2014, more than 1.9 billion adults had an excessive body weight, of which 600 million were obese. More than 42 million children aged 5 yrs and over are obese. It is estimated that in 2015 there came another 100 million obese adults all over the world. The risk of developing hypertension in obese adults is 2–3 times higher, and in obese children even 7 times higher than in normal-weight individuals. Obesity and hypertension coexist in 78 % of hypertension cases in men and in 65 % of the cases in women. The development of hypertension in obese patients is associated with numerous central and peripheral abnormalities, such as the activation of the sympathetic nervous system and the renin-angiotensin-aldosterone system; impairment of endothelial function; increased water retention caused by excessive sodium intake, increased sodium resorption in the renal tubules and reduced levels of atrial natriuretic peptide (ANP). During the lecture there will be presented the impact of obesity on cardiovascular system, some characteristic features of obesity-induced hypertension, the most appropriate management, and finally, the most common mistakes in the therapy.

45. Mechanisms and potential targets of dyslipidaemia in obesity

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The dyslipidemic state (atherogenic dyslipidaemia) frequently observed in patients with visceral obesity is a key feature of the clustering abnormalities of the metabolic syndrome. Atherogenic dyslipidaemia is characterized by a cluster of quantitative and qualitative changes in the metabolism of lipids and lipoproteins, leading to increased atherogenicity of plasma: increased concentration of the triglycerides and apoC-III-rich VLDL particles, total and LDL cholesterol levels are generally within the normal range, with modified small dense LDL particles, quantitative and qualitative changes in HDL-C particles with loss of cardioprotectivity, increased concentration of remnant lipoprotein particles and the presence of postprandial hyperlipidemia. In a typical clinical setting, hypertriglyceridemia and low HDL cholesterol will, therefore, be the two major detectable blood abnormalities associated with visceral obesity. The increased proportion of small, dense LDL and HDL particles is an important aspect of the atherogenic dyslipidaemia. This phenomenon is due to the remodeling of these lipoproteins in the circulation by enzymes such as cholesteryl ester transfer protein and hepatic triglyceride lipase. In the presence of hypertriglyceridemia, increased concentration of large VLDL1 particles promotes the transfer of triglyceride molecules to LDL and HDL in exchange for cholesteryl ester molecules. As a consequence, both triglyceride-enriched LDL and HDL particles of visceraally obese patients become good substrates for hepatic triglyceride lipase, leading to the depletion of the lipid core of these lipoproteins, thereby forming small, dense LDL and HDL particles. Smaller HDL have reduced cholesteryl ester core content and become more sensitive to degradation and increased clearance from the blood. Each component of the atherogenic dyslipidemia described could contribute, with many other factors, to the development of atherosclerosis. Hypertriglyceridemia per se has been proposed as an independent risk factor for atherosclerosis. Remnants of triglyceride-rich lipoproteins, which are elevated in hypertriglyceridemic states, are highly atherogenic, probably as much as small, dense LDL. Several factors could contribute to the atherogenicity of small, dense LDL particles. In contrast, HDL could be antiatherogenic in a number of ways. The combination of high triglyceride, low HDL cholesterol levels and small, dense LDL particles has been termed the “atherogenic lipid triad”; it has been recognized as a major CVD risk factor. Despite the huge success achieved through statin therapy in reducing LDL-C (primary endpoint) together with the reduction of cardio-cerebrovascular morbidity and mortality still remains high cardiovascular risk. This reflects the rise in obesity, increased metabolic syndrome and type 2 diabetes, which is characterized by high prevalence of atherogenic dyslipidaemia. Targeting the atherogenic dyslipidaemia complex is a next extension of the therapeutic targets. From the existing lipid-lowering agents, we should review the effect of fibrates in combination therapy in patients with atherogenic dyslipidaemia. Near future are selective PPAR α modulators, a little further ahead is therapy directly targeting the metabolism of triglyceride-rich lipoproteins. These options represent a new opportunity to reduce cardiovascular risk by influencing the complex atherogenic dyslipidaemia in obese patients.

46. Non-alcoholic fatty liver disease in overweight and obese patients

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Non-alcoholic fatty liver disease (NAFLD) is a major cause of liver disease worldwide. Obesity is a global epidemic contributing to an increasing prevalence of obesity-related systemic disorders. Obesity is a well-established risk factor for the non-alcoholic fatty liver disease. With the increasing epidemic prevalence of obesity, diabetes, and the metabolic syndrome in the general population is increasing the prevalence of NAFLD. Global prevalence of NAFLD is 30 %. The rising prevalence of NAFLD globally may be accounted for by changes in dietary habits and an increase in sedentary lifestyle. The risk of development and progression of NAFLD increases with numbers of components of metabolic syndrome. NAFLD spans a spectrum of hepatic pathology from hepatic steatosis, through steatohepatitis (NASH), to fibrosis and cirrhosis at the opposite end of the disease spectrum. Up to 70 % patients with type 2 diabetes mellitus have NAFLD. Prevalence of NAFLD among obese individuals is up to 76 %, 60 % have NASH, 30 % fibrosis, and up to 10 % liver cirrhosis. NAFLD is associated with a list of hepatic complications considerably adding to morbidity, mortality. NAFLD contribute with a large proportion on cirrhosis, liver failure, and hepatocellular carcinoma. NAFLD is an important and independent risk factor for the development of atherosclerosis and cardiovascular disease (CVD). NAFLD is strongly associated with the clinical features of insulin resistance and is the hepatic component of metabolic syndrome. As the global epidemic of obesity fuels metabolic conditions, the clinical and economic burden of NAFLD will become enormous.

47. Obesity-related nephropathy

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The aim of our study was to clarify the effect of obesity on the genesis of chronic kidney disease. Obesity has a negative impact on the organism. It causes cardiovascular, gastrointestinal, respiratory and other complications, such as chronic kidney disease. We undertook a systematic review of the literature using PubMed database to investigate the relationship between obesity and chronic kidney disease. As key words we used obesity-related glomerulopathy. We searched studies from the last 10 years. 22 studies were corresponding to the above mentioned criteria. Typical abnormalities were confirmed on kidneys such as glomerulomegaly, podocyte malfunction (milder fusion of podocyte pedicels), increased mesangial matrix, vascular changes, tubular atrophy and interstitial fibrosis. Functional changes included hyperfiltration, hyperperfusion, albuminuria and proteinuria. These abnormalities were partially reversible with adequate and on time therapy. The most important, based on these studies, is to change the eating habits, to keep low-calorie diet and to perform more physical activity. Appropriate pharmacotherapy and bariatric surgery is applicable in the case of morbidly obese patients. We should also take into consideration the treatment of obesity complications. In conclusion, there is still a need for further research of therapeutic options, as well as their verification based on series of clinical experiments.

OBESITY AND TYPE 2 DIABETES

48. Sarcopenic obesity: diagnosis and nutritional treatment

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Sarcopenic obesity (SO) is combination of sarcopenia (muscle mass smaller than -1 SD of average mass in young people) and obesity. Reduction of skeletal muscles mass is caused by ageing, inactivity and obesity itself. Muscles are harmed by inflammatory cytokins produced in fat tissue and their contractility is compromised with fat infiltration (myosteatorsis), decreasing uptake of glucose. Changes of muscles further decrease mobility, and contribute to progression of obesity and glucose tolerance impairment. There is reduction of anabolic factors in SO (decreased effect of insulin due to fat infiltration, decreased level of IGF-I and GF). Aforementioned changes increase rate of obesity complications (increased mortality and disability, hypertension, dementia etc.). Reduction of weight is associated with loss of muscles mass which can be attenuated with exercise. There are big differences between SO prevalence in different studies, ranging from 0 to 25 %. Approximate average prevalence is 5–10 % both in men and women.

49. Targeting gastrointestinal tract in the treatment of obesity/type 2 diabetes

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Bariatric surgery is the most efficacious method in the treatment of both obesity and its metabolic complications, in particular type 2 diabetes mellitus. In general, bariatric procedures can be subdivided into two categories. The first one are purely restrictive procedures that limit food intake through decreasing stomach volume with subsequent decreased food intake, weight loss and metabolic improvements (e.g. gastric banding). The second group is represented by either combined or purely malabsorptive procedures that are based on the bypassing of the part of small intestine in some cases combined with decreased stomach volume (e.g. gastric bypass). Numerous studies have shown that exclusion of the proximal part of small intestine from the contact with food (for example duodenum exclusion in gastric bypass) markedly improves glucose control even leading to diabetes remission in some patients before significant weight loss clearly suggesting that weight loss-independent mechanisms are in place. Numerous endoscopic or surgical procedures have been developed based on the notion that exclusion of proximal intestine improves metabolic control and induces weight loss. The most extensively tested device was duodenal-jejunal bypass liner that can be inserted endoscopically in the duodenum and jejunum and kept in place for 12 months. This procedure mimics most of the effects of gastric bypass suggesting that some of the endoscopically placed devices can at least partially substitute for some of the bariatric procedures in the future.

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50. Dulaglutide: a new once-weekly glucagon-like peptide-1 receptor agonist in clinical practice

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At present, individual approach is recommended for the treatment of type 2 diabetes mellitus. It is proven, that incretin based therapy with glucagon-like peptide-1 receptor agonists, is sufficiently effective and safe. Dulaglutide, long acting once-weekly applicated glucagon-like peptide-1 receptor agonist, is a new drug from this group available in clinical practice. Results of programme AWARD confirmed, that dulaglutide in dose 1,5 mg is superior in HBA_{1c} reduction in comparison with oral antidiabetics (metformin, sitagliptin), insulin glargin and exenatide BID.

Study AWARD-6 proved, that HbA_{1c} reduction with dulaglutide was comparable to liraglutide 1,8 mg. Treatment with this drug is associated with weight reduction, and low risk of hypoglycaemia. The most common adverse effects of dulaglutide are nausea, vomiting and diarrhoea, comparable with other glucagon-like peptide-1 receptor agonists. The advantage of this preparation is simple initiation of treatment by a pre-filled pen designed with the patient in mind.

51. Childhood Obesity Surveillance Initiative (COSI) in the Czech Republic

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Childhood obesity represents a global health risk. For evaluation of childhood obesity prevalence in individual countries the precise measurement by the approved method is necessary. Since 2007 WHO Europe has started Childhood obesity surveillance initiative (COSI). Aim of the is to evaluate obesity prevalence in 7 years children in the Czech republic since 2008. **Methods:** Weight, height, waist and hip circumference were measured in a representative sample of the Czech 7 year children and questionnaires about their family and school environment were filled in four rounds of COSI (2008, 2010, 2013, 2016). The data were collected by primary care paediatricians. BMI was evaluated according to WHO references (2007) and according to the Czech reference standards (1991). The data were compared with the previous Crech data in the same age category (since 1951). **Results:** Obesity prevalence increased in boys in 2008 (in comparison with 2001) followed with a decrease to under 2001 level in 2013. In girls after decline in 2008 obesity prevalence increased to 2001 value in 2013. In comparison with European countries the CR ranks between the countries with lower prevalence of overweight and obesity in 7 year old children (Wijnhoven et al 2014). Overweight and obesity prevalence from 2016 will be shown. **Conclusion:** The results suggest levelling of the prevalence of obesity and overweight in the Czech Republic in 7 years old children during the last 10 years. Underweight prevalence has remained low.

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52. Prevention of childhood obesity in Bulgaria

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According to the National survey on nutrition in the population above 1-year old obesity in boys below 5 years was 7.1 % in 2014 in comparison with 3.3 % in the same age in 2004. There is a positive trend towards a slight decrease in obesity levels in girls below 5 years with 2.7 % in 2014 compared to 5.4 % in 2004. However, the data presented on October 9th 2016, the World Obesity Day, showed that in Bulgaria 230,000 school-age children are expected to be overweight or obese by 2025. Obesity puts our children health in danger. By 2025 as many as 8,000 will have impaired glucose tolerance, 2 000 will have type 2 diabetes, 18,000 will have high blood pressure, 25,000 will have first stage fatty liver disease. The reasons of these striking numbers are clear: a sedentary lifestyle and a poor nutrition. Data show that there is an increase in the consumption of sugar-containing food and beverages, in salt, very early beginning of alcohol consumption, low intake of yoghurt and fish in school-age children in Bulgaria. The European project EPHE (EPODE for the promotion of healthy equity) demonstrated that Bulgarian children between 6–9 years old consume more fruit and vegetables compared to the Netherlands, Belgium, and France. On the other hand, Bulgarian children spend approximately 26 hour weekly screen time compared to the children in the Netherlands with 14.5 hours. Since 2013 BASORD organizes annually 1-week “School for health – for children, parents and teachers” with promotion of healthy lifestyle, incl. increased physical activity and good nutrition habits. This initiative is one of the few in this field. Bulgaria doesn't have a working state programme for prevention of childhood overweight and obesity.

53. Overweight and obesity in children – WHO Childhood Obesity Surveillance Initiative in Slovakia

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Prevalence of overweight and obesity is relevant for programs that focus on reducing obesity. According to the WHO European project – Childhood Obesity Surveillance Initiative – we evaluated prevalence of obesity in Slovak school children, to develop internationally comparable indicators. **Patients and methods:** We measured anthropometric parameters (weight, height, waist and hips) among 2,805 school 7–7.99 year-old children (1,406 boys and 1,399 girls), (1,547 rural, 1,258 urban). The prevalence of overweight and obesity according to the WHO and International Obesity Taskforce definition was determined with the use of LMSGrowth software. **Results:** According to the WHO, we found 16.5 % (OITF: 13.8 %) overweight boys and 13.5 % (OITF: 12.6 %) overweight girls. There were 13.8 % (OITF: 8.8 %) obese boys and 10.7 % (OITF: 8.1 %) obese girls. **Conclusions:** This is a preliminary data of COSI project results. We note the high incidence of obesity early in school age, which requires the introduction of preventive measures against obesity. The results are compared with the prevalence of obesity in other European countries.

54. Whys and hows of physical exercise for children

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There is hardly any doubt on health benefits of physical exercise in children. Positive effects on cardiovascular system, musculoskeletal tissues, energy balance and healthy body weight, psychophysiological well-being, self-expression, self-confidence, social integration, cognitive functions including academic performance at school as well enhancement of adoption of healthy behavior (e.g. avoidance of tobacco, alcohol and drug use) have been well documented and are generally accepted. However, the application of this knowledge into practical life is more problematic. Firstly, in modern industrial societies demands of education process, attractiveness of sedentary leisure activities (TV, computer, game consoles, tablets and smartphones) and often also problematic access to exercise facilities make it difficult to fulfill daily amount of physical activities recommended for children population. Secondly, general knowledge on appropriate form of physical activities is rather poor with lots of prejudices. Children's physiological specificities of response to exercise should be taken into account while designing exercise programs for young population. These include namely immature glycolytic system and lower buffering capacity of lactate, faster oxygen uptake kinetics at the onset of exercise and lower tolerance to monotonous endurance exercise. Such physiological specificities are well met by frequent intermittent activities with high intensity of active intervals not exceeding 20 seconds. „Fun factor“ is of paramount importance. Only attractive activities have a potential to creating a positive attitude to physical activities. Despite of still prevailing over cautiousness toward strength exercise, these activities should be an integral part of exercise programs for children. It has been demonstrated that, if carried out properly, they are not only safe, but can contribute to a substantial reduction of injuries while performing other activities as e.g. soccer, ice hockey, basketball etc. and enhancement of musculoskeletal health. Mandatory physical education (even in countries offering one-hour class on daily basis) do not meet the minimum requirements for children and should be complemented by additional leisure activities.

NUTRITION, COGNITIVE-BEHAVIORAL THERAPY

55. Fat: relation to obesity development and management

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The role of fat in nutrition has been re-evaluated in the last decade. Twenty years ago the increased consumption of fat was considered as one of the main causes of obesity. In last years fat intake is ambiguously connected with obesity development. Some studies show probable evidence for a moderate direct association between total fat intake and BW, some studies show even inverse association. Composition of dietary fat is the major issue. High saturated fat diet decreases insulin sensitivity, is related to abdominal obesity and is more obesogenic in comparison to monounsaturated and polyunsaturated fatty acids (MUFA and PUFA). In obese subjects participating in Kuopio Obesity Surgery Study proportion of saturated fatty acids in adipose tissue correlated positively with inflammation in subcutaneous and visceral adipose tissue, concurrently n-6 PUFA in adipose tissue correlated with liver inflammation. Role of n-6 to n-3 polyunsaturated fatty acid ratio (n-6/n-3) is discussed in relation to obesity. Ailhaud (2006) suggested potential role of high n-6/n-3 perinatally in obesity development. This was found in animal but also human studies. Also exercise may impact fatty acid composition of adipose tissue. In rats on high fat diet training led to decrease in palmitoleic fatty acid and increased linoleic acid independently of dietary fat composition, but only endurance training lead to lower inflammatory response in AT. Enhanced uptake, oxidation and accumulation of fatty acids in muscle was found in overweight men after 12-week training. Several derivatives of fatty acids were shown to influence body composition. Monounsaturated fatty acid (MUFA) derivative oleoylethanolamide (OEA) synthesised from oleic acid is a high affinity agonist of the nuclear transcription factor PPAR alpha. High intake of oleic acid increases OEA levels in serum. OEA was shown to stimulate fatty acid uptake, lipolysis, beta oxidation and promote food intake control. Docosahexaenoic acid-derived fatty acid esters of hydroxy fatty acids (FAHFAS) with anti-inflammatory properties synthesised in white adipocytes in mice and human were described recently (Kuda O e al. 2016). Weight reducing regimen may positively influence fatty acid composition in plasma and adipose tissue concurrently with improvement of cardiometabolic profile. This was shown after lifestyle intervention but also as a result of bariatric/metabolic surgery.

57. Obesity and body image

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Introduction: Obesity and its treatment is associated with several mental disorders with disturbed body image being one of them. The term “Body Image” was coined by Prof Paul Schilder, an Austrian neurologist and psychiatrist, and used for the first time in 1935 and its use is not restricted solely to psychiatry but is rather common also in psychology, medicine, philosophy, sports, gender studies and many other areas and no unified definition has been offered. **Aim:** The aim of this contribution is to explicate the concept of body image, specifics among people with obesity and to point out its diagnostic methods and psychotherapeutic treatment. **Results:** In psychology, the concept of body image is defined as a mental representative of own body, i.e. the image of its size as perceived by the subject and the subject’s relationship to own whole body and its single parts. The influences on body image development are based on historical aspects (cultural socialization, interpersonal experience, physical characteristics and personal attributes) and, also, on proximal events (internal dialogues, body image emotions, adjusted self-regulatory strategies and activating events). The risk factors that contribute to body image disturbance in obese individuals are physical (weight, weight loss, gender, ethnic origin), mental and cultural (sexual orientation, presence of binge eating disorder, weight cycling, age of obesity onset and social response on state of “being obese”). Serious manifestation of body image distortion may result into Phenomenon fat or Body dysmorphic disorder. 3 categories of methods for diagnosing of body image in obese patients exist and they are as follows: 1. figure preference (e.g. Standard figure rating scale), 2. method based on visual recordings, 3. questionnaires. The cognitive behavioral psychotherapy appears to be a promising and appropriate treatment. **Conclusion:** The Body image is an important aspect of obesity. Its better understanding and adequate psychotherapy may lead to improvements in the quality of life in obese population. Also, they may enhance their compliance with treatment of obesity and its somatic comorbidities.

58. Internet as help in reducing weight and maintaining weight-loss

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Introduction: Today, people are spending more time at their computer than ever. This sedentary lifestyle is one of the reasons of the epidemics of obesity. Internet programs such as STOBklub dedicated to weight-loss and healthy lifestyle are therefore a great help in maintaining healthy weight, being users friendly, offering information and guidance and help to overweight and obese patients in a way that is in accordance with current lifestyle. **Methodology:** Healthy weight-loss and weight maintenance demand more than reducing caloric intake. The first and foremost thing is to change behavior. If people spend so much time looking at screens of their computers, they can learn how to live and reduce weight more healthy this way that is users friendly. At STOBklub we offer not only caloric counters and food database. Using CBT principles, we work with our users more personally and are ready to help them with changing their behavior step by step and show them a way to a more balanced life. Apart from our personal approach, offered also via internet at our community webpage www.stobklub.cz, we give them various tools: self-coaching for changing eating habits, psycho-coaching for changing unsuitable thinking patterns, emotion and behavior, fit-coaching for movement; articles and blogs with information from experts. We also create

specialized projects – for shorter or longer time-span. In 2017, we offer the project called Healthy Year. **Specific project:** In Healthy Year project, we offer 12 months dedicated to 12 topics one at a time. Via internet program, our users get information from expert articles (1 every day on average), in discussion forums (1 for every topic), in open discussions with experts. Every user can actively use the information in choosing their personal challenges working with a given topic of the month: up to 3 per day and 1 for every week. **Results:** At STOBklub, we work with 166,322 users. Thanks to program of self-coaching (at www.stobklub.cz) clients lost 120,000 kg during 7 years. Starting January 1, 2017, our users have lost 667.5 kg (data being from the end of April 2017). Since the beginning of the project Healthy Year in January, there are 6,500+ users actively involved in this new project and they have already chosen 147,871 daily and weekly challenges in the first four months. The average number of expert articles for this project is 35.5 per month. **Conclusion:** Internet can be used as a helping tool in taking care of overweight and obese patients as an added bonus to medical professionals' care or, in some cases of overweight patients, as the main care. With the help of a common communication tool, we can help those patients live more healthily and reduce their weight in healthy way when necessary.

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59. Cognitive Behavioral Treatment of Obesity: Program STOB

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Organisation STOB (Stop Obesity) was founded in 1990 by PhDr. Iva Malkova in Czech Republic and since 2007 STOB also operates in Slovakia. STOB's activities (www.stob.sk, www.stob.cz) are based on the principles of cognitive-behavioral psychotherapy (CBT). Obesity is the failure of normal weight regulation and energy regulation mechanisms leading to an increase in the body "fat mass set point". Obesity treatment is not only the weight reduction itself, much more emphasis is placed on body fat lowering and weight loss maintenance. Therefore, effective treatment must work from the beginning as a prevention of a recurrent increase after weight reduction (so-called JO-JO effect). Obesity treatment is generally divided into conservative and surgical. Conservative evidence based treatment is built on four basic pillars – diet therapy, physical activity, lifestyle change and pharmacotherapy. Both diet pattern changes and ordination of regular aerobic physical activity lead to life style change. One of the most common approach to lifestyle change and maintenance is CBT. STOB program, based on CBT principles, eliminate inappropriate eating habits and teach an obese patient to replace inappropriate thoughts and self-blaming with a positive approach to a new lifestyle. Despite the indisputable benefits of group CBT, comparable results can also be achieved by individual approach. CBT techniques are most effective when applied over a longer period, the usual duration of STOB program is 12-week structured program used in overweight reduction courses. Participants meet once a week for 3 hours, 2 theoretical hours with CBT based techniques and one hour is dedicated to physical activity. The first two lessons are devoted to the diagnosis of obesity, motivation, the real goals, profits and losses during weigh reduction program and patients start they work with food diary. In the 3rd and 4th lesson patients learn how to change the energy value of food, the composition of food and about the modern technological modification of meals. Next lesson is targeted to ordination of physical activity and leads patients to increase energy expenditure and to improved use of the energy they received. Apart from the beneficial effect on the "obesitological equation", there are also many positive psychological impacts. It helps to increase the sense of well-being and improves self-control of the patient. In general, aerobic exercise is recommended and the degree of exercise is adjusted according to the body mass index and patient co-morbidities. Next four lessons works with identification and active control of external meal triggers, internal meal triggers self-control techniques, negative automatic thoughts suppression and identification of mistakes in thinking which lead to undesirable behavior. Last two lessons are about learning how to like your body, reward yourself, weight regain prevention, feedback about the most helpful techniques and tools learned during the STOB course. The advantage of patients group is the fact that clients encounter similar problems in the course and encourage each other to gradually change their lifestyle. The average weight loss is 6.5 kg/12 weeks. In combination with diet, they not only reduce weight, 65–70 % of the weight reduction remain one year after treatment. In contrast to other weight reduction programs, it does not only concern what patient eat but also how to apply theoretical knowledge in everyday practice. The STOB methodology,

based on the CBT principles, applied in overweight reduction courses is a complex weight management tool. STOB course graduates gain practical skills that correspond with the conservative evidence based obesity treatment built on diet, physical activity and lifestyle changes. A cognitive-behavioral approach is the ideal tool for changing the lifestyle of an obese patient.

60. Motivation of Obese Patients for Changes in Behaviour

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Specialists focusing on the treatment of obesity are daily faced with the fact that the level of motivation of their patients differs considerably case by case. For a long time, motivation has been deemed the key factor of a change. The patients who refuse to co-operate or even fail in treatment are often labelled poorly motivated. Is this assessment not a bit too simplifying, though? As the theory of motivation defines it, motivation is a process consisting of five stages, and before it starts the patient goes through the initial phase of pre-contemplation – they are either unaware of the problem or they do not find it pressing enough as to take appropriate measures against it. The following stages, then, are as follows: 1. contemplation, 2. preparation for a change, 3. action, 4. maintenance, 5. relapse. The motivational therapy, which may be made use of during the psychological treatment of obesity, aims to facilitate faster and internally motivated co-operation of the patient. One of the key aspects is the identification of the patient's level of motivation, and, subsequently, the therapist's flexibility and ability to set and use modified strategies during the individual stages of the process. Common causes for the (self-)inconfidence in the possibility of a change are repeated failures ("I have tried so many times but failed every single time...") or a feeling that the difference between the current and required states is too profound, time-consuming or impossible to reach. Also, the patients often undervalue their ability to persist ("I can never hold on long enough..."), to succeed ("I have never slimmed down enough..."), to withstand the discomfort ("Yes, but..."). So as to improve the level of patient's motivation and a subsequent change in their attitude towards the treatment, a Brief intervention has been created and is widely used in treatment of addictions and Eating Disorders. It is known under the acronym of FRAMES: Feedback – identification of the main aspects of the disorder which the patients feel most uncomfortable with and what their fears are; uncovering the positive and negative points of the disorder as seen by the patient. Responsibility – accenting the patient's responsibility and free choice ("no-one but you may solve your problems"). Advice – simple and clear advice on what the necessary steps to produce a change are and how it may be achieved. Menu – a list of alternatives/options of possible strategies. Empathy – supportive, warm and attentive attitude. Self-efficacy – inspiring the patient's feeling of competence and increasing their self-confidence. As the treatment may often span longer periods of time, the strategies may need to be modified during the course of it which requires a high degree of flexibility on the part of the therapist. All therapeutic recommendations are to be offered on the basis of a previous dialogue with the patient – partnership, respect, real interest in the patient and his problems and the ability to look at them from the patient's point of view are the key ingredients of the therapeutic approach.

BARIATRIC/METABOLIC SURGERY II.

61. Jejunoileal anastomosis – novel procedure in bariatric/metabolic surgery – technical aspect

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Background and aims: In the history of bariatric/metabolic surgery are known more than 60 procedures. Recently there is tendency to diminish the minimal invasivity of laparoscopic surgery. Therefore endoscopic procedures are emerging. Long term results of these are not as good as effects of surgical procedures, so far. One of new procedures is endoscopic jejunoileal anastomosis by magnetic rings. To compare results of endoscopic approach we initiated study with jejunoileal anastomosis done by means of laparoscopy. The aim is to refer technical details of the procedure. **Material and methods:** From September 2016 to April 2017 together 8 laparoscopic jejunoileal anastomosis was performed. There were 5 women in the group, age ranged from 30 to 58 years (48.5), BMI from 35.26 to 47.6 kg/m² (42.5). Two patients were type 2 diabetics. General anesthesia was used, patient in supine position. For trocars were inserted, one of them 12 mm for the use of the linear stapler. The side to side anastomosis was created by means of the stapler 4 cm long, 40 cm from Treitz ligament and 40 cm from ileoocaecal junction. Mesenteric defect was left open, no additional stitches to secure the intestinal anastomosis were placed. **Results:** Operating time ranged from 27 to 61 minutes (skin to skin time), no intraoperative complication was recorded. In the follow up two redo procedures were needed for internal hernia and intestinal obstruction 14 days and 4 months respectively. In six patients who completed three months follow up weight loss from 5 to 17 kg (11.3) was observed. Average BMI dropped to 39.35 kg/m². In one diabetic patient improvement of glucose metabolism was observed. **Conclusion:** Long term effect of standard bariatric/metabolic surgery is good documented. Research in the metabolic field leads to invention of new metabolic procedures. Low invasivity connected with long term effect is the major aim of this effort. Longer follow up in bigger cohort is necessary to assume the effect of this new procedure. It is not very demanding, minimally invasive and cost effective.

62. Effect of endoscopic gastroplasty and surgical plication of the stomach on bodycomposition: short term, 6 months study

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Introduction: Endoscopic methods in bariatrics have been an alternative in recent years to morbidly obese patients who can not perform surgery or fear it. The aim of the study was to evaluate the weight loss and changes in the body composition of patients undergoing endoscopic gastroplasty, and then compare them with the results of patients who had surgical laparoscopic gastric plication. **Methods:** The study included 40 morbidly obese patients (8 males and 32 females, ØBMI 37.98 ± 2.65 kg/m², Ø age 40.90 ± 8.25). Two bariatric performances were evaluated, namely endoscopic gastroplasty (4 males and 16 females, Ø initial weight 103.81 ± 102.10 kg) and laparoscopic plication (4 males and 16 females, Ø initial weight 110.95 ± 10.68 kg). Patients underwent anthropometry and densitometry (DXA technology) at pre-treatment screening, then 3 and 6 months after surgery. **Results:** Patients' results were compared before and after 6 months after bariatric surgery. All patients experienced a statistically significant decrease in body weight after 6 months. In patients with endoscopic gastroplasty, %EWL 24 %, total mass (kg) 7.55 ± 3.08 (p < 0.0001), fat mass (kg) 5.50 ± 2.11 (p < 0.0001), lean + BMC (kg) 2.05 ± 1.31 (0.0003), waist (cm) 7.60 ± 2.61 (p < 0.0001), hips (cm) 5.25 ± 2.13 (p < 0.0001). In patients after laparoscopic gastric plication total mass (kg) 19.53 ± 3.54 (p < 0.0001), fat mass (kg) 13.43 ± 2.54 (p < 0.0001), lean + BMC (kg) 5.94 ± 1.43 (p < 0.0001), waist (cm) 14.05 ± 3.41 (p < 0.0001), hips 14.30 ± 3.19 (p < 0.0001). Comparison of the results for both bariatric methods revealed a higher decrease in %EWL 50 %, total mass (kg) 11.83 ± 4.54 (p < 0.0001), fat mass (kg) 7.94 ± 3.19 (p < 0.0001) lean

mass + BMC (kg) 3.89 ± 1.87 ($p < 0.0001$), waist (cm) 6.45 ± 4.15 (0.001632), hips 9.05 ± 3.71 ($p < 0.0001$), after surgical gastric plication. **Conclusion:** Both methods have statistically significant desirable decreases in body weight, fat mass, waist and hip circumference. Higher loss of active body mass was measured in patients after surgical plication, who also had a higher total body weight loss. Although higher rates of body weight, body fat, waist and hips have been measured after surgery, the endoscopic gastroplasty method can be considered as a possible alternative for patients who are not suspected or suspected of having surgery. Patients after endoscopic gastroplasty will be measured 12 months after the procedure, then compare the results again with a group of patients after surgical procedure.

63. Guillain-Barré-syndrome following laparoscopic sleeve resection

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Background: Bariatric surgery until now is performed with rare complications. Nevertheless the corresponding patient population usually represents a high risk collective. Thus consistent management of complications is of enormous importance. We demonstrate the case of a 39 year old female, developing a Guillain-Barre-Syndrome (GBS) following smooth laparoscopic sleeve resection (LSR). **Case history:** In August 2015 the patient had a BMI of 60.2 kg/m² with characteristic obesity associated comorbidities. First she underwent full-scale nutrition advice, accompanied by fitness and rehab training two to three times a week. On June 7, 2016 LSR was performed. Initial course was without any complications. On the fourth postoperative day (popd) she developed an ascending weakness in both legs. Our neurologist first assumed a critical illness polyneuropathy, despite of unremarkable course until then. Myelon MRT scan, cranial, thoracic and abdominal CT scans were normal. Spinal fluid puncture (SFP) failed, due to excess of subcutaneous adipose tissue. Until the 6th popd symptoms were increasing, the patient even was incapable of sitting. Electromyography (EMG) showed prolonged distal motoric latency, a leak of persistence of the F-wave and prolonged F-wave latency, thus leading to the suspicion of a GBS. Immediately immuno adsorption (IA) was performed. On the 14th popd, following 10 courses IA of the patient was moved to neurological rehabilitation, at this time mobile on the wheeled walker. Until now, the patient recovered completely, her actual BMI is 36 kg/m². **Conclusion:** Apart from following infections of the airways or the gastrointestinal tract, GBS also has been observed to occur after surgical procedures. A symmetric muscle weakness, usually first representing in the lower limbs, continuously ascending is characteristic for the GBS. Feared complications are affliction of the autonomic nervous system with orthostatic disorder and heart rhythm disturbances, as well as affliction of the diaphragmatic muscles with respiratory insufficiency, in obese patients not infrequently leading to life threatening long lasting mechanical ventilation. Typical findings of SFP in patients suffering from GBS are increased protein values in the spinal fluid, while cell counts are in normal range. As a SFP often fails due to excess of subcutaneous adipose tissue, it is of enormous importance to gather alternative diagnostic tools, in order to come to fast solution of diagnosis. In the present case the typical clinical findings the results of EMG were path breaking, prompt IA was the tool of choice for treatment of the patient. Retrospectively we should have indicated EMG when the first symptoms of muscle weakness occurred.

64. Correlations between the distribution of ghrelin producing cells and anthropometric parameters in obese patients who underwent laparoscopic sleeve gastrectomy

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Background and aim: Metabolic surgery is currently the most efficient treatment for obesity. Laparoscopic sleeve gastrectomy (LSG) is one of the most used procedures, due to the sustainable long time effects on weight loss, metabolic parameters, and fewer side effects compared to gastric by-pass. The complex post-operative changes in obese patients provide also a multitude of opportunities to research into the aetiology of obesity. Ghrelin is a major contributor in appetite regulation and it is secreted mostly by the gastric fundus mucosa, hence being altered after LSG. We aimed to characterise the ghrelin producing cells in patients who underwent LSG and describe

correlations with anthropometric parameters. **Methods:** We performed a nested study inside our larger study on obese patients surgically treated in our centre, using immunohistochemical methods to analyse the ghrelin producing cells in the resected stomach pieces after LSG. We analysed the distribution of ghrelin producing cells in three different areas from the resected stomach pieces – fundus, corpus and antrum. Tissue sections of 4 μ m were treated with monoclonal IgG anti-ghrelin antibodies. For all patients, we recorded anthropometric parameters before surgery. The study had the approval of the ethical committee of our university. **Results:** We analyzed 21 surgical samples. The total number of ghrelin producing cells was 15.06 ± 5.97 , with the highest number of cells being in gastric corpus (16.6 ± 7.2), followed by the fundus (14.85 ± 7.02) and antrum region (13.75 ± 8.12), the differences being statistically significant ($p < 0.001$). Women had more ghrelin producing cells than men, but without statistical significance. The number of ghrelin producing cells at the site of gastric corpus negatively correlated with weight ($R^2 = 0.305$, $p = 0.011$), body mass index ($R^2 = 0.211$, $p = 0.017$) and waist circumference ($R^2 = 0.2$, $p = 0.066$). **Conclusions:** Our study shows correlations between the number of ghrelin producing cells in the stomach and anthropometric parameters. We need to pursue this line of research in order to determine whether this correlates also with the plasma level of ghrelin and other metabolic parameters.

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SHORT ORAL PRESENTATIONS

TOP 9 E-POSTERS

65. Effects of a maternal Maillard reaction products-rich diet on offspring somatic and motoric development and metabolic status in a mice model

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Background: Maternal diet may affect not only fetus development and outcomes of pregnancy, but also postnatal development of offspring, and their susceptibility to metabolic disturbances. Maillard reaction products (MRPs) are formed in foods during heat processing by non-enzymatic glycation. Dietary MRPs are partially absorbed into circulation. Their exaggerated intake may induce negative health effects, corresponding to those induced by advanced glycation end-products (AGEs) – *in vivo* formed analogues of MRPs. In adult rats, even a short-time consumption of MRP-rich diet induces pro-diabetogenic effects and behavioral disturbances. AGEs are maternally transferred to fetus. **Aim:** We investigated the impact of prenatal exposure to MRPs-rich diet on early development of mice offspring, and their metabolic status in young adulthood. **Methods:** During pregnancy, C57BL mice were administered either a standard rat chew (CTRL) or a MRP-rich diet (BC, pellets containing 25 % bread crusts and 75 % standard rat chew). After delivery, both groups of dams received a standard diet. In offspring, somatic, motoric, and neurological reflexes development (eye opening, ear unfolding, incisor eruption, ear twitch-, eyelid-, and auditory startle- reflexes, forelimb/hindlimb grasp, negative geotaxis, air and surface righting, rope suspension) were monitored until weaning (day (D)21). After weaning, offspring (CTRL: n = 18; BC: n = 13) were placed on a standard diet. Reaching adulthood (D80 of age), their metabolic status was tested. **Results:** Both groups of dams consumed during pregnancy or lactation similar amounts of food. Body weight of newborn (D3) or weaned (D21) offspring of CTRL and BC dams did not differ significantly, while at D80 male offspring of BC dams were significantly heavier ($p < 0.02$) comparing with their CTRL counterparts. Offspring of BC dams developed ear twitch, eyelid, and auditory startle reflexes significantly earlier comparing with their counterparts from CTRL dams. They also performed surface righting earlier and were better in its performance. In adulthood, both groups of offspring presented normal blood pressure, renal function, and similar measures of oxidative status. BC offspring maintained similar glycemia to that of their CTRL counterparts with significantly higher insulinemia (11.6 ± 5.0 uIU/ml vs. 24.4 ± 19.9 uIU/ml, $p < 0.042$), resulting in lower insulin sensitivity (HOMA: 3.6 ± 1.8 vs. 8.8 ± 7.2 , $p < 0.026$). At sacrifice, both groups of offspring presented similar AGEs-associated fluorescence of plasma. A trend towards lower levels of soluble receptor for AGEs – sRAGE – was observed in BC offspring (648 ± 156 pg/ml vs. 553 ± 131 pg/ml, $p = 0.07$). No significant between-group difference in heart-, liver-, and kidney-to-body weight ratio; liver cholesterol or triacylglycerols content was revealed. **Conclusions:** Our findings indicate that in mice a maternal MRP-rich diet (even if consumed solely during pregnancy) may affect early somatic and motoric development, and in later life insulin sensitivity in offspring due to prenatal programming. Further work is needed to determine the underpinning mechanisms by which a maternal MRP-rich diet adversely affects neurobehavioral and metabolic pathways in offspring.

66. Functional state of muscle mitochondria in seniors with impaired glucose tolerance and mild cognitive impairment

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Sedentary ageing accelerates the risk of chronic metabolic and neurodegenerative diseases. Within an initial pre-intervention part of our 3-month supervised aerobic/strength training study, we examined the whole body metabolism and muscle mitochondrial functions in association with glucose tolerance and cognitive state in 34 seniors. **Methods:** Glucose metabolism was examined by oGTT, insulin sensitivity by euglycemic hyperinsulinemic clamp, Resting Energy Expenditure (REE) and metabolic substrate preference (RQ) by indirect calorimetry (Ergos-tik, Geratherm). Cognitive functions were assessed with a battery of validated cognitive tests (MMSE, CogState, Memtrax). Biopsy of *m. vastus lateralis* was performed in local anesthesia using Bergström needle technique and functional state of muscle mitochondria was measured by O₂k high-resolution respirometry (Oroboros, n = 14) applying SUIT protocols RP1 and RP2. Oxygen consumption rate [pmol/(s.mg) tissue wet weight] was evaluated in saponin-permabilized muscle fibers. **Results:** Mitochondrial respiration rate was significantly decreased (p < 0.05) in a subgroup of individuals with impaired glucose tolerance (n = 7). Moreover, muscle mitochondrial oxidative phosphorylation (OXPHOS) capacity was negatively associated with age (R = -0.574; p = 0.032) and BMI (R = -0.548; p = 0.042) and maximal noncoupled respiration rate also decreased with age (R = -0.549; p = 0.042). More importantly, rotenone-induced inhibition of NADH-linked mitochondrial respiration was negatively associated with the reaction time in a short-term memory test (Memtrax, n = 14, R = -0.557; p = 0.037) and mitochondrial fatty acid oxidation rate was positively associated with short-term memory test score (CogState, n = 14, R = 0.616; p = 0.019). Insulin-induced change in resting energy expenditure (Δ REE, clamp) was positively associated with both coupled (n = 8, R = 0.797; p = 0.018) and noncoupled (n = 8, R = 0.717; p = 0.045) muscle mitochondrial respiration rate. **Conclusions:** Our results clearly show that functional state of muscle mitochondria is tightly linked with age, BMI, whole body metabolic state as well as with cognitive functions in seniors with mild cognitive impairment. Next, we plan to test the hypothesis that benefits of regular exercise are connected with improvements in mitochondrial function.

67. Nutrition management in bariatric metabolic surgery

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Introduction: Bariatric surgery is considered to be one of the most effective ways to treat extreme obesity. The surgical procedures modify the gastrointestinal anatomy and physiology including the alteration of the nutrient digestion and absorption. We work on the presumption that morbidly obese often have nutritional deficiencies, particularly in fat soluble vitamins. **Methods:** Two hundred patients underwent an elective bariatric surgery (*adjustable gastric band, sleeve gastrectomy, gastric plication and gastric bypass*) were included in the study. The available data from pre- and postoperative measurements of serum 25 hydroxyvitamin D have been analysed. As a satisfactory levels of serum 25 (OH) D was determined ≥ 30 ng/ml. All levels below this value have been evaluated as insufficient. Further, the serum levels of other vitamins, micronutrients and hormones (vitamins A, E, B₁₂, folic acid, iron and parathyroid hormone) were observed as their metabolisms may also be deteriorated. The collected data were evaluated and analysed. **Results:** The high prevalence of nutritional abnormalities in levels of all followed micronutrients has been detected. Most of them have been observed in gastric bypass patients, the least in gastric plication patients. Vitamin D deficiency and abnormal parathyroid hormone levels were the most common nutrient deficiency in our bariatric patients. **Conclusion:** There is an obvious need for a long term vitamin D levels monitoring as well as of other mentioned nutrients, as the levels are affected after bariatric surgeries. A careful nutritional follow-up is mandatory and should optimize nutritional status and significantly decrease a risk of nutritional deficiencies following bariatric surgery. The designed nutritional protocol works on the assumption that all bariatric patients would be best served by receiving perfect nutritional intervention and monitoring of serum nutrients starting preoperatively, ideally through the whole life.

68. Type 1 diabetes patients eating behaviour analysis – alarming results

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Background: The increase of overweight and obesity among type 1 diabetes patients (DM1) is reported. Acquiring features of metabolic syndrome leads to the further worsening of patient's prognosis. Balancing the need for optimal glycaemia and weight reduction in overweight/obese DM1 individuals is problematic because insulin dose must be adjusted accordingly. **Objective:** During the development of a diabetic application for smart phones we provided in DM1 patients' diet and glycaemia records analysis. Patients' diet was mostly unhealthy (high energy, fat and monosaccharides content) and dietary mistakes were the main cause of postprandial hyperglycaemia. We decided to obtain deeper insight into DM1 patient's diet in a larger patient cohort. **Methods:** In this study 25 DM1 patients (14/11 F/M), treated by intensified insulin regime and educated according to standards in last two years, were involved. Their further characteristics are (median, range): age 39 years (20–55), DM1 duration 23 years (9–35), insulin dose 0.5 IU/kg (0.4–0.8), HbA_{1c} 66 mmol/mol (48–89) IFCC (International Federation of Clinical Chemistry), 11/25 already with chronic diabetic complications. Median of BMI was 25.6 (20.4–35.5). According to BMI 9/25 patients are overweight and 5/25 obese. All these overweight and obese patients (14/25) had waist circumference higher than recommended in treatment standards. Patients were instructed to document at least two weeks all food and drinks by smart phone camera, to weigh all food and to write log book including all physical activities (to evaluate an energy expenditure). Their diet records were analysed by using professional nutritional software (NutriPro EXPERT). According to results on carbohydrates and lipid intake patients were categorised into 3 groups with different compliance to diabetic diet (Group 1: all results within 100 % + 1SD, Group 2: none parameter > 100 % + 2SD, Group 3: at least one parameter > 100 % + 2SD; 100 % means 100 % of recommended value, SD was calculated from observed results for each parameter). Results (median, range) in % of recommended daily value: Energy intake: 117 % (94–180 %), total carbohydrates 109 % (80–120 %), mono + oligosaccharides 133 % (93–180 %), total fat 144 % (120–210 %), saturates 133 % (105–196 %), cholesterol 97 % (93–110 %), proteins 98 % (83–132 %), fiber 72 % (63–110 %). Only one patient had absolutely appropriate diet as well as energy expenditure. Twelve patients scored 3 (the worst category, 5 of these 12 patients are obese and 4 of them are overweight). We observed the correlation between the compliance category and sex (women scored better, $p = 0.049$) as well as with HbA_{1c} level when patients scoring 3 had higher HbA_{1c} at baseline ($p = 0.019$) as well as after diet re-education combined with 5 weeks of continuous glucose monitoring ($p = 0.037$). Women energy expenditure was more frequently lower than recommended in comparison with men ($p = 0.028$). Patients did not evaluate their diet as unhealthy and they considered only total carbohydrate intake as important. **Conclusion:** We must pay an attention to DM1 patients eating behaviour to prevent their weight increase. In agreement with our previous observation the biggest problem was high fat intake. Re-education and psychological support are crucial at this point.

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69. Effect of chickpeas incorporation into „Mankoushe“ on post prandial glycemia & lipidemia

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Consumption of refined carbohydrates is known to be associated with the development of chronic diseases. Mankoushe, a popular Lebanese breakfast, is made of white wheat flour that contains low-quality protein due to having lysine as limiting amino acid. The addition of pulses to cereals is known to improve their nutritional quality. Therefore, an experiment was conducted to investigate the effect of incorporating chickpeas into "Mankoushe" on postprandial glycemia and lipidemia. **Method:** A randomized cross-over study was performed on sixteen healthy Lebanese females aged between 20 and 40 years, having a BMI between 18.5 and 29.9 kg/m². Overnight fasted females were asked to consume two isoenergetic (Mankoushe) meals (200 g; 680 kcal) on two separate days, few days apart. One meal was the "Regular Mankoushe" and was made with white flour 100 % and the second meal was the "Chickpeas Mankoushe" that was made of a mixture of white/chickpea flour (70/30). Blood samples were collected 15 min before meal ingest and at 30, 90, 150 and 210 min, and serum glucose and triglycerides were measured. Results:

Changes in serum glucose from baseline showed slightly but not significantly lower values at 30 and 90 min in the chickpeas group as compared to the control group. While the ingestion of the “*Chickpeas Mankoushe*” showed a significantly lower triglycerides level at 30 min as compared with the control group. **Conclusion:** The incorporation of chickpeas flour in the dough of “*Mankoushe Zaatar*” was able to reduce postprandial glycemia and lipidemia. Chickpea flour is a promising functional ingredient to be integrated into pastries to lower their glycemic index.

70. Screening for risk factors of NAFLD in Slovakia

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Background: Noncommunicable diseases are estimated to account for 90 % of total deaths in Slovakia compared to 68 % in Europe (WHO, 2014). Cardiovascular diseases, cancer, and diabetes are the cause of 78 % of all deaths in Slovakia. Premature death is accountable for 19 % of all deaths. Two major preventable risk factors of precocious mortality are: overweight and obesity present in 91 % (compared to 59 % in Europe) and alcohol consumption (12.5 l per person per year vs. 11 l in Europe) (WHO, 2015). Moreover, Slovakia is on the 6th lowest position in fruit and vegetable intake (463 grams per day) in Europe (Faostat, 2013) together with low fish intake. Therefore, liver mortality has been increasing over the last years. **Aim:** The aim of this study was screening of key lifestyle factors that contribute to nonalcoholic fatty liver disease (NAFLD) in Slovak liver outpatients. **Methods:** A total number of 923 patients (59 % women, 41 % men) aged 18 to 91 years were included in the period of 8 months from 13 hepatologic outpatient clinics in Slovakia. Self-managed anonymous questionnaires (Q) were filled in by patients in the waiting room and dropped into the box provided in the waiting room. Nine questions were included relating age, gender, education, weight and height, vegetable, fruit, fish and coffee intake, smoking and physical exercise. **Results:** Overweight or obesity were detected in 59 % of patients, insufficient fiber intake in 87 %, insufficient fish intake in 85 % and insufficient physical exercise in 68 % of patients. BMI over 25 together with risk alcohol consumption (Audit-C > 4 points) was present in 68 % of patients. Smoking was present in 19 % of patients and insufficient coffee intake from its hepatoprotective point of view in 35 %. According to our study, a total number of 75 % pts. were at risk for NAFLD. An absolute change of lifestyle is needed in 59 % of pts. with overweight or obesity. In our study, only 12 % had adequate fruit and vegetable supply (600 g or more). More physically active lifestyle is strongly recommended in 68 % of our pts. **Conclusions:** Anonymous Q is a useful tool for unravelling the risk factors leading to NAFLD. All mentioned lifestyle factors are modifiable and preventable. They are associated with higher risk for NAFLD, cancer, and premature cardiovascular death. Significantly lower number of men was included in dispensaries compared to women despite a known higher precocious mortality. Systematic national screening should help detect patients with risk behavior. Early intervention can catch 90 % of liver diseases and help avoid precocious and avertable deaths.

71. Stability and changes in feeding cues and quality of mealtime interaction: A longitudinal cross-cultural study of British and Israeli mothers and infants

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Decisions about what and how to feed infants influences obesity risk. In support, early weaning and formula feeding are associated with rapid infant weight gain which is a risk factor for obesity development. Therefore, it is important to understand and to characterize the earliest interactions between mother and baby during feeding. This study aimed to explore stability and changes in mealtime interactions and feeding cues in a sample of Israeli and UK mothers and how these varied by maternal BMI and country. Mother-infant dyads (N = 41) from Israel and UK were filmed from birth and until two years old (every six months). Behaviours were coded using the Nursing Child Assessment Satellite Training (NCAST) and the Simple Feeding Element Scale (SFES). Positive mealtime interactions were seen in the first follow-up, however, with time; babies ate in a less ideal setting and were distracted during the feed. Breastfed babies showed higher levels of hunger and satiety cues in early life compared to bottle fed babies. UK mothers enjoyed the feeding interaction more than Israeli mothers, potentially explained by faster return to work in Israeli mothers compared to stay-at-home mothers in the UK. Healthy weight women used fewer feeding commands and fed their babies a healthier meal compared to overweight and obese mothers. Mealtime observations offer an insight into the quality of the early feeding experience and future research should continue to explore this within larger and more diverse populations.

72. The effect of 8 weeks of weight loss intervention on cardiometabolic parameters (ongoing study)

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Lifestyle interventions can prevent the deterioration of impaired glucose tolerance to manifest type 2 diabetes, and also prevent cardiovascular diseases, as it showed many studies [the Finnish Diabetes Prevention Study, Diabetes Prevention Program (DPP), the China Da Qing Diabetes Prevention Study, etc.]. Therefore the aim of our study was to compare the effect of intensified life style intervention on cardiometabolic parameters. **Methods:** It is ongoing randomized interventional clinical study (NCT02325804) focused on reduction of body fat. Patients are randomly assigned to one of two arms: 1) caloric restricted low carbohydrate diet (LCD) and intermittent interval exercise, or 2) classic caloric restricted diet and aerobic physical activity. In both arm diets restriction of calories 30 % and physical activity 150 minutes/week. Before and after 8 weeks of intervention all patients underwent complete medical examination [measurement of physical fitness, resting metabolic rate (RMR), body composition analysis, measurement of insulin resistance parameters, parameters of lipid metabolism, and other cardiometabolic risk factors]. **Results:** So far 25 patients finished the intervention. The average reduction of body weight was 6.8 + 4.9 kg (0–15 kg; p = 0.0006), accompanied with significant reduction of body fat percentage (p ≤ 0.0001), amount of fat mass (p = 0.03), waist circumference (p = 0.02). Amount of lean mass and RMR remained unchanged. Systolic and diastolic blood pressure was reduced (p = 0.01, p = 0.02 resp.) as well as insulin sensitivity and were improved, however we were not able to find any differences in lipid parameters. **Conclusion:** Preliminary results of our study are in line of previous results about beneficial effect of intensive life style changes on reduction of cardiometabolic risk factors.

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73. Glucose metabolism, cognitive functions and physical (in)activity

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Introduction: Substantial evidence indicates that impaired glucose metabolism and sedentary lifestyle may accelerate cognitive decline, increasing the risk of Alzheimer's disease. Regular exercise represents an effective way of preventing both age-related metabolic and cognitive decline. **Objectives:** (i) to evaluate cognitive functions in seniors with prediabetes & type 2 diabetes (T2D) and in controls with normal glucose tolerance (NGT); (ii) to evaluate associations of physical fitness and cognitive functions; (iii) to determine the effect of long-term aerobic-strength training on cognitive functions and metabolism. **Methods:** Study population (n = 52; 68.3 ± 7.9 yrs, M/F = 21/31) included patients with prediabetes & T2D (n = 20). The level of physical activity was assessed by a validated questionnaire. Cognitive functions were determined by the battery of cognitive tests (Addenbrook's test, ACE-R; Mini Mental State Examination, MMSE; Montreal Cognitive Assessment, MoCA; computerized tests CogState and MemTrax). Glucose tolerance was evaluated by oral glucose tolerance test (oGTT) and hippocampal volume by Magnetic Resonance Imaging (MRI). Long-term supervised aerobic-strength training (2 × 1h/week, for ~12 months) was performed in a subpopulation of seniors (n = 16). **Results:** Performance in standardized cognitive tests MMSE, MoCA, ACE-R was negatively associated with 2h glycaemia (R = -0.46; R = -0.39; R = -0.43; p<0.01) and positively with sport index (self-assessed sport activity) (MMSE, R = 0.31; ACE-R, R = 0.29, p<0.05). Hippocampal volume negatively correlated with 2h glycemia (oGTT, R = -0.49, p<0.05) and there was a trend towards a positive association with physical activity (leisure time index, R = 0.39, p = 0.063). Sport index and 2h glycemia were the strongest age, gender and BMI-independent predictors of cognitive functions (multiple regression analysis). Working memory test score was negatively (CogState, R = -0.47, p<0.05) and reaction time was positively (MemTrax, R = 0.72, p<0.05) associated with 2h glycemia. Supervised aerobic-strength training intervention improved cognitive performance in seniors with Mild Cognitive Impairment (MCI, n = 16; ACE-R, p<0.05; learning & working memory: CogState; p<0.05). **Conclusions:** Impaired glucose metabolism and low physical activity were associated with impaired cognitive functions in seniors, supporting a role of active lifestyle in prevention of age-associated cognitive and metabolic decline. Long-term regular physical activity has a potential to improve cognitive functions in seniors with MCI.

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GUIDED E-POSTER PRESENTATIONS

74. The impact of obesity on alternative renin-angiotensin system pathways in adipose tissue

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The classical adipose renin-angiotensin system (RAS) has been found to be over-activated during the obesity and locally generated angiotensin (Ang) II may contribute to the obesity pathogenesis. The contemporary view on the RAS has become more complex with the discovery of its alternative pathways including angiotensin-converting enzyme 2 (ACE2)/Ang-(1–7)/Mas receptor and (pro)renin receptor (PRR). It has been proposed that Ang-(1–7) counteracts with most of the Ang II-mediated deleterious effects implying its beneficial role in the glucose and lipid metabolism, oxidative stress, inflammation and insulin resistance. PRR may play a role in the increasing the local

production of Ang II in adipose tissue as well as triggering signal transductions independently of Ang II. The main objective of the study was to assess the modulation of alternative RAS pathways during obesity in visceral adipose tissue of rats and in subcutaneous adipose depot (SAT) in humans. Seventeen lean young healthy male subjects with BMI < 25 kg/m² and thirteen obese young healthy male subjects with BMI > 30 kg/m² were participating in our study. The expression of RAS components was quantified by Real Time qPCR in SAT obtained by biopsy. The modulation of alternative RAS pathway components during obesity in animals were studied by the gene and protein expression in epididymal adipose tissue of Zucker rats, representing a genetic model of obesity. Our results showed significantly elevated transcription of PRR gene and oppositely decreased gene expression of ACE2 in SAT of obese subjects. Furthermore, the expression of PRR positively correlated ($r = 0.813$, $p < 0.001$) and the expression of ACE2 negatively correlated ($r = -0.514$, $p < 0.01$) with BMI. In obese Zucker rats we observed significantly increased adipose expression of PRR when compared with lean controls. However, obesity development had no impact on ACE2 and Mas receptor transcription in visceral adipose depot in these rats. Our findings indicate that PRR in adipose tissue is modulated by obesity. Our results point out that PRR by Ang II-dependent or -independent manner may affect the adipose tissue homeostasis and functions, and that PRR may substantially contribute to the pathophysiology of obesity.

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75. Adipose tissue contributes to rapid normalization of macrophage and liver-cell lipid handling during dietary reversal of obesity, despite continued inflammation

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Background: Adipose tissue inflammation and dysfunction are considered central in the pathogenesis of obesity-related dys-metabolism, but their role in the rapid metabolic recovery upon obesity reversal is less investigated. We hypothesized that changes in adipose-tissue para-endocrine mechanisms may support the rapid improvement of obesity induced impairment in cellular lipid handling. **Methods:** C57Bl-6J mice were fed **ad-libitum** either normal chow (NC) or high-fat Feeding (HFF) for 10 weeks. A dietary Reversal group was fed HFF for 8 weeks, then switched to NC for 2 weeks (HFF- > NC). **Results:** Whole-body glucose homeostasis rapidly nearly-normalized in the HFF- > NC mice (fasting glucose and insulin normalized, glucose and insulin tolerance tests reversed 82 % to the NC group levels). During 2 weeks of dietary reversal, the liver was significantly cleared from ectopic fat accumulation, and functionally glucose production tests were completely normalized. In contrast, adipose-tissue inflammation (macrophages, pro-inflammatory cytokine expression) largely remained as in HFF, though adipose-tissue macrophage lipid content was ~50 % decreased, and adipose-tissue MAP kinase activation was reversed. Nevertheless, *ex-vivo* mild changes in adipose-tissue adipocytokine profile (but not glycerol release per gram tissue) were noted. These corresponded to partial or full reversal of the excess cellular lipid droplet accumulation induced by HFF conditioned media in liver-derived cells or in macrophages, respectively. **Conclusions:** We propose that rapid metabolic normalization early following nutritional obesity reversal precedes resolution of adipose-tissue inflammation. Nevertheless, adipose-tissue's paracrine/endocrine function supports improved regulation of lipid handling by the liver and by macrophage.

76. Hydrogen-rich water alleviates ethanol induced fatty liver via anti-oxidation and anti-inflammation in mice

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Aims: To investigate the effects of hydrogen-rich water (HRW) treatment on prevention of ethanol (EtOH)-induced early fatty liver in mice. **Methods:** *In vitro* reduction of hydrogen peroxide by HRW was determined with a chemiluminescence system. Female mice were randomly divided into five groups: control, EtOH, EtOH + silymarin, EtOH + HRW and EtOH + silymarin + HRW. Each group was fed a Lieber-DeCarli liquid diet containing EtOH or isocaloric maltose dextrin (control diet). Silymarin was used as a positive control to compare HRW efficacy against

chronic EtOH-induced hepatotoxicity. HRW was freshly prepared and given at a dosage of 1.2 mL/mouse trice daily. Blood and liver tissue were collected after chronic-binge liquid-diet feeding for 12 weeks. **Results:** The *in vitro* study showed that HRW directly scavenged hydrogen peroxide. The *in vivo* study showed that HRW increased expression of acyl ghrelin, which was correlated with food intake. HRW treatment significantly reduced EtOH-induced increases in serum alanine aminotransferase, aspartate aminotransferase, triglycerol and total cholesterol levels, hepatic lipid accumulation and inflammatory cytokines, including TNF- α and IL-6. HRW attenuated malondialdehyde level, restored glutathione depletion and increased superoxide dismutase, glutathione peroxidase and catalase activities in the liver. Moreover, HRW reduced TNF- α and IL-6 levels but increased IL-10 and IL-22 levels. **Conclusion:** HRW protects against chronic EtOH-induced liver injury, possibly by inducing acyl ghrelin to suppress the pro-inflammatory cytokines TNF- α and IL-6 and induce IL-10 and IL-22, thus activating antioxidant enzymes against oxidative stress.

77. Obesity brings forward the age-related changes of food intake regulation by anorexigenic neuropeptides in rats

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Background: Middle age is characterized by obesity later followed by anorexia of aging leading to sarcopenia. Age-associated rise in body weight or obesity had often been explained by age-related decrease of sensitivity to anorexigenic leptin. **Previous observations:** Our earlier studies in ad libitum fed male Wistar rats have shown that after a fast increase of body weight in juvenile animals (up to age 3–4-months) a further rise was demonstrated at mid-ages of 6–12-months and early-aged 18-months, then a fall was observed by old age of 24-months. In female rats body weight did not change after age 3–4-months. The body weight course of male rats may also be influenced by changes in feeding: as compared with normally ad libitum fed (NF) animals, in high-fat diet-induced obesity (HF) body weight reached significantly higher levels by 6–12-months and at age 18-months, while in calorie-restricted (CR) rats there was no weight rise after age 3–4-months. **Question:** Is responsiveness to anorexigenic peptides influenced either by aging or by nutritional state? **Methods:** The influence of administration of alpha-melanocyte stimulating hormone (alpha-MSH), or leptin by 7-days long intracerebroventricular (ICV) infusion on spontaneous food intake, or ICV injections on fasting-induced re-feeding food intake after, as well as the influence of intraperitoneal cholecystokinin (CCK) on re-feeding was analyzed in male rats of different ages. The effects of leptin and CCK were analyzed also in rats of different nutritional states (NF, HF, CR). **Results:** The strong anorexigenic effect of these peptides in young NF rats was followed by decreased sensitivity in mid-aged animals, while the sensitivity increased again in NF18 and even more in NF24 rats. In CR rats the sensitivity to the anorexigenic peptides remained pronounced as in mid-aged animals (similar to those in young animals), and it definitely increased in old animals. In contrast, in HF obese rats the responsiveness to CCK and leptin was very low at early mid-ages (HF6), but increased again already in late mid-aged (HF12) animals. **Conclusions:** Age *per se* does not decrease, but definitely increases the anorexigenic responsiveness to the investigated peptides. In contrast, an obesogenic diet may suppress the responsiveness (thereby may promote the development of obesity) in early mid-aged animals, and this may also bring forward (to age 12-months) the enhanced responsiveness that would be characteristic for the old animals – as if obesity speeded up the aging process.

78. Extracellular DNA and bariatric surgery

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Background: The only treatment of obesity that has long-term positive effects in the real life is bariatric surgery. These effects do not include only the loss of bodyweight, but also improvements of insulin sensitivity and decrease in microinflammation. Extracellular DNA (ecDNA) is higher in obesity likely due to the release from adipocytes. Whether changes in weight after bariatric surgery are accompanied by changes in ecDNA is unknown. **Materials & Methods:** Blood samples were collected from obese patients before bariatric surgery, one day after surgery and during control visits 3 months and one year after surgery. Total ecDNA and its subcellular origin was assessed

using spectrofluorometry and real time PCR. In addition, the deoxyribonuclease activity was quantified. The dynamics was analyzed using repeated measures ANOVA. **Results:** Bariatric surgery led to a considerable weight loss in all treated patients ($p < 0.001$). The surgery temporarily led to a slight but significant increase in plasma ecDNA ($p < 0.05$). However, after 3 months and one year plasma ecDNA of both, nuclear and mitochondrial origin, was decreased in comparison to baseline concentrations ($p < 0.01$). Interestingly, the reduction of ecDNA was associated with an increase in plasma deoxyribonuclease activity ($p < 0.05$). **Conclusions:** Due to the enormous prevalence of obesity it is of utmost importance to search for the mechanisms underlying the metabolic consequences of bariatric surgery. Recently published experiments pointed towards ecDNA as a likely pathogenic link between obesity and metabolic syndrome. The results of our study might indicate that the beneficial effects of bariatric surgery might be partially mediated by the decrease of plasma ecDNA. Further studies are needed to prove whether the observed associations of ecDNA and deoxyribonuclease activity are causal.

79. Management of a chronic staple line leak following laparoscopic sleeve resection

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Background: As it is easy to be performed, even in super obese patients, since 2010 laparoscopic sleeve resection (LSR) is the most performed bariatric procedure in Germany and on its way to become the leading procedure worldwide. Until now staple line leak (SLL) is a rare but still unsolved problem in LSR. Common tools in managing this complication are endoscopy (stenting, over the scope clipping and endovac therapy) and interventional radiology (CT targeted puncture). The sleeve is a system of high intraluminal pressure, thus leaks following LSR tend to become chronic, leading to a long healing process. We present the case of a patient in which a chronic leak was successfully treated by surgical intervention one year after it occurred. **Case history:** A 56 year old male patient with a BMI of 44.8 kg/m² underwent a LRS in April 2014. We used a 60 mm ECHELON FLEX™ ENDOPATH™ stapler (four green and five gold reloads, no staple line buttress reinforcement). A 36 Ch bougie was placed prior to stapling. According to our routine over sewing of the proximal three to four cm of the staple line was performed. Intraoperative methylene blue test was inconspicuous. A drain was placed next to the staple line. Initial course was without any complication, except a bloody secretion of 100 ml per day via the drain, Postoperative gastrografen study on the 6th postoperative day showed a regular shaped sleeve and no leak. As secretion via the drain persisted, relaparoscopy on day 8 revealed a diffuse bleeding of the greater omentum. Again the methylene blue test was inconspicuous. On the 11th postoperative day blood samples showed an increase of inflammation parameters, the compelled CT scan a proximal SLL surrounded by a huge abscess. The patient's state of health improved due to CT targeted puncture until day 15, when we performed endoscopy, without visible evidence for SLL. The patient was discharged with the drain and had again endoscopy two month following surgery. This time endoscopic finding suggested a proximal SLL, wherefore stenting was performed. From August 2014 till February 2015 the patient had two further unsuccessful attempts of stenting and multiple sessions of endovac therapy which resulted in a reduced secretion of 10 ml per day via the drain but could not lead to healing up of the SLL. In May 2015 a laparoscopic attempt of over sewing the SLL was performed, resulting in recurrence of the SLL within a few days. Again the patient had several sessions of endovac therapy. In April 2015, almost one year after the initial sleeve we decided to drain the SLL in an excluded jejuna loop via an open access. The further course was regular, until now the Patient is symptom free with am BMI of 28 kg/m². **Conclusion:** Draining of a SLL in an excluded jejuna loop might be a further tool in managing this rare but often long lasting complication of LSR. In case of chronification of the SLL this procedure should be contemplated early in the disease course.

80. Are proton pump inhibitors associated with weight gain?

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Proton pump inhibitors (PPIs) have been demonstrated to induce small intestinal bacterial overgrowth and a decrease in small intestinal pH value. Recent studies reported that the percent excess weight loss at 6 months after bariatric surgery was smaller in PPI users than in non-PPI users among the obese. In addition, the use of either PPIs

or histamine-2 receptor blockers was linked with suboptimal weight loss among obese subjects aged > 40 years. We investigated the impact of PPIs on normal body mass index (BMI) patients with gastric ulcers. Those with endoscopically proven *Helicobacter pylori* (HP)–negative gastric ulcer took oral rabeprazole sodium 20 mg per day, continuously for 4 months. On the other hand, subjects with HP–positive gastric ulcer received combination therapy (rabeprazole sodium 20 mg bid, clarithromycin 500 mg bid, and amoxicillin 1,000 mg bid) for 7 consecutive days as treatment for HP followed by rabeprazole 20 mg per day for the next 4 months. In 21 patients with HP–negative gastric ulcer, no significant change was observed in body weight or BMI as compared with baseline values. In 25 patients with HP–positive gastric ulcer, there were no significant changes in body weight (BW) and BMI in both the successful eradication (19 patients) and failed eradication groups (9 patients). Analysis of patients aged > 40 years did not reveal any significant changes in BW and BMI after treatment in both the successful eradication and failed eradication groups. In conclusion, the 4-month rabeprazole treatment does not induce weight gain in lean subjects with HP–negative gastric ulcer. Irrespective of HP eradication, the 4-month rabeprazole treatment did not contribute to weight gain in patients aged > 40 years with a normal BMI and HP–positive gastric ulcer, either. However, future studies are needed to confirm the long-term effects of different PPIs on body weight in both lean and obese subjects.

81. Non-invasive determination of liver fibrosis in patients with non-alcoholic fatty liver and cardiometabolic risk factors

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Background: NAFLD is the common comorbidity in patients with overweight and obesity (with appearance in 60–95 % of obese patients and 100 % of obese diabetics). Determination of liver fibrosis is the most important point in the course of liver disease. Various non-invasive scoring indexes of liver fibrosis together with transient elastography have been used over the past years. **Aim:** Two non-invasive scoring models of liver fibrosis NAFLD score and APRI index together with transient elastography (TE) were used in patients with non-alcoholic fatty liver (NAFL) and cardiometabolic risk factors. The aim was an early assessment of significant liver fibrosis. **Patients and Methods:** A total number of 35 patients (22 women, 13 men) with NAFL with the mean age 61.77 ± 13.01 years were examined. Inclusion criteria included: age over 18 years, fatty liver detected by ultrasonographical examination, daily alcohol intake less than 20 g/30 g (for women/men, respectively), overweight or obesity together with two risk factors of metabolic syndrome. The following clinical and laboratory parameters were examined: weight, height, waist circumference, blood pressure, ALT, AST, triacylglycerols (TG), platelets, and albumin. NAFLD score (ALT, AST, albumin, TG) and APRI index (AST, platelets) were calculated. Interpretation: APRI > 1.5 – positive predictive value, APRI > 1.0 – cirrhosis, APRI 0.7 – significant fibrosis, APRI < 0.5 – negative predictive value, 0.5 < APRI < 0.7 – undetermined score, degree of liver stiffness was detected by TE (F0–F4), according to the NAFLD score patients were divided into F0–F2, F3–F4, and undetermined score. **Results:** The highest degree of valid results were found by TE comparing to APRI index and NAFLD score. Severe fibrosis (F3–F4) was detected in 23 % patients by TE, in 11.6 % by APRI and in 20 % of patients by NAFLD score. A disadvantage of NAFLD score was the highest degree of undetermined values (40 %) found in 17.1 % of patients by APRI index. A correlation of age with a degree of fibrosis was found by TE, and an inverse correlation of platelets with the fibrosis stage was found. A linear correlation of detected degree of fibrosis by TE and APRI index was found. **Conclusion:** A high degree of significant fibrosis was found in patients with NAFL and cardiometabolic risk factors. From the preventive point of view, earlier detection of high-risk patients should be done to achieve better results. We recommend the following tools for liver fibrosis screening: APRI index may be the first-line tool; in the case of the undetermined score, then TE should be the tool of the second line. APRI index is a cheap, simple, repeatable tool for the general use in practitioners, even in those, where TE is not available.

82. Fatty liver screening based on fatty liver index (FLI)

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Background: Fatty liver (FL) is one of the most common liver diseases in western countries with an estimated prevalence of 25–30 %. The fatty liver index (FLI) represents a simple clinical laboratory method of fatty liver screening. **Aim:** The aim of the project was to assess the applicability of the methodology in the routine practice of a biochemical laboratory in cooperation with paediatrician, general practitioner and gastroenterologist. **Methods:** The cohort was selected on the basis of routine clinical practice of general practitioners and gastroenterologists. The inclusion of patients into the cohort was based on a clinical judgement of the examining physician assuming possible FL (at least two parameters of metabolic syndrome present). A total number of 146 patients aged between 8 and 88 years were included. Data collection ran from 1 April 2016 to 16 February 2017. Patients were classified according to their weight, height, BMI, waist circumference, triglycerides and gamma-glutamyltransferase. Based on the above data, FLI was calculated. FLI < 30 ruled out the FL diagnosis and FLI ≥ 60 ruled in FL. **Results:** We divided the group of cohort by age into 2 groups: 1st ≤ 18 years (juvenile) and 2nd > 19 years (adult). The juvenile group consisted of 44 patients (26 boys; 18 girls), with the mean age of 13.2 years, an average weight of 81 kg, and BMI of 29.75. The FLI index greater than ≥ 60 was found in 43.2 % of the patients, FL was ruled out in 15.9 % of juvenile patients. The adult group of 102 patients included 43 men and 59 women. The mean age of the group was 50.6 years; the average weight of the group was 91 kg, BMI 30.72. FLI indicative of FL reached 73.5 % and steatosis was ruled out in 8.8 % of patients. **Discussion:** According to the analysed data, we can state that there is a high prevalence of overweight (40.9 %) and obesity (45.3 %) among juvenile patients which comes with a very high risk of passing obesity and overweight into adulthood, associating with other manifestations of metabolic syndrome as well. FLI evaluation allows for further diagnostic procedures in patients with FLI ≥ 60. It is advised to undergo an ultrasound examination of the liver, laboratory ALT, AST, platelet count and albumin. These tests could allow for a detection of potential cirrhosis of the liver and would enable the practitioner to send the patient to the hepatologist. **Conclusion:** The advantage of FLI is the ability to perform FL screening based on a single examination by a practitioner or specialist. For this reason, FLI is suitable for the use in primary prevention of screening of fatty liver at population level and is useful in paediatric and adolescent practice. Positive FLI is also a tool for persuading the patient to collaborate in order to change their lifestyle and is a precursor for consistent treatment of the metabolic syndrome and FL. It is the juvenile and early adult age that provides us with the best chance of success in achieving a change in patient's lifestyle.

83. Metabolic factors and non alcoholic fatty liver in patients with impaired glucose tolerance

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Background and aims: Non alcoholic fatty liver disease (NAFLD) includes a wide range of liver disease, from simple hepatic steatosis, to non alcoholic steatohepatitis and liver cirrhosis. The aim of this study is to investigate the metabolic factors that affect NAFLD in patients with impaired glucose tolerance (IGT). **Materials and methods:** The study includes 122 patients with mean age 62 ± 7 years. IGT was defined according to the IGT criteria. All patients underwent liver ultrasound and blood tests (glucose, glucose 2 hours after charging, total cholesterol, HDL cholesterol, LDL cholesterol, triglycerides, lipoprotein a). Participants were divided into 2 groups according to the presence or not of NAFLD. The results were expressed as mean value ± standard deviation. For the univariate analysis between the 2 groups, continuous variables were studied under the student t-test. Statistical significance was

considered when the $P < 0.05$. **Results:** Out of 122 patients, NAFLD was found in 70 patients (57 %) that consist group A; 37 were men (53 %) and 33 women (47 %). Group B consists of the remaining 52 patients (43 %) – 25 men (48 %) and 27 women (52 %) – that did not have NAFLD. Comparison of biochemical tests characteristics between the two groups are presented in the table (NS: statistically not significant). **Conclusion:** There is a possible correlation among diabetes mellitus, metabolic profile and NAFLD in patients with IGT.

84. Prevalence and risks factors of New-onset diabetes mellitus after liver transplantation (NODAT): single-centre experience

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Introduction: After solid organ transplantation including liver transplantation (LTx), NODAT is a frequent complication: One year after LTx, NODAT was diagnosed in 9–21 % of patients (pts). It is associated with higher risks of cardiovascular diseases, infection, reduced patient survival, graft rejection, or accelerated loss of graft function. Risk factors of NODAT are either non-modifiable (age, gender, family history of DM), or modifiable [type of immunosuppressive therapy (IS), obesity and other components of metabolic syndrome (MS), infections with hepatitis C virus (HCV) and cytomegalovirus (CMV), hypomagnesaemia (êMg), etc.]. Identification of these risk factors before LTx as well as early diagnosing and correct management are needed to improve long-term patient and graft outcomes. **Aim:** To determine the prevalences of NODAT, and its modifiable and non-modifiable risks factors in pts after LTx in the Transplant Center Banska Bystrica (TC BB). **Methods:** Retrospective analysis. Review of the records retrieved from the electronic hospital database (ZM). **Study interval:** may 2008–may 2016. **Inclusion criteria:** LTx in TC BB. **Exclusion criteria:** DM at the time of LTx; malignancy; follow-up shorter than 6 months; IS by cyclosporine A. **Recorded variables:** age; gender; etiology of liver disease leading to LTx; MELD score; Child-Pugh score; family history of DM; body mass index (BMI [kg/m²]; trough levels of tacrolimus (TAC, ng/ml). The statistical analysis was performed by MedCalc 13.1.2. The results given here are from the month 6 of follow-up. **Results:** Of the 150 pts transplanted during the study interval, 102 fulfilled predetermined criteria. Mean age was 50 years (22–67, significantly higher in women); 60 were men (54 %). Mean BMI was 25.5 ± 4.8 , MELD 18 ± 5 , Child-Pugh 10 ± 2 . The most frequent etiology of cirrhosis was alcoholic liver disease (ALD, in 42 % of pts). NODAT occurred in 19 (18.6 %) of 102 LTx recipients. In multivariate analysis, ALD etiology and TAC > 10 were associated with an increased risk of NODAT. **Conclusions:** In this selected cohort with overweight 6 months after LTx, NODAT occurred in one-in-five pts, more so if underlying etiology of liver disease was ALD, and TAC levels higher than 10 ng/ml.

85. Overweight, obesity, and putative contribution of non-alcoholic fatty liver disease (NAFLD) to the patients undergoing liver transplantation (LTx) for etiologies other than NAFLD: analysis of the cohort

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Background: Due to the dynamics of diabetesity, non-alcoholic steatohepatitis (NASH) is the major/increasing etiology of liver transplantation (LTx). In 10 years until 2014, NASH grew 170 % as LTx-indication. Relationship between NASH and other ACLD etiologies is oxymoronus: a) NASH is the diagnosis of exclusion, but b) can contribute to the progression of i.e. alcoholic liver disease (ALD, called BASH [B = both]); hepatitis C (CHC), etc. The role of NAFLD/NASH as co-factor in the progression to LTx of other ACLD etiologies was suspected since the body mass index (BMI, kg/m²) in our pts post-LTx seemed to reach or surmount that of pre-ACLD phase in both NASH, and non-NASH ACLDs. Since NASH tends to disappear from liver histology in terminal phases of ACLD, to study its contribution in non-NASH cohort we decided to use Fatty Liver Index (FLI) calculated post-LTx: at the time pts use to reach pre-morbid-pre-LTx BMI. **Aims:** To determine post-LTx i) the trajectory of BMI; ii) FLI in pts LTx for non-NASH indications. **Methods:** Prospective study. Data retrieval from medical records of LTx at HEGITO (JB). Study interval: 2015–2016. **Inclusion criteria** LTx; recorded variables present. **Recorded variables:** Age, gender, LTx indication, body weight, waist

circumference, triglycerides, γ -GMT (FLI) at LTx and months 3, 6, 12. **Exclusion criteria:** death before month 12 of follow-up. Overweight = BMI > 25; obesity = BMI > 30. Post-LTx FLI > 60 was deemed suggestive of pre-LTx NAFLD. **Results:** During study interval of XX months 21 of 54 LTx pts fulfilled all the pre-determined criteria. Men = 6, age 49 years (24–62), LTx for non-NASH = 20 (95 %). Overweight at months 3, 6, and 12 was found in 5 (15 %), 7 (35 %), and 9 (45 %) pts; obesity in 1 (5 %), 2 (10 %), and 3 (15 %) pts. FLI > 60 in 1 (5 %), 2 (10 %), and 3 (15 %). **Conclusions:** One year after LTx, overweight, obesity, and FLI suggestive of NAFLD evolve in 45 %, 15 %, and 15 % of pts undergoing LTx for non-NASH indications, respectively. The complexity of interrelationships between pre- and post-LTx factors leading to NAFLD/NASH notwithstanding, these results support the notion that NAFLD/NASH can play a role in the progression to LTx of liver diseases other than NASH.

86. Obesity and posttransplant diabetes mellitus in Slovakia

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Introduction: The incidence of posttransplant diabetes mellitus (PTDM) after kidney transplantation (KT) is 5–40 %. The objective of the analysis is to identify the risk factors of PTDM after KT in the Slovak Republic (SR). **Materials and methods:** In the group of 133 patients/non-diabetics, we identified the risk factors of PTDM in the monitored period of 12 months from transplantation. **Results:** The incidence of PTDM in the SR in 2014 was 38.3 %. By logistic regression, we discovered that the age at the time of KT [odds ratio 1.0885; 95 % CI 1.0222–1.1592 (P = 0.0082)], the value of body mass index at the time of KT [odds ratio 1.4606; 95 % CI 1.0099–2.1125 (P = 0.0442)], and the value of insulin resistance index (HOMA-IR) at the time of KT [odds ratio 2.5183; 95 % CI 1.7119–3.4692 (P < 0.0001)] represent predictive factors of PTDM. The independent risk factors of PTDM in our group are: age at the time of KT of more than 60 years [HR 0.3871; 95 % CI 0.1659–1.7767 (P = 0.0281)], waist circumference at the time of KT in males more than 94 cm and in females more than 80 cm [HR 3.4833; 95 % CI 1.2789–9.4878 (P = 0.0146)], BMI at the time of KT [HR 3.0011; 95 % CI 1.0725–8.3977 (P = 0.0363)], and triacylglycerols at the time of KT more than 1.7 mmol/l [HR 2.9763; 95 % CI 1.0141–8.7352 (P = 0.0471)]. **Conclusion:** In the group of Slovak patients after kidney transplantation, the dominating risk factor for PTDM development is insulin resistance prior to KT.

87. Pigment epithelium derived factor and C1q/TNF-related protein 9 in patients with type 2 diabetes; their relationship to metabolic syndrome and vascular damage

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Introduction: Pigment epithelium derived factor (PEDF) and C1q/TNF-related protein 9 (CTRP-9) belong to novel adipokines, which may contribute on insulin resistance and vascular damage. Aim of the study was to compare their circulating levels in type 2 diabetes patients with and without metabolic syndrome (MS) to healthy controls. Their relations to risk cardiovascular factors and markers of vascular damage were detected too. **Methods:** Fifty individuals with type 2 diabetes (23 men, 27 women) and forty healthy controls (15 men, 25 women) were included to the study. PEDF, CTRP-9, lipids, anthropological parameters, markers of insulin resistance and diabetes compensation were investigated in all subjects. Diabetics were divided into two groups: with (n = 30; 11 men, 19 women) and without (n = 20; 12 men, 8 women) MS. Von Willebrand factor and plasminogen activator inhibitor-1 (PAI-1) served as markers of endothelial dysfunction. Markers of arterial stiffness – augmentation index (AI) and pulse wave velocity (PWV) – were measured as other parameters of vascular damage. **Results:** Compared to healthy controls only diabetics with MS had higher levels of PEDF [14,160 (10,240–16,000) ng/ml versus 11,120 (8,560–14,400) ng/ml; p < 0.05]. CTRP-9 levels did not significantly differ between groups. In all subjects PEDF significantly (p < 0.05) correlated: positively with BMI, waist circumference, hs-CRP, triglycerides, non-HDL cholesterol, apolipoprotein B, fasting glucose, glycated hemoglobin, C-peptide and insulin; negatively with HDL-cholesterol and apolipoprotein A1. Additionally, in patients with diabetes a negative correlation of PEDF with PWV ($\rho = -0.34$; p < 0.05) and in diabetics with MS a negative correlation of

PEDF with vWF ($\rho = -0.46$, $p < 0.05$) were found. CTRP-9 levels positively correlated with vWF ($\rho = 0.56$; $p < 0.05$) and PAI-1 ($\rho = 0.57$; $p < 0.05$) only in group of diabetics with MS. **Conclusion:** Patients with type 2 diabetes and MS have significantly higher levels of PEDF, which are associated with symptoms of MS and insulin resistance. A negative correlation of PEDF with some markers of vascular damage may point out its vascular protective role.

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88. Effect of aging on lipogenic potential of human subcutaneous adipose tissue and adipocytes

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Background: Subcutaneous adipose tissue (SAT) is an organ specialized for the synthesis and metabolically safe storage of lipids. In aging, however, the capacity of SAT to store lipids decreases and this results in metabolically unfavorable fat redistribution and insulin resistance. Despite substantial health impact of this SAT dysfunction in elderly, its cellular and molecular triggers remain rather unclear. It has been suggested that the age-related dysfunction of various tissues can be partly related to the accumulation of senescent cells. Moreover, the storage of lipids in adipocytes can be inhibited by endoplasmic reticulum stress (ERS) that appears to be higher in SAT from aged mice. Therefore, we aimed to investigate lipogenic capacity of human SAT in relation to senescence and ERS markers. **Subjects and methods:** SAT samples were obtained by needle biopsies from two groups of women ($n = 15$, each group), differing in age (36 vs. 72 years) but matched for fat mass. SAT samples were used for qPCR analysis of mRNA levels of genes involved in lipogenesis (ACLY, ACACA, FASN, DGAT2, SCD1, ELOVL6), ERS (HSPA5, XBP1s, DNAJC3, HYOU1, EDEM1, GADD34, CHOP, PERK, CALR) and senescence (p16, p27, NOX4, GDF15, DLC1). Similar qPCR analysis was performed in in vitro differentiated adipocytes derived from the same samples of SAT ($n = 7–10$ per group). **Results:** Compared to SAT from young group, aged SAT exhibited reduced mRNA expression of two important lipogenic enzymes, FASN and DGAT2, together with higher mRNA levels of senescence markers p16INK4a and NOX4. Even though mRNA expression of two additional senescence markers, p27 and GDF15, was not different in SAT from the two groups of women, the negative correlation between their expression and mRNA expression of all analyzed lipogenic markers was found. Similar relationship was found among GDF15, NOX4 and lipogenic markers in in vitro differentiated adipocytes. As expected, the expression of XBP1s, an essential transcription factor of IRE-1 branch of unfolded protein response, was increased in aged SAT, but the expression of its target genes, chaperones HSPA5, DNAJC3 and HYOU1, was surprisingly diminished in SAT from the elderly compared to the young. Intriguingly, expression of these ERS chaperones correlated positively with the expression of lipogenic enzymes. These results were partly recapitulated in in vitro differentiated adipocytes from SAT of the same individuals. **Conclusions:** Higher expression of GDF15, a cytokine linked to senescence and mitochondrial dysfunction, is linked with decreased lipogenesis in both human SAT and subcutaneous adipocytes. Reduced capability of aged SAT to express ER chaperons may contribute to worsening of lipogenic SAT function in the elderly.

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89. Obesity and T2DM related changes of skeletal muscle secretory profile: in vitro and in vivo studies

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Introduction: Myokines are products of skeletal muscle involved in regulation of energy metabolism, muscle functional and structural remodeling including angiogenesis and inflammation. Muscle secretory profile can be

modulated by physical (in)activity, inflammation, lipids, insulin resistance or hyperglycemia. **Aims:** We aimed to investigate the regulation of CC / CXC chemokines (MCP1, IL8, NAP2, GRO α), their receptors and macrophage activity markers in human skeletal muscle and primary muscle cells derived from individuals with obesity, prediabetes and type 2 diabetes (T2D). **Subjects & methods:** Volunteers (men, n = 97): healthy lean controls; obese: with normal glucose tolerance (NGT), prediabetes or newly diagnosed T2D. Glucose tolerance (oGTT), whole-body insulin sensitivity (euglycemic hyperinsulinemic clamp, EHC), body composition (bioimpedance), intramyocellular & hepatic lipid content (¹H-MRS) and physical activity (accelerometer) were assessed. Muscle samples were taken by Bergstrom needle biopsy (*m. vastus lateralis*). Primary skeletal muscle cells were treated with palmitate (100 μ M) or glucose (5.5/10/20 mM). Myokines secretion into conditioned media was assessed by multiplex assay (Millipore), gene expression in tissue and cells by qPCR. **Results:** In vitro, gene expression and media content of selected myokines tended to decrease with obesity, prediabetes and T2D ($p > 0.05$). Palmitate treatment reduced MCP1 secretion in myotubes from obese and T2D individuals compared to lean ($p < 0.05$) and increased IL8 mRNA in myotubes derived from obese individuals ($p < 0.05$). Prediabetes was associated with higher mRNA levels of IL8 ($p = 0.07$), GRO α , NAP2 ($p < 0.01$) and their receptors CXCR1 ($p < 0.01$), CXCR2 ($p < 0.05$) in skeletal muscle tissue. T2D was associated with increased MCP1 mRNA ($p < 0.01$) in muscle, but the mRNA levels of its receptor CCR2a were not changed. Markers for both M1- (CD86, CD40) and M2- (CD206, CD163) macrophages significantly increased in muscle with T2D ($p < 0.05$). Muscle myokines expression positively correlated with obesity (BMI, body fat, extramyocellular lipids), fasting glycemia and insulinemia, hepatic lipid content and transaminases and LDL-cholesterol ($p < 0.05$). **Conclusion:** Increased production of selected myokines (chemokines) in skeletal muscle of patients with prediabetes and type 2 diabetes suggests a gradual parallel activation of inflammatory state with metabolic disease progression. Reciprocal changes in skeletal muscle and primary muscle cells in (pre)diabetes may suggest, that (i) regulatory factors associated with the development of metabolic disease exist in integrated organism, (ii) apart from muscle fibers, other cell types (e.g. endothelial cells, leukocytes) contribute to the myokine expression/ secretion in skeletal muscle *ex vivo*.

90. Diurnal changes of acetylcarnitine in human vastus lateralis muscle and response to exercise

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Introduction: Skeletal muscle is the main reservoir of carnitine, which plays an important role in fat metabolism since it serves as a shuttle for acetyl groups to mitochondrial matrix. Therefore, acetylcarnitine covers also a key role in glucose metabolism and is implicated in the pathogenesis of insulin resistance contributing to a diagnosis of Type 2 Diabetes. Since acetylcarnitine concentrations in plasma are known to vary during the day and increase after high-intensity exercise we aimed to investigate the diurnal and exercise related changes in concentration of acetylcarnitine at 2.13 ppm in skeletal muscle non-invasively, using a long echo-time ¹H MRS at 7T. **Methods:** All measurements were performed on a 7T whole body Siemens MR system with knee coil. Five healthy volunteers participated in this study. They were positioned supine in the magnet and the measurement was performed on left vastus lateralis (VL) muscle. T₁ weighted images were acquired. The MRS VOI (40 × 35 × 15 mm³) was carefully placed into the VL muscle. Localized shimming was performed manually. Data were obtained using STEAM sequence with TR/TE = 2,000/350 ms. For absolute quantification determination, water signal was measured separately (TR/TE = 2,000/20 ms). All volunteers underwent first measurement early in the morning, after overnight fast and no strenuous exercise in the morning. Second measurement from the same VOIs was performed after normal hospital canteen lunch. Subsequently, volunteers performed high intensity exercise. The ¹H MRS measurements were repeated twice after the exercise (starting at 0 and 15 min). The absolute concentration of acetylcarnitine was calculated according to the formula for millimolar concentration in wet weight: $C_{AC} = (S_{AC}/S_w) \times (CF_w/CF_{AC}) \times cw \times nw \times w\%$ where S are signals of metabolites (W – water, AC – acetylcarnitine), CF are correction factors for T₁ and T₂ relaxations, $c_w = 55$ mol/L is the molar concentration of the water, $n_w = 2$ is the number of protons in a water molecule and w % is the approximate water content of skeletal muscle tissue. Differences in the values of the acetylcarnitine concentration during diurnal changes and after exercise were tested for significance by repeated-measures ANOVA and Fisher's post-hoc test. **Results:** The measured acetylcarnitine concentration varied during the day, in particular, it decreased by approximately 70 % between the morning (mean \pm SD; 11.47 \pm 5.34 mmol/kg ww) and

after the lunch measurement (3.43 ± 1.66 mmol/kg ww). Following 10 minutes of high-intensity exercise the concentration significantly increased ($p = 0.021$) and again significantly decreased 15 minutes after cessation of the exercise ($p = 0.017$). **Discussion:** Serum carnitine and acetylcarnitine concentrations were previously found to vary significantly during the day reacting to the plasma free fatty acid concentrations. Free fatty acid concentrations are increased in the fasting state and acutely after exercise, and on the other hand decreased after a carbohydrate rich meal. Our results from repeated non-invasive ¹H-MRS measurements during the day are in good agreement with these findings. Skeletal muscle acetylcarnitine concentrations in the morning were higher than in the afternoon after lunch. Increase of the acetylcarnitine level was detected after high-intensity exercise, and approximately 15 minutes after the cessation of exercise we could detect acetylcarnitine depletion or washout which is in the accordance with the findings on trained group of subjects performed by Seiler et al. 2015.

91. Concordance of bioactive vs. total immunoreactive serum leptin levels in children and adolescents with severe early onset obesity

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Background: Leptin secreted from adipose tissue signals peripheral energy status to the brain. Monogenic leptin deficiency results in severe early onset obesity with hyperphagia. Recently, a similar phenotype of inactivating leptin mutations but with preserved immunoreactivity and hence normal circulating immunoreactive leptin has been reported. **Objective:** We screened a subset of children selected for a high expected likelihood for leptin with reduced bioactivity based on extreme obesity of early onset to identify leptin gene mutation carriers through decreased proportion of bioactive leptin. Furthermore, we compared the association of bioactive and immunoreactive leptin levels with indices of insulin secretion/resistance in obese children. **Design/Setting/Patients:** We measured bioactive and immunoreactive leptin levels in fasting serum samples of 70 children with severe (BMI SDS > 3) non-syndromic obesity with onset. **Results:** The mean levels of bioactive and immunoreactive leptin were almost identical (41.1 ± 25.2 vs. 41.1 ± 25.4 ng/mL). In three probands with the lowest bioactive leptin proportion (< 90 %) we did not identify mutations in the leptin gene. Compared to immunoreactive leptin, bioactive leptin showed similar and slightly better statistical associations with indices of insulin resistance in correlation and multivariate analyses. **Conclusion:** In our sample selected for severe early onset childhood obesity, we did not identify leptin gene mutations leading to decreased proportion of bioactive leptin. Nevertheless, the bioactive leptin levels were stronger associated with selected insulin secretion/resistance indices than the immunoreactive leptin levels.

92. Contribution of GP to prevention of stroke in atrial fibrillation, how obesity can be dangerous

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Background: Atrial fibrillation (AF) is the most frequent arrhythmia in clinical practice. AF contributes to all-cause mortality, heart failure and increases stroke incidence by five-times. GPs play an important role in AF screening. Immediately initiated and well controlled anticoagulation therapy helps to attenuate AF related stroke risk. **Aim:** Patients with risk factors for AF (hypertension, heart failure, obesity, diabetes, age > 65 years, renal diseases and COPD) were screened for AF. **Methods:** Recruited were all patients with risk factors: age > 65, arterial hypertension, heart failure, obesity (BMI > 25), diabetes, stroke/ TIA, renal diseases and COPD who visit GP regularly for chronic medication prescription. We focused on patients with “warning AF signs” (palpitations, fatigue, dizziness, chest pain or changes in cognitive functions). We checked the pulse (screened for AF), blood pressure and body weight. If irregular pulse, ECG was performed. If AF detected on ECG and patient in good condition without symptoms requiring

hospital admission, scores CHA2DS2VASc and HASBLED were assessed. In patients with CHA2DS2VASc > 1 the anticoagulation therapy with warfarin was initiated. GPs in Slovakia are not allowed to prescribe NOAK's. In patients taking warfarin INR was checked regularly by POCT. **Results:** Total number of registered patients at our office is 2,348 (96.34 %), 86 patients with AF (3.66 %), paroxysmal in 24 (27.9 %) and permanent in 62 patients (72.1 %), 44 men (51.2 %) and 42 women (48.8 %), average age 73.5 years. The main risk factor was hypertension, present in all patients (100 %). The second risk factor was obesity (58 %), followed by heart failure (29 %), stroke (19.7 %) and COPD (3.4 %). Anticoagulation therapy was initiated in 76 % of patients, antiplatelet therapy in 22 %. 2 % of patients refused to take any therapy. **Conclusion:** AF is affecting 1–2 % of adult population worldwide, in our study the prevalence rate was 3.6 %. Surprisingly obesity was the second most common risk factor present. GPs can contribute to AF diagnosing and prevention very simply and easy: checking the pulse, controlling blood pressure and weight and initiating anticoagulation therapy quickly.

93. How many risk factors affecting body weight reduction we know?

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Introduction: Education is the most time-consuming part of the treatment of DM. **Objective:** Stratified risk factors affecting the prevalence of overweight and obesity. **Patients and methods:** We were comprehensively educated 200 outpatients (117 men and 83 women, aged from 30 to 92 years) with newly diagnosed and previously untreated diabetes mellitus type 2 during the period of 8/2007–8/2011. In order to determine the quality of education and compliance after 18 months we have compiled a questionnaire containing 63 questions that followed the lifestyle measures: physical activity, shift work, sleep, passing diet in the past, alcohol consumption, smoking and drinking regime and a qualitative changes in the diet: meal frequency directly, the frequency of fruits and vegetable consumption, consumption of: nuts, fish, white and dark meat, legumes, thermal technologies in food processing, intake of unhealthy fat and simple carbohydrates, frequency of consumption of: bacon, greaves, liver, sausages and sausage, chocolate, cookies, instant meals, soft drinks, eggs, dairy products, sweetening and salting. 142 patients (74 men and 67 women), women age: 44 to 86 years (median 65 years), male age: 37 to 92 years (median 64 years) have agreed for filling out the questionnaire. **Results:** The combined effect of education and drug treatment has been shown to reduce HbA_{1c} IFCC/DCCT and BMI (kg/m²) by up to 16/11 % and 3 % in women and 20/15 % and 2 % in men in a group of 200 patients after 18 months. **Conclusion:** Based on the results of the questionnaire and subsequent re-education of patients we have in the coming years empirically recorded 40 risk factors affecting body weight reduction.

94. The effect of the regulation on the trans fatty acid content of foods

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Artificial trans fatty acids are formed during the industrial processing of foods, and are proven to be harmful for the human body. They have been associated with an increased risk of cardiovascular disease, abdominal obesity, diabetes, and certain types of cancer. Decree 71/2013 (XI. 20.) of the Ministry of Human Capacities, which has been in force since 18 February 2014, defines the highest permitted amount of trans fats in food products placed on the market in Hungary. The limits are defined according to the total fat content of the foods. The official control of foods are performed by the food chain safety and animal health directorates of the capital and county government offices. They are obliged to report each quarter on the results of inspections related to the trans fatty acid content of food products to the National Food Chain Safety Office, which shall aggregate the data and forward it to the National Institute of Pharmacy and Nutrition (OGYEI). OGYEI sets up a database using the measurement data related to the trans fatty acid content of food products sold to end consumers, carries out a survey on the population's consumption of trans fats, monitors changes of the composition of food products sold to end consumers in relation to the requirements in the decree, and performs laboratory analysis on the trans fatty acid content of food products for the purposes of surveying. In this connection the evaluation of the effect of the regulation has been started in collaboration with the World Health Organization (WHO), which includes a comparison between the trans fatty

acid content of foods available on the market and the limits set by the regulation, and additionally, a monitoring of population intake. Between 2010 and 2016 the total number of the measured products was 1,586 with special emphasis on biscuits, cakes, wafers, bakery products/fine bakery products, chocolates, products made from chocolate compound, vegetable fats. 900 products were measured before the regulation (2010–2013) and 686 products were measured after (2014–2016). Prior to the regulation an average of 20 % of the food products had a high trans fatty acid content and after the entry into force a significant improvement was observed. In 2016, only less than 2 % of the products exceeded the permitted limits. The regulation has reached its goal, thanks to the standard legislation the number of food products with high trans-fatty acid content has been drastically declined.

95. Assessment of nutritional state of professional soldiers in the Armed Forces of the Czech Republic in view of new regulation about evaluating the health capability of active-duty service

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Introduction: In the Armed Forces of the Czech Republic we used for a long time only BMI criterion for nutritional state assessment according to regulation No 103/2005 Sb. about evaluating the health capability of active-duty service. From the end of 2016 there is new regulation, which added waist circumference to evaluation criteria. Aim of our work was to evaluate nutritional state of soldiers according to new regulation No 357/2016 Sb. **Methods:** The soldiers were examined by military physicians within the Programme of extended preventive care. The examinations are compulsory for all professional soldiers at the age of 25, 30, 33, and 36 years. From the age of 39, these examinations are carried out every year till the end of their career. Besides taking personal histories, carrying out standard physical examinations and blood samples for a biochemical examination of saccharide, lipid and protein metabolism and liver enzymes, the following anthropometric parameters are monitored: body constitution using Body Mass Index (BMI) and waist circumference. **Results:** In 2015 were examined 9,009 of male soldiers and 1,248 of female soldiers with mean age 40.4 ± 6.9 years and 41.0 ± 7.1 years, respectively. BMI was 27.2 ± 3.2 kg.m⁻² vs. 24.8 ± 5.9 kg.m⁻². Overweight was found in 58.2 % vs. 26.0 %, obesity in 17.0 % vs. 12.1 %. Waist circumference in the range of 94–102 cm for men and in the range of 80–88 cm for women (risk I) was found in 25.7 % and 17.8 % and waist circumference ≥ 102 cm for men and ≥ 88 cm for women (risk II) was found in 15.4 % and 22.1 %. Overweight along with risk I waist circumference had 19.6 % of men and 10.3 % of women. Obesity along with risk II waist circumference had 10.7 % of men and 10.7 % of women too. **Conclusion:** There is significant difference between prevalence of overweight and obesity according to BMI and waist circumference parameter at professional soldiers. Waist circumference is important parameter for evaluating of nutritional state especially at male soldiers. Waist circumference is able to complete the BMI values and better distinguish individuals with the risk of development of obesity and associated complications from physically fit individuals with increased body weight due to well-developed musculature.

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96. Three months aerobic–strength training and nutritional preference in relation with functional status, metabolism and cognitive functions in seniors with mild cognitive impairment

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Introduction: Prevalence of Mild Cognitive Impairment (MCI) in 65 years old Europeans is approximately 6 % and it increases with age. Active lifestyle and healthy diet could protect from ageing-associated cognitive decline. **Aim:**

To explore the effects of (i) 3-months combined aerobic-strength training and (ii) food preference on functional status, metabolism and cognitive functions in healthy seniors (controls; 2M/5F) and seniors with MCI (2M/11F). **Methods:** Twenty individuals (age 72 ± 5 yrs) underwent phenotyping before/after intervention. Body composition (bioimpedance; Omron), Resting Metabolic Rate (RMR, indirect calorimetry), glucose tolerance (oral glucose tolerance test) and cognitive functions (Adenbrook's Cognitive Examination, ACE-R; computerized MemTrax test) were assessed. Physical activity (Baeck questionnaire, accelerometers) and food preference (questionnaire) were assessed and skeletal muscle index (SMI) was calculated. Physical fitness (VO_{2max} , Rockport Walk Test), muscle strength (dynamometry) and muscle performance (10 m Walk Test – max/preferred speed, 10-MWT/M/P; Chair Stand Test, CST) were measured. **Results:** Three months training improved functional capacity (10MWT/P, controls $p = 0.03$; MCI $p < 0.001$), 10MWT/M (MCI $p = 0.02$), CST (controls $p = 0.02$; MCI $p = 0.01$) with no change in body composition, BMI, glucose tolerance and RMR ($p > 0.05$). Cognitive functions improved specifically in MCI group (ACE-R: total score, $p = 0.01$; ACE-R: memory, $p = 0.01$). MemTrax reaction time improved in both groups ($p < 0.001$) and it was associated with 10MWT/P ($r = 0.78$; $p < 0.01$) and CST ($r = 0.68$; $p < 0.01$). No effect of intervention on nutritional preference was observed. Interestingly, we observed lower fat preference score in MCI individuals compared to controls ($p = 0.05$). High protein score was associated with muscle strength (knee flexion; $r = 0.37$; $p = 0.02$) and 10MWT/P ($r = 0.5$; $p < 0.01$). High fat/high simple sugar score was negatively associated with fasting insulin ($r = -0.45$; $p < 0.01$). Negative correlation was observed between fasting and 2-hour insulin and SMI ($r = -0.64$; $p < 0.001$ and $r = -0.4$; $p = 0.02$ resp.). **Discussion:** Three months of regular aerobic-strength training improved functional capacity and cognitive functions in seniors, cognition being improved especially in seniors with mild cognitive impairment. Food preference was associated with muscle strength, motor and metabolic parameters, supporting its impact on metabolic health, functional state and cognitive functions.

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97. STOB activities focused on weight reduction and maintenance with respect to the motivational readiness of patients

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Introduction: Primary health care alone cannot take long-term care of obese and overweight people. Patients' organizations therefore represent a very important part of obesity management in the Czech Republic. STOB is one of the patients' organizations involved in weight management counselling. **Methodology:** Theoretical ground – STOB works with patients' motivational readiness to change. People with a lower level of motivation have materials based on motivational interviewing at their disposal. Methodology for higher levels of motivation is based on the principals of cognitive-behavioural therapy and mindfulness. Programs of STOB are focused on a clearly defined specific problem concerning an eating habit, inappropriate or no movement habit, and a psychological problem resulting in eating extra food contrary to a plan. Methodology in the field of nutrition covers not only a problem of what patients eat but also how and why they eat. **Form of influence:** Besides direct impact employed especially within healthy weight reduction courses, STOB influences tens thousands of people "in distance" through printed materials and during last 7 years also through the internet. STOB materials help also to hundreds of specialists within their quick interventions. **Specific materials:** Printed materials for prevention and therapy of obesity will be presented in a real form. You will be acquainted with a set of self-help materials I Want a Change. Internet programs Self-coaching consisting of food-coaching, fit-coaching and psycho-coaching, the system of "traffic lights" offering an immediate feedback will be presented. Psychological video-course Tailored Weight Reduction with STOB consisting of 80 videos based on CBT principles and mindfulness will be mentioned. For maintenance of weight loss a methodology in a form of booklet How to maintain a weight loss and an internet programme Healthy Year (regular week challenges or tasks, motivational competitions, individual motivation and professional advice and other tools) will be presented. **Results:** Via courses of a healthy weight reduction and a methodology of a short intervention provided by professionals STOB has an impact on several thousand people a year. STOB offers help also "in a distant way" via self-help handbooks and especially through internet programs. Due to programme self-coaching (www.stobklub.cz) clients lost 120,000 kg during 7 years. A programme Healthy year brought more than 6,000 clients not only to an increase in education but also to actual change of their habits. **Conclusion:** STOB methodology offers programs with active participation, self-help handbooks and internet programs. STOB helps people not only to acquire knowledge but also to transfer it into real life situations. The activities involve not just weight reduction but mainly maintenance of a weight loss. Practical materials help patients themselves but they spare time also for

professionals using materials for a short intervention provided to patients. Activity of organization STOB focuses on programs addressing many people at low cost.

98. The effect of mexiletine on body weight in type 2 diabetes patients with visceral obesity

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Background and Aims: Visceral fat develops insulin resistance which is a major cause of type 2 diabetes. Reducing visceral fat results in ameliorating metabolic parameters, and eventually decreasing the risk of cardiovascular events. Mexiletine is an anti-arrhythmic agent used for treatment of painful diabetic neuropathy. In the present study, the effect of mexiletine on body weight was evaluated in type 2 diabetes patients with visceral obesity. **Methods:** Type 2 diabetes patients with neuropathy exhibiting visceral obesity ($n = 19$) treated by mexiletine (300 mg/day), and a control group of type 2 diabetes patients in the same condition who received vitamin B12 ($n = 12$) were retrospectively evaluated for 6 months. Body weight, waist circumference, HbA_{1c} , blood pressure, liver function, kidney function, serum lipids and serum uric acid were assessed monthly for 6 months after the treatment. **Results:** Mexiletine significantly decreased body weight (from 79.5 ± 3.9 to 77.9 ± 3.8 kg, $p < 0.05$) and waist circumference (from 99.1 ± 2.4 to 97.6 ± 2.4 cm, $p < 0.05$). The change in body weight and waist circumference in 6 months in the mexiletine group was greater than in the control group (BW: mexiletine 1.6 ± 0.5 , control 0.4 ± 0.8 kg, $p < 0.05$, WC: mexiletine 1.6 ± 0.5 , control 0.4 ± 0.4 cm, $p < 0.05$). In the metabolic parameters, there was significant decrease in triglyceride (from 138 ± 21 to 116 ± 18 mg/dl, $p < 0.05$) and serum uric acid (from 5.2 ± 0.3 to 4.6 ± 0.2 mg/dl, $p < 0.05$). HbA_{1c} decreased from 6.31 ± 0.21 to 6.16 ± 0.15 %. There were no changes in other parameters. Two patients dropped out the study because of epigastric discomfort. **Conclusion:** Mexiletine may have an effect on body weight regulation. It may decrease body weight resulting in reduction of waist circumference, and may possibly ameliorate metabolic parameters by reducing visceral fat in type 2 diabetes patients. Further study should be carried out to clarify the mechanism of the effect.

99. Self-perceived fatigue and physical performance in Flemish school children

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Introduction: Overweight and obesity are increasing in school children. These conditions are often related to an excess caloric intake but also due to increased sedentary behaviour. It was shown that obese adolescents experienced higher levels of fatigue compared to normal weight peers. The aim of this study was to determine the effect of physical activity on self-perceived fatigue and the influence of body composition on these parameters. **Methods:** Adolescents following a technical and professional curriculum ($N = 597$) were assessed during physical education lessons for self-perceived fatigue (SpF; MFI-20), body composition parameters (BCP; using DXA), activity level (AL; Backe questionnaire) and physical performance (PP; grip performance and Cooper-test). **Results:** No significant differences were found for age and length between the normal weight, overweight and obese pupils. Weight, BMI, fat (expressed in kg and %) and absolute lean mass were highest in obese followed by overweight and normal weight. Total Fatigue and all sub-scales were affected by sport Index, fat mass and less for body weight. General, physical fatigue and reduced motivation were affected by sex. **Conclusion:** Weight status did not influence sport index or visa versa, but increased school/work index did. Encouraging pupils to be more physical active to lower SpF would be favourable. Since higher work load (curricular or extra) was related with higher fatigue and fat mass, schools offering a technical and professional curriculum must be aware of this negative effect. Further research is necessary to verify whether school or extra curriculum work has the higher impact on fatigue and a possible effects on school results.

UNMODERATED (DISPLAYED) E-POSTER PRESENTATIONS

100. The different effect of angiotensin 1–7 receptor agonist (AVE 0991) administration on the local renin-angiotensin system of metabolically active tissues in obese Zucker rats

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Local renin-angiotensin system (RAS) in metabolically active tissues, including skeletal muscle and adipose tissue is of physiological relevance. Angiotensin 1–7 (Ang 1–7) is able to enhance insulin signalling and glucose transport activity in both tissues. The major limitation of exogenous administration of Ang 1–7 is that it is a peptide with very short biological half-life and low oral bioavailability. AVE0991, a non-peptide Mas-receptor agonist, has been reported to mimic the action of Ang 1–7. The aim of our study was to evaluate the effect of AVE0991 application on the metabolic parameters, the expression of the RAS components and markers of oxidative stress such as NADPH oxidase 4 (NOX4), p22phox, superoxid dismutases (SOD) and nitric oxide synthases (NOS) in the skeletal muscle and adipose tissue of rat model of obesity. 33-week-old male obese Zucker rats were treated with vehicle (30 % solution of cyclodextrin) and AVE0991 (0.5 mg/kg BW/day in 30 % solution of cyclodextrin) via osmotic minipumps for two weeks. Gene expressions were determined in musculus quadriceps and epididymal adipose tissue using qPCR analysis. Administration of AVE0991 significantly improved glucose tolerance. In the epididymal adipose tissue AVE0991 treatment significantly down-regulated the expression of angiotensin-converting enzyme (ACE). The decrease in angiotensin II producing enzyme of RAS was accompanied by decreased NOX4 as well as eNOS and SOD2 expression with antioxidant properties, establishing a new oxidative-antioxidant balance on a lower level. In the skeletal muscle AVE0991 application significantly enhanced the expression of renin receptor, transcription factor PLZF and NOX4, and tended to increase the expression of p22phox. It has been shown that reactive oxygen species (ROS) have insulin-mimetic action in muscle. Our data indicate that the improved glucose tolerance after AVE0991 treatment might occur due to increased ROS production in the skeletal muscle. On the other hand, the antioxidant mechanisms are enhanced as well by elevated expression of nNOS and SOD1. In contrast to skeletal muscle with high oxidative capacity, adipose tissue is characterized by a far lesser oxidative capacity which is in accordance with presented data on NOX4, eNOS and SOD2. Our results suggest that AVE0991 improves insulin action by different mechanisms in skeletal muscle and adipose tissue.

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101. The effect of high-energy diet on Zucker diabetic fatty rats

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Type 2 diabetes (T2D) is a metabolic disorder characteristic with high blood glucose level due to insulin resistance and insulin deficiency. T2D is closely associated with obesity. Frequently used model of obesity are Zucker diabetic fatty (ZDF) rats showing glucose intolerance, hyperglycaemia, hyperlipidemia and hyperinsulinemia and polyuria. The goal of this study was to determine the effect of chronic high-energy diet feeding on development of diabetes mellitus complications associated with obesity in ZDF rats. Male ZDF rats (a fatty *fa/fa* mutation (-/-); n = 20) and their lean controls (ZL, non-diabetic, +/-, not display expression of *fa* phenotype, n = 10) of the same strain in the age of 3 months were involved in the experiment. All animals were housed under specific conditions at 23 ± 2 °C and 55 ± 10 % relative humidity with a 12 h light-dark cycle, provided with water and diet on *ad libitum* base. The

rats were divided into three groups (n = 10 each) as follows: lean untreated controls (C) and obese rats (E1), both fed by normal chow with 5 % of oils and fats (KKZ-P/M, Dobra Voda, Slovak Republic), and obese rats (E2) fed by modified high energy diet where the number of joules increased substantially (30 % saturated fatty acids, 5 % polysaccharides and 15 % disaccharides). After overnight fasting rats were checked for blood glucose level by a FreeStyle Optium Neo Glucose and Ketone Monitoring System (Abbott Diabetes Care Ltd., UK) using test stripes (FreeStyle, Abbott Diabetes Care Ltd., UK) once a week. During the experimental period there were two spontaneous deaths in E2 group (n = 2, 20 %) 7 weeks after starting modified diet application. Since that the high energy diet was replaced by normal chow in order to prevent further death cases in this group of animals. Analysis of food intake showed the presence of hyperphagia mainly in E1 group. Modified diet caused significantly lower ($P < 0.05$) food intake. Probably the lower content of high-energy diet was able to induce the feeling of satiety quicker and to influence the amount of food consumed. Water requirement was significantly higher in E2 group (modified diet) in comparison to the lean controls and E1 group during the 6 weeks of the experiment. After 6th week of the experiment the water requirement in E1 group started to rapidly increase and in 8th week of experiment was higher than in E2 group. The high energy diet caused rapid increase in water intake and polyuria was higher in rats of E2 group compared with other groups. Modified diet, despite lower intake, caused massive increase ($P < 0.05$) in blood glucose level in comparison to the control and E1 group and earlier manifestation of diabetes complication accompanying with glucose impairment. In our experiment male ZDF rats developed obesity, hyperglycaemia, non-insulin dependent diabetes. Non-diabetic male ZDF lean controls were without any complications. High-energy diet accelerates the symptoms of diabetes mellitus in rat's model for T2D despite of lower absolute food intake.

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102. Administration of peroxisome proliferator-activator receptor alpha (PPAR-alpha) agonist reduces body weight and adipose depots in fructose fed wistar rats

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Aims: To investigate the effect of fenofibrate (PPAR-alpha agonist), on body weight, adipose depots and metabolic parameters in an experimental model of the metabolic syndrome. **Methods:** Metabolic syndrome was induced in 32 male Wistar rats by adding a fructose in drinking water (10 % solution) for 12 weeks. During the last 4 weeks, 16 rats were treated with fenofibrate (100 mg/kg/day) by intragastric tube, while the remaining 16 did not receive any medication (fructose group). Another control group of 16 rats consumed standard rat chow and water for 12 weeks. **Results:** Chronic fructose administration for 12 weeks induced a significant increase in body weight ($p < 0.05$), as well as the weight of the measured fat pads: perirenal ($p < 0.001$) and epididymal pads ($p < 0.001$) as representatives of the visceral adipose depots and the inguinal pads ($p < 0.05$) as a representative of the subcutaneous adipose depots. This was accompanied with a decrease of the subcutaneous/visceral fat ratio. Additionally, serum triglycerides, free fatty acids, insulin, plasma glucose were increased, whereas the serum HDL concentrations were decreased compared to the control group ($p < 0.001$ for all parameters). Treatment with fenofibrate over the final 4 weeks significantly decreased the body weight ($p < 0.001$). This was accompanied by a significant proportional reduction of the epididymal, perirenal and inguinal fat pads ($p < 0.001$ for all parameters), without changes of the subcutaneous/visceral fat ratio. Treatment with this PPAR-alpha agonist reduced serum triglycerides ($p < 0.001$), free fatty acids ($p < 0.001$) and increased HDL ($p < 0.01$) compared with the fructose group. Although the fasting plasma glucose values remained unchanged ($p > 0.05$), fenofibrate improved the insulin sensitivity, as assessed by a decrease of the serum insulin concentration ($p < 0.05$) and a reduction of the HOMA (Homeostasis Model Assessment) index of insulin resistance ($p < 0.01$) compared with the fructose group. **Conclusion:** This study indicates that, beside its well established lipid lowering effects, treatment with the PPAR-alpha agonist fenofibrate also decreases body weight and reduces the fat depots in an animal nutritive model of the metabolic syndrome.

103. Feeding and metabolism altering attributes of the glucose-monitoring neurons in the cingulate cortex of the rat

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Purpose: We aimed to determine the consequences of selective destruction of the glucose-monitoring (GM) neurons in the cingulate cortex (cctx). In the previous experiments, our research group has identified and localized these cells in the cingulate cortex of the rat and during neurochemical characterisation of the neurons they proved to be influenced by catecholamines already known to participate in feeding-associated learning, and memory mechanisms. The (primary) aim of the present study was to further examine the involvement of these chemosensory neural cells in the organization of feeding and metabolism related regulatory processes. **Subjects and materials:** In adult male Wistar rats, after bilateral microinjection of streptozotocin (STZ) into the cctx, 1) acute (20 min) and subacute (2 weeks) glucose tolerance tests (GTTs) were performed; 2) plasma metabolite (total cholesterol, HDL, LDH, triglycerides, uric acid) concentrations before and during GTT were determined; and 3) taste perception capabilities of the animals were tested by means of taste reactivity, 4) conditioned taste avoidance and 5) two-bottle tests. **Outcome measures:** The dynamics of the blood glucose curves of control and streptozotocin treated rats during GTT has proved to be substantially different, in addition, the plasma metabolite levels in the two groups also showed differences. In a parallel series of experiments, the unpleasant tastes elicited more ingestive responses after the GM neuron destroying STZ microinjection, and the observable perception deficit in simple two bottle tests further substantiated the existence of gustatory disturbances of these animals. Nevertheless, it is important to note that conditioned taste avoidance could be established in all animals. **Conclusions:** Our findings suggest definite involvement of GM neurons of the cctx in adaptive regulatory mechanisms of the maintenance of homeostasis. Selective destruction of these chemosensory neurons appears to cause various symptoms of metabolic, gustatory and motivational alterations, thus, indicating finer and probably more complex dysfunctions of the regulatory processes in the background, than it has been suggested in previous experiments.

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104. Metabolic alterations after interleukin-1 β microinjection into the cingulate cortex of the rat

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Broadening our knowledge about the central regulation of feeding and metabolism is indispensable in order to understand the background of feeding-related diseases, such as obesity, diabetes mellitus, metabolic syndrome, etc. The aim of the present series of experiments was to examine the metabolic effects of the primary cytokine interleukin-1 β (IL-1 β) after its administration into the cingulate cortex of male Wistar rats. The cingulate cortex, as part of the forebrain limbic circuitry, is known to have important role in the maintenance of homeostasis. Beyond that, the receptors of IL-1 β have been detected in this area, and the existence of IL-1 β responsive neural cells has also been revealed here during extracellular single neuron recording experiments of our laboratory. The cytokine was microinjected bilaterally by means of a microinfusion pump, via guide cannulas implanted above the target area during a stereotaxic operation one week earlier. The measurements were performed after a 12 hour fasting period, 20 minutes following the microinjections. Blood glucose levels of the animals were examined in a glucose tolerance test (GTT). Blood samples were obtained from the tail vein of the rats right before the cerebral micrionjections and 9, 18, 30, 60 and 120 minutes after the intraperitoneal glucose load. The plasma levels of total cholesterol, HDL, LDH, triglycerides and uric acid were measured with a cold chemistry photometer. Blood glucose concentrations of the cytokine treated animals were found to be higher compared to the controls throughout the GTT, but the differences did not reach the level of significance. In contrast, a significant decrease in the plasma concentrations of HDL and

total cholesterol were measured compared to the control rats. There was no significant alteration in the concentrations of LDL, triglyceride and uric acid levels. Our results provided evidence for the existence of local IL-1 β mediated control mechanisms of the lipid metabolism, and further emphasize the intimate involvement of the cingulate cortex in these complex regulatory processes of the maintenance of homeostasis.

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105. The use of newly discovered myokine irisin as a biomarker for individualised recommendation for physical exercise in obese individuals

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Obesity is one of the most important public health problems of the 21st century, due to its increasing prevalence and causal relationship with non-communicable chronic diseases. In the absence of efficient medical treatment, people with excess weight are advised to follow a low calorie diet and do regular exercise, with only modest results on weight loss and hence poor adherence. However, increasing physical exercise has numerous beneficial effects even in the absence of significant weight loss, among which cardiovascular and metabolic, which is why it is viewed as an indispensable part of the treatment for obesity. The recommendation for physical exercise in individuals with excess weight should be specific and based on quantifiable factors. High-intensity interval training (HIIT) appears to have more beneficial results on cardio-vascular fitness and metabolic parameters than moderate intensity continuous training (MICT), but there are no such studies in people with excess weight. Recently, the focus has been on the muscle as an endocrine organ during physical exercise. A newly discovered myokine called irisin appears to determine the browning of white adipose tissue with all the beneficial results. Irisin increases during physical exercise, dependent on intensity and duration, but data comes only from animal models and a few small studies in humans. We conducted a narrative review of published data aiming to determine whether irisin could be used as a biomarker of the efficiency of physical exercise and discriminate between the efficiency of HIIT vs. MICT. We found that although irisin is a suitable biomarker for assessing physical exercise, data is controversial regarding what type of physical exercise leads to a more significant increase in irisin in obese individuals. Currently, we are undergoing a case-control study to determine the type of physical exercise that leads to the maximum increase in irisin in men with excess weight, HIIT or MICT, in comparison to normal weight men. The study includes 40 healthy young men with excess weight and 20 normal weight controls that undergo single boosts of both types of physical exercise (HIIT and MICT) and circulating levels of irisin in dynamic are being assessed, along with complex anthropometric and metabolic parameters. To our knowledge, it is the first study of this type and magnitude, and the results will be important for more specific recommendation for physical exercise in people with excess weight.

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106. Association between biomarkers of adipose-tissue inflammation and immune response: A meta-analysis

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Background: Obesity-induced inflammation potentially promotes a variety of chronic conditions and diseases. Immunometabolism has emerged as a new field of research that investigates the interplay between immunological and metabolic processes in human organism. As a result of booming research interest on this topic over the last years, a large number of biomarker studies on adipose-tissue derived hormones and immune-inflammatory biomarkers has been published. However, no quantitative evaluation of reported associations between biomarkers of immunity and metabolism was previously performed. **Methods:** We aimed to systematically evaluate population-based studies reporting on the associations between adipose-tissue derived hormones [leptin and adiponectin] and inflammatory biomarkers [C-reactive protein (CRP), interleukin (IL)-6 and tumor necrosis factor (TNF)- α]. In addition, we assessed the influence of age, sex and adiposity status on these associations. We conducted a systematic search of the databases EMBASE and MEDLINE (PubMed) up to January, 2017. Peer-reviewed cross-sectional

studies were included reporting on correlation coefficients between evaluated biomarkers. Studies with participants younger than 18 years and conducted in terminally ill participants and pregnant women were excluded. Data was independently extracted by two reviewers. Pooled effect sizes and 95 % confidence intervals were calculated using random-effects models considering variations among the studies. Quality of the studies was assessed using BioCross evaluation tool developed for biomarker-based cross-sectional study evaluation. Results: After initial search 5,907 publications were retrieved and from these 314 articles were retained for a full-text review. After evaluation for eligibility, overall 60 studies and a total number of 45,210 participants aged on average 50 years were included in the meta-analysis. Positive correlations were observed for leptin with the inflammatory biomarkers (Pooled R_{ho} = 0.35, 0.17 and 0.16 for CRP, Il6 and TNF α , respectively), whereas the respective correlations with adiponectin were negative (Pooled R_{ho} = -0.17, -0.14, and -0.14 for CRP, Il6 and TNF α , respectively). Stratification by age showed that the correlations among biomarkers tended to be weaker with increasing age of the study participants, particularly for adiponectin. When analyzed according to adiposity status, stronger correlations were observed for leptin with CRP and IL-6 in obese participants, whereas no differences were observed for the correlations with adiponectin. No substantial differences were observed by participants' sex. Conclusion: This is the first quantitative synthesis of human studies using measured biomarkers to evaluate the interplay between metabolic and immune-inflammatory pathways. Importantly, the data revealed potential influences by older age of participants that require further evaluation. Interdisciplinary research for a better understanding of the obesity and inflammation links predisposing disease onset with advanced age is highly warranted in the future.

107. Assessment of the resting energy expenditure in obese individuals

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Introduction: Weight loss programs are based on inducing a negative energy balance by decreasing energy intake while increasing energy expenditure. Energy needs of obese patients are difficult to determine. The value of resting energy expenditure, as the largest component of the energy needs, is usually calculated to assess an adequate energy intake for obese patient. In clinical practice, predictive equations are most commonly used for this purpose, because of their simplicity, although many clinical studies have shown that in obese individuals they may generate errors large enough to impact the outcome of treatment. It leads to the prescription of an inadequate diet that does not meet the criterion of long-term sustainability. **Objective:** The aim of the thesis is to compare the values of resting energy expenditure (REE) measured by indirect calorimetry with values calculated with Harris-Benedict predictive equation in a selected group of obese individuals. **Methods:** The sample includes 38 subjects, 28 women and 10 men, patients of the General University Hospital in Prague. The average age is 48 ± 11.71 years, the mean BMI is 42.88 ± 9.09 kg/m². For each subject, resting energy expenditure was measured by indirect calorimetry and calculated by the Harris-Benedict predictive equation. Indirect calorimetry is considered as a reference method. The values of measured and calculated REE were statistically evaluated. Paired t-test on the mean value was selected for the statistical significance testing. **Results:** The mean value of REE obtained by calculation according to the Harris-Benedict equation is $8,462 \pm 1,919$ kJ/day. The mean value of REE measured by indirect calorimetry is $8,006 \pm 1,675$ kJ/day. The average absolute deviation value of calculated REE in comparison to the measured values is $456 \pm 1,325$ kJ, the average percentage deviation is 7 ± 17 %. The REE values calculated according to the Harris-Benedict equation obtained in comparison to the values measured by the indirect calorimetry REE ± 10 % variation in only 48 % of cases (n = 18). Based on the 5 % significance level, there is a significant difference between the results of the method of indirect calorimetry and the predictive equation Harris-Benedict. **Conclusion:** The calculations of REE with the Harris-Benedict predictive equation show statistically significant differences in comparison to the actual values measured by indirect calorimetry. Using predictive equation gives inaccurate results for obese. Indirect calorimetry, while maintaining correct measurement conditions, is considered the most accurate method available, but cannot be used across the board in all patients within a weight management plan. The optimal approach thus appears to be to calculate energy intake from patient's current food records.

108. Linking Adaptive Response to Regular Exercise in Muscle and Brain

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Introduction: Muscle function and morphology are closely related to regular exercise and nutritional preferences. Exercise is known to improve cognitive functions and modulate nutritional preference. **Goals:** To investigate relationships between exercise induced-effects on (i) muscle functional and morphological parameters and (ii) dietary preference in individuals subjected to 3-month supervised exercise intervention. (iii) Interactions with exercise-induced changes in cognitive functions were investigated in a subgroup of elderly individuals with mild cognitive impairment (MCI). **Methods:** Study population consisted of 80 non-obese (BMI 28.9 ± 0.5 kg/m²) upper-middle aged (56.4 ± 1.9 yrs.) individuals and 10 individuals with MCI (26.0 ± 0.7 kg/m²; 71.3 ± 1.6 yrs). Hand-grip and leg-press dynamometry were used to evaluate exercise-induced changes in muscle strength. Muscle cryosections (6 mm) were examined by histomorphometry and histochemistry (ATPase activity). Food preference for individual micronutrients was calculated using food preference questionnaire and food composition databases (FDA, ALIMENTA). Samples of *m. vastus lateralis* were taken by Bergstrom needle biopsy. Cognitive functions were assessed by standardized cognitive tests. **Results:** Handgrip strength was positively associated with lean body mass (LBM) and negatively with fat mass ($R = 0.76/-0.62$, $p < 0.001$). Size of fast oxidative (Type IIa) fibers was positively associated with hand-grip strength ($R = 0.56$, $p < 0.001$) and with LBM ($R = 0.35$, $p < 0.045$). Exercise-induced change in type IIa fiber size positively correlated with BMI and body fat and negatively with LBM ($R = 0.57/0.64/-0.63$, $p < 0.023/0.006/0.008$). Slow twitch to fast-twitch fiber ratio was negatively associated with exercise-induced improvements of short-term visual memory (MemTrax) in MCI individuals ($R = -0.81$, $p < 0.001$). There was a positive correlation between exercise-induced changes in visual memory, slow to fast fiber ratio and type IIa fiber size ($R = 0.64/0.61$, $p < 0.045$). Dietary preference for food containing arachidic (C20:0) and behenic (C22:0) acid (e.g. fish & vegetable oils) was positively related to type IIa fiber size ($R = 0.56/0.62$, $p < 0.05/0.025$) and muscle strength (hand-grip & leg press) (C20:0, $R = 0.6/0.56$, $p < 0.0005/0.031$, C22:0, $R = 0.63/0.56$, $p < 0.0001/0.032$) and negatively to short term visual memory (C20:0, $R = -0.53/-0.51$, C22:0, $R = -0.53/-0.51$, $p < 0.03$). **Conclusion:** In our study, muscle strength was related to size of fast oxidative IIa fibers and to dietary preference for fish and vegetable oils containing long chain saturated fatty acids. Exercise-induced change in visual memory was greater in MCI individuals whose muscle contained more IIa fibers, which readily increased in size in response to exercise.

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109. Fat makes adolescents feel tired

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Introduction: Puberty can be disrupted by various factors such as unhealthy behaviors, malnutrition but also obesity. Being physically active, at least 60 minutes a day, and decrease recreational screen time to no more than 2 hours a day is recommended. Beside these physiological concerns, more attention is given to the psychological aspect. Fatigue is already identified in chronic conditions such as obesity but is also a growing problem in school attending adolescents (< 25 %). This study tried to link body composition parameters with (self-perceived) fatigue and physical activity/performance. Further, relations between (self-perceived) fatigue and physical activity were examined and finally predictors for (self-perceived) fatigue were determined. **Methodology:** A total of 452 high school pupils (12-20 years) were recruited with a 66/34 boy/girl ratio. Pupils were measured for body length, weight and body composition (Fat mass, fat percentage, fat free mass and muscle mass). Additionally, physical activity (Baeke questionnaire), physical performance (grip strength, fatigue resistance, grip work and Cooper test) and self-perceived fatigue (MFI-20) were assessed. The population was divided into 3 groups namely Low Fatigue (LF), Medium Fatigue

(MF) and High Fatigue (HF), based on Total Fatigue outcomes. **Results:** No significant differences were found for age, weight and BMI between the 3 fatigue groups (LF, MF and HF). Fat mass and fat % were significantly lower in the LF group compared to MF ($p < 0.05$) and HF ($p < 0.01$). Grip endurance was increased in LF ($p < 0.05$) and MF ($p < 0.01$) compared to HF, similar results were found for Cooper test. Grip strength, on the other hand were comparable, between the groups. Sport Index was higher in LF compared to MF and HF ($p < 0.01$). Fat and physical activity were related with self-perceived fatigue ($p < 0.01$). Finally results showed that decreased Fatigue Resistance, Sport Index and a higher fat % increased the chance of being extremely fatigued. **Conclusion:** An Increased sense of fatigue appears in adolescents with higher fat percentage, reduced physical performance and decreased physical activity. This study emphasises the importance of using fat mass and fat percentage instead of BMI for screening adolescents to determine their health status. To prevent increased fatigue, it is necessary to stimulate youngsters to be physically active and to promote healthy behaviours.

110. Super obesity and bariatric surgery – is the gastric balloon always useful?

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Background: A male, 35-year-old patient was presented in June 2014 in our obesity consultation with the question of a bariatric surgical intervention (BCI). For a body size of 1.97 m, the body weight was 275 kg, which corresponded to a BMI of 71 kg/m². There was a marked metabolic syndrome with diabetes mellitus type II, arterial hypertension and sleep apnea syndrome, orthopedic attendant diseases and a global heart failure with recurrent decompensations. Multiple hospitalizations were necessary due to cardiac insufficiency. For a given primary indication for BCI, a preoperative weight reduction for the reduction of the operative risk should be achieved by means of application of a gastric balloon (GB) prior to laparoscopic sleeve resection. **Case history:** The GB application (Obera/Allergan) took place in December 2014. The GB was filled with 700 ml of NaCl solution which were colored blue with indigocarmin in order to be able to detect a possible leakage or rupture of the GB due to a coloration of the urine. The patient was closely checked by the team of our obesity center and was intensively accompanied by a trophologist. Following an initial success and a temporary weight loss of approximately 30 kg, there was a weight regain, which could not be stopped, despite an extended duration of therapy with the GB up to 8 months. Relevant side effects of the GB (vomiting, GI bleeding and aspirations) did not occur. Finally, the GB was removed in August 2015. At 257 kg, the weight was only 18 kg below the initial weight. Cardiac insufficiency therapy has become increasingly difficult. The Patient had several hospitalizations during he had the GB, mostly because of hyperhydration. Finally, laparoscopic sleeve resection with a body weight of 258 kg was performed in October 2015 without complications. A few days after the procedure, an increased spontaneous diuresis was observed. By May 2017, a weight reduction of 134 kg could be achieved. The antihypertensive agent could be discontinued, the diuretic dose significantly reduced. **Conclusion:** The presented course shows that an urgently indicated BCI can also be delayed by a GB application. The patient would have been operable on ex post, even with 275 kg, which is an argument for an always critical indication GB, especially due to the fact that severe complications might be associates to GB in super obese patients. Moreover, the case also shows that even super obese patients with cardiac insufficiency can be successfully treated by BCI.

111. Gastric perforation, a rare complication of gastric balloon (Case report)

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The BioEnterics intragastric balloon (BIB) is one of the most common bariatric procedures in obese patients in Egypt and middleeast. There are many complications related to it, one of rare and life-threatening complications is gastric perforation. We report a case of such complication 4 months after BioEnterics intragastric balloon insertion in a 27 years old male patient. The patient came to emergency department; he was ill and toxic with sever agonizing pain since two days. By examination there was marked guarding all over the abdomen (surgical abdomen) plain Xray revealed air under diaphragm, moderate peritoneal collection by ultra sonography. Laparotomy was done which revealed anterior gastric wall perforation.

112. Food habits and nutritional status in Hungarian young people

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The Health Behaviour in School-Aged Children (HBSC) study is a World Health Organization (WHO) collaborative cross-national data collection, in which Hungary has taken part for more than three decades. The aim of the HBSC study, besides monitoring different trends, is to get information about young people's health- and risk-behaviour. In 2014, when the latest data collection was carried out, 6,153 11–18-year-old students were involved in the nationally representative sample. This study presents the food habits: frequency of fruit, vegetable, sweets and non-diet soft drink consumption, and the nutritional status of the youth based on the last HBSC survey. Data were collected in school-settings by the use of voluntarily self-reported, anonymous questionnaires, and with the approval of the Hungarian National Ethical Authority. Descriptive statistics were computed, sex and age differences were tested by bivariate analyses (Chi-square tests, t-tests, and ANOVAs). In the whole sample 32.6 % of the students consumed fruits and 30.4 % consumed vegetables daily. One-third of the students reported daily sweets consumption and 26.3 % consumed soft drinks daily. Generally, girls consumed fruits and vegetables more frequently than boys; and the frequency of consumption declined with age in both genders. The sweets and soft drinks consumption frequency also decreased with age and the sweets consumption was more typical in girls but the soft drink consumption frequency was higher in boys. According to the reported BMI based nutritional status, less than 3 % of the youth were obese, a bit more than 12 % were overweight, 70 % had normal weight and 15 % were underweight. Hungarian students' percentages in daily fruit and vegetable consumption were close to the international average, but the sweets and soft drinks consumption was higher. Generally, the fruit and especially vegetable consumption in Hungary increased between 2010 and 2014. Young people's prevalence in different nutritional groups have not changed comparing the last two data collections; however, the ratio of obese and underweight students is still high. Despite the positive changes documented in this study, the majority of the young people are far from meeting the international dietary recommendations.

113. Evaluation of nutrition-related risk factors among the Hungarian adult population

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Nutrition related diseases are the leading causes of morbidity and mortality in Hungary. In order to improve the health of the population it is essential to assess the nutrition-related risk factors and to reduce their prevalence by targeted interventions. Nationally representative nutritional surveys reveal the nutritional risks among the population. In this current study the evaluation of the main nutrition-related risk factors (excessive fat, saturated fat, sugar and salt intake, low vegetable and fruit consumption) is presented through the results of three major nutritional surveys: The First Hungarian representative nutrition survey (1985–1988), the Hungarian Diet and Nutritional Status Survey 2009 (OTAP2009) and the Hungarian Diet and Nutritional Status Survey 2014 (OTAP2014). According to the data of the First Hungarian representative survey the fat intake of the Hungarian population was about 10 % higher than recommended and the intake of saturated fatty acids was nearly three times higher than the recommended maximum of 7 E %. In the OTAP2009 and OTAP2014 studies there was a decline in the population's fat intake compared to the first survey but at the same time the fat intake of women showed a significant increase between 2009 and 2014. Although the intake of saturated fatty acids has fallen since the first study the < 7 E % intake recommendation is exceeded by both men and women. The proportion of energy from saturated fatty acids from dietary intake in women has increased slightly but significantly by 2014 compared to the 2009 data. According to the results of the first study the intake of added sugar exceeded the recommended 10 E % but in the other studies the intake values met the recommendations. However, it should be highlighted that while in 2009 the proportion of energy from added sugar was below 10 E % in all ages, in 2014 the intake of added sugar in young women exceeded the recommended level. The salt intake of men was extremely high at the time of the first study and although it has fallen by 25 % by 2014, it is still three times higher than recommended. The salt intake of women has also declined but it still exceeds the recommended level. The fruit/vegetable consumption increased between 1985 and 2009, but a declining tendency can be observed between 2009 and 2014. According to the surveys conducted between 1985 and 2014 the fat, saturated fatty acid, added sugar and salt intake fell in Hungary, however, with the exception of sugar intake, each value still exceeds the recommended level. It is important to follow the nutrition and the nutritional status of the population in the future as well so that targeted interventions can be implemented.

114. Which foods are deficient in the diet of patients with type 2 diabetes?

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Introduction: Education is the most time-consuming part of the treatment of DM. **Objective:** The aim of this work is to emphasize the importance of regular consumption of nuts, dairy products rich in omega-3 fatty acids and the daily consumption of vegetables and fruit several times a day. **Patients and methods:** We were comprehensively educated 200 outpatients (117 men and 83 women, aged from 30 to 92 years) with newly diagnosed and previously untreated diabetes mellitus type 2 during the period of 8/2007–8/2011. In order to determine the quality of education and compliance after 18 months we have compiled a questionnaire containing 63 questions that followed the lifestyle measures: physical activity, shift work, sleep, passing diet in the past, alcohol consumption, smoking and drinking regime and a qualitative changes in the diet: meal frequency directly, the frequency of fruits and vegetable consumption, consumption of: nuts, fish, white and dark meat, legumes, thermal technologies in food processing, intake of unhealthy fat and simple carbohydrates, frequency of consumption of: bacon, greaves, liver, sausages and sausage, chocolate, cookies, instant meals, soft drinks, eggs, dairy products, sweetening and salting. 142 patients (74 men and 67 women), women age: 44 to 86 years (median 65 years), male age: 37 to 92 years (median 64 years) have agreed for filling out the questionnaire. **Results:** Our data suggest that 29.87 % of women and 24.32 % of men in our study consumed tree nuts times a week. 10.45 % of women and 9.46 % of men consumed tree nuts five times a week. 28.36 % of women and 24.32 % of men in our study consumed 5 times a week dairy products and 28.4 % of women and 37.8 % of men consumed 3 or 4 times a week dairy products. Only 74.63 % of women and 50 % of men in our study consumed every day of the week fruit and only 31.34 % women and 16.22 % of men consumed every day of the week vegetables. **Conclusion:** According to the Statistical Office of the Slovak Republic is a low consumption of nuts, milk products, vegetables and fruit per capita per year in comparison with consumption in other countries with lower cardiovascular and oncological mortality. In the present days, more scientific evidence is available that supports the recommendation of Mediterranean diet is applicable therapeutic strategy for decrease the risk of oncological and cardiovascular disease associated with metabolic syndrome and type 2 diabetes. We present recommendations that support use of this specific diet in daily praxis. The implication of Mediterranean diet is based on no radical nor extensive intervention in dietary habits, in rather represents an offer of wider variety of healthier types of food.

115. The dietary habits of the Hungarian adult population – Hungarian diet and nutritional status survey (OTAP 2014)

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The mortality and morbidity rates of the Hungarian population show a negative picture compared to other European countries. One key measure to prevent chronic diseases is the promotion of healthy eating. The aim of the analysis is to demonstrate how the dietary habits of Hungarian adults comply with the key elements of dietary recommendations (e.g. quantity and quality requirements for the consumption of fruits and vegetables, whole grain, milk and milk products, as well as the reduction of salt intake). The Hungarian Diet and Nutritional Status Survey 2014 included the completion of three-day dietary records followed by a multistage validation process. The three-day dietary records provided information on the energy and nutrient intake values, the number of daily meals consumed, the eating rhythm of the population, and the type and quantity of foods most frequently consumed over a given period. According to the dietary records, 72 % of adults do not consume whole grain based food at all. Two thirds of the Hungarian population consume less fruits and vegetables than recommended. It is a particularly unfavorable change that the consumption of fresh fruits and vegetables has fallen by almost a fifth compared to the previous survey in 2009. Instead of the recommended daily 0.5 l milk or equivalent calcium-containing dairy products, the population only consumes an amount of calcium equaling to 0.3 l of milk. Based on the results of the study it can be concluded that the dietary habits of the Hungarian population do not meet the recommendations. The information obtained from nutritional status surveys could promote the elaboration of effective recommendations, public health programs and legislative measures, which could help to reduce the prevalence of overweight and obesity currently affecting two thirds of the Hungarian population.

116. Investigation on the existence of eating disorders and differences to eating habits, in students aged 15–18 years old in the city of Nafpaktos, in resting conditions and in exams period

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Aim: The aim of the study was to investigate the existence of eating disorders in a sample of adolescents and on the other hand the assessment and verification of the contribution of exams anxiety to possible changes in dietary habits or in the incidence of eating disorders, exploring a potential climax for both anxiety and eating behavior during national university entrance exams. **Material–method:** 120 students in High Schools of Nafpaktos participated in the study. Except for anthropometry, a wide range of specific questionnaires was used and completed on two separate occasions: a) during the control period (relax) and b) during the examination period (anxiety). Statistical analysis was performed using the statistical package SPSS 23. **Results:** 1.71 % met criteria for anorexia and 5.83 % for bulimia. 7.5 % had atypical anorexia symptomatology (1.66 % presents bulimic symptoms). 12.5 % was vulnerable to a future development of eating disorders symptoms. The 50.83 % likely reflected a subclinical group of binge-eaters. The average adherence to the Mediterranean diet was low in the resting phase and even lower in the anxiety period. Those who fed according to the Mediterranean Diet standards showed an increase during the anxiety period in potato and whole grain consumption, stagnation in consumption of olive oil, reduction in all other foods. The average adherence to the Mediterranean diet was low in the resting phase and even lower in the anxiety period. Those who fed according to the Mediterranean Diet standards showed an increase during the anxiety period in potato and whole grain consumption, stagnation in consumption of olive oil, reduction in all other foods. More stress and nutritional changes were found in the A, C class where there was a decline in the consumption of pulses, fish, and cereals during the exam period. Pupils of A' Class also were experienced a drop in full dairy consumption, while C' class' students increased poultry, meat and fruit consumption. Statistically significant differences were found between boys and girls in all food categories in the anxiety period, while in both sexes statistically significant differences in the two periods in consumption of fruits and juices, pulses, and red meat. Girls also show a statistical difference in the consumption of vegetables and salad and fish and soup while the boys in olive oil and alcoholic beverages: $p < 0.05$. Exams anxiety was negatively related to adherence to the Mediterranean diet, consumption of legumes ($p < 0.05$), red meat, poultry ($p < 0.01$) in the testing phase and positive correlation with the consumption of olive oil ($p < 0.01$). It is related to girls with all the scales of eating disorders, eating habits, feeding according to external stimuli, while in boys only with emotional nutrition. In girls it was correlated with all eating disorders scales and the subscales "Preoccupation with food" and "Dealing with diets", the subscale "nutrition under external stimuli" while in boys there was correlation only with "emotional eating" subscale. **Conclusions:** Urgent need for eating disorder prevention programs and management of exams anxiety in schools.

117. Association between lipoprotein(a) and fatty liver disease in nonalcoholic patients

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Background and aims: High levels of lipoprotein a [Lp(a)] have been associated with increased risk of cardiovascular disease, possibly through atherogenesis or through disruption of the fibrinolytic mechanism. The aim of this study is to investigate the effect of Lp(a) levels on the presence of fatty liver disease in nonalcoholic patients. **Methods:** The study included 223 participants, with a mean age of 71 ± 11 years that were hospitalized for minor illnesses in or visit for routine health screening examination the departments of internal medicine of three tertiary hospitals. None of the patients suffered from diabetes or had any medication for dyslipidemia. The study duration was 12 months. Patients were divided into two groups according to the levels of Lp(a) (normal-abnormal) The presence of the fatty liver disease was assessed to all patients by ultrasonography by two independent ultrasonography specialists. **Results:** Group A included 101 participants who had abnormal values of Lp(a), while in Group B were included 122 patients with normal Lp(a). In group A, 65 patients with fatty liver disease were recorded, while in Group B 57 patients had fatty liver disease. The difference between the two groups showed borderline statistical significance ($p = 0.055$). The statistical significance did not change after adjusted for other factors such as LDL, BMI, total

cholesterol, triglyceride, presence of high blood pressure or fasting glucose. **Conclusions:** It seems that there is a possible correlation of abnormal levels of Lp(a) and the presence of fatty liver disease in nonalcoholic patients. Further studies with a larger population with greater statistical power are needed to confirm these findings and to clarify the possible pathogenetic mechanism.

118. Half-century trends of obesity development in Slovak population – dietetic possibilities of obesity correction and its complications

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Introduction: An extensive review of foreign literature confirms the epidemic increase in obesity prevalence, especially in populations of economically prosperous states. The number of overweight or obese young children globally increased from 31 million in year 1990 to 42 million in 2015 (WHO). It is important to find out if this aforementioned unfavorable world phenomenon also concerns the inhabitants of Slovakia. **Objective:** To present the results from the 50-year trends in the prevalence of obesity in the young generation and adults in the SR and its dynamics (1964–2014) and to point out the dietetic possibilities of obesity correction and its complications. **Characteristic of the study sample and methodology:** Different samples of representative studies from the population of children and adolescents, aged 7–18 y. (totally over 5,500 children and youngsters), and healthy adults, aged 19–75 y. (about 3,500 people), gender and age-proportioned population were used. **Dietetic tests:** Reduction diets 600 kcal (2,500 kJ)/24 hours, 4 weeks, 750 kcal (3,350 kJ)/24 hours, with the addition of 2.5 g of n-3 PUFA, three times a week for period of 6 weeks in proportional and obese individuals with hyperlipoproteinemia, in one group also with an impaired glucose tolerance for 4 weeks. Totally were involved 208 subjects, age in zone 36–49 years. Basic somatometric measurements were determined by standard methodical procedures. We have calculated the height-weight indexes BMI (kg/m²). For children and youth we have used BMI percentile tables, differentiated by gender and age, developed from 1951, regularly updated at 10-years intervals, the last ones in 2011, from Nation-wide research of the young generation aged 7–18. The criteria for preobesity (overweight) was 90–96.99 percentile, for obesity 97 percentiles and above. Preobesity was classified as BMI 27.3–29.99 kg/m² for adult women and for men 27.8–29.99 kg/m², as obesity BMI over 30 kg/m² for both sexes. Serum lipid parameters were analyzed (total cholesterol-TC, LDL-C, HDL-C, triacylglycerols (TAG) using Johnson & Johnson's Vitros automated analyzer, there were calculated AI (TC/HDL-C), glycemic curve determined by standard laboratory procedure after 75 g of glucose p.o., glycemia by o-toluidine reaction and insulinemia, as an immunoreactive insulin (IRI) kit (NS-SET /DCC) from Poland. **Results:** Development of the obesity prevalence among young generation (girls and boys) aged 7–18 during the period 1964–2014 shows in 2 forms – preobesity and obesity: 9.4 %, vs. obesity rate 3.1 % in 1964, 11.3 %, vs. 5.1 % in 1984, 13.3 %, vs. 6.3 % in 2007 and 18.9 %, vs. 8 % obesity in 2014. In adults (females and males) aged 19–75 years, preobesity and obesity: 20.1 %, vs. obesity 8.3 % in 1964, 25.3 %, vs. 11.7 % in 1984, respectively just obesity 18.8 % in 1995, 18.1 % in 2000 and 16.8 % in 2014 (OECD). **Clinical tests:** After reduction diet (600 kcal/24 h), lasted 4 weeks, weight reduction was 9.5 kg, p < 0.01, we recorded decrease in serum lipids parameters (mmol/l): TChol, p < 0.001, LDL-C p < 0.01, HDL-C p < 0.05 (adverse finding), TAG p < 0.01, AI was non-significant. After PUFA application n-3, 2.5 g/day, 3 times per week for 6 week in proportional individuals; significant reduction in TAG levels p < 0.001, TC and LDL-C p < 0.01, AI p < 0.05, the desired increase in HDL-C p < 0.05. After reduction diet 750 kcal + 2.5 g PUFA n-3, 3 × week: weight reduction was 10.6 kg, p < 0.01, significant reduction in TAGs, p < 0.001, TC and LDL-C, p < 0.01, also decrease in AI p < 0.05, no significant changes in HDL-C. Reduction diet 600 kcal/24 h, 4 weeks in obese women with hyperlipoproteinemia (n = 47), also with impaired glucose tolerance (n = 37), weight reduction was 9.7 kg, p < 0.01, TC, p < 0.01, LDL-C, TAG and AI p < 0.05, HDL-C, ns. glycemic curve before and after reduction – improvement in glucose tolerance, p < 0.05, insulinemia curve – significant reduction of basal insulinemia and whole curve, p < 0.001. **Conclusion:** Obesity among inhabitants of the Slovak Republic does not show the conditions of the epidemic yet, but it is justified to apply complex procedures for its prevention, especially in the younger generation. A frequent finding of hypertriacylglycerolemia in 55 % of obese people is appropriate to correct by adding PUFA n-3 in their diet. Reduction diet (low caloric diet) in addition to achieving weight loss, also regulates hyperlipoproteinemia, improves glucose tolerance and reduces hyperinsulinemia.

119. Consumer perspectives about weight management services in a community pharmacy setting in Albania

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Background: Obesity is a public health challenge faced worldwide. Community pharmacists may be well placed to manage Albania's obesity problem owing to their training, accessibility and trustworthiness. However, determining consumers' needs is vital to the development of any new services or the evaluation of existing services. **Objective:** To explore Albanian consumers' perspectives regarding weight management services in the community pharmacy setting, including their past experiences and willingness to pay for a specific pharmacy-based service. **Design:** An online cross-sectional consumer survey was distributed to participants regular customers of a community pharmacy in Lezhe, Albania. The survey instrument comprised open-ended and closed questions exploring consumers' experiences of and preferences for weight management services in pharmacy. It also included an attitudinal measure, the Consumer Attitude to Pharmacy Weight Management Services (CAPWMS) scale. **Setting and participants:** A total of 213 consumers from Lezhe, Albania completed the survey. **Results:** The majority of respondents had previously not sought a pharmacist's advice regarding weight management. Those who had previously consulted a pharmacist were more willing to pay for and support pharmacy-based services in the future. Most consumers considered pharmacists' motivations to provide advice related to gaining profit from selling a product and expressed concerns about the perceived conflicts of interest. Participants also perceived pharmacists as lacking expertise and time. **Conclusion:** Although Albanian consumers were willing to seek pharmacists' advice about weight management, they perceived several barriers to the provision of weight management services in community pharmacy. If barriers are addressed, community pharmacies could be a viable and accessible setting to manage obesity.

120. Effectiveness of cognitive behavioral therapy on changes of anthropometric and biochemical parameters in group weight reduction courses

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Introduction: Obesity is currently considered to be the most frequent metabolic disease worldwide, not only in developed but also in developing countries. Increasing prevalence of obesity could be called an epidemic of the third millennium. STOB society evolved a 12-week structured plan for weight reduction, which is applied in a closed group. Group therapy is based on cognitive behavioral therapy. Aim of our work is monitoring effectiveness of this programme on anthropometric and biochemical changes and changes of eating and physical activity habits. **Methods:** Women who intended to reduce their excess weight were enrolled. Design of study consists of first baseline measurement of nutritional state and control measurements after 12 weeks intervention. Nutritional state was evaluated by BMI, waist circumference, and bioelectrical impedance analysis. Muscle strength was evaluated using the hand grip test by digital strain gauge Geta. For evaluation of nutritional intake we used 7-day food record and analyzed by software Nutridan2. We collected blood samples for biochemical examination (fasting glycemia, total cholesterol, HDL cholesterol, LDL cholesterol, triglycerides and uric acid). Physical activity was monitored by accelerometer InBody band and number of steps by day. **Results:** Till now we enrolled 23 women with mean age 40.3 ± 13.3 years. BMI was changed from $34.0 \pm 7.3 \text{ kg}\cdot\text{m}^{-2}$ to $32.8 \pm 7.3 \text{ kg}\cdot\text{m}^{-2}$ ($p < 0.001$). Mean weight reduction was $-3.7 \pm 2.7 \text{ kg}$ (in range +2 kg to -8.2 kg). Mean reduction of body fat was from $40.1 \pm 14.8 \%$ to $39 \pm 15.9 \%$ ($p = 0.001$). Waist circumference was reduced from $102.3 \pm 15.1 \text{ cm}$ to $97.5 \pm 15.1 \text{ cm}$ ($p < 0.001$). In nutritional intake we found reduction of energy intake from 7980 kJ to 7105 kJ per day and lipid intake from 75 to 60 grams per day. From biochemical parameters best results were in serum lipid reduction. Total cholesterol was lowered from 5.2 ± 0.9 to $4.8 \pm 0.9 \text{ mmol/l}$ ($p < 0.001$) and LDL cholesterol was lowered from 3.2 ± 0.9 to $3.0 \pm 0.9 \text{ mmol/l}$ ($p < 0.001$). **Conclusion:** Almost all women could reduce their weight. From body weight they reduced especially body fat, muscle mass remained the same. Every anthropometric and biochemical parameter was improved. CBT is a very effective method for improving eating and physical activity habits. In our study we will continue and we will follow the weight maintenance and change of biochemical parameters after finishing the course.

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121. Determination of slimming effect by auricular acupuncture stimulation –statistical analysis of 1,017 female data

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We investigated the effects of auricular 1.5 mm small sphere particle stimulation on non-obese healthy volunteers and mildly obese patients. Subjects (n = 1,017) averaged 42.8 ± 12.26 years old, and BMI was 25.64 ± 3.75. Slimming by acupuncture stimulation existing in auricle is a treatment method with history of more than 20 years in Japan, but gold or ceramic particles are pasted on the acupuncture point of 6 points (Shin-mon MA-TF1 Ershenmen, stomach, esophagus MA-IC6 Shidao, cardia MA-IC7 Benmen, lung MA-IC1 Fei, endocrine MA-IC3 Neifenmi). This is done by applying stimulation twice a week. In this study, statistical study and correlation were analyzed as to whether this method could be effective against slimming. We have used Dual frequency body composition meter (TANITA DC-430A, Tokyo Japan) Body weight (63.64 kg ± 10.13 → 57.12 kg ± 9.00) BMI (25.64 ± 3.75 → 23.03 ± 3.48) Body fat ratio (36.80 % ± 5.59 → 31.73 % ± 6.10) Overall muscle mass 37.46 kg ± 3.93 → 36.37 kg ± 3.66) Waist (77.60 cm → 74.23) Basal metabolic rate (1,207.64 kcal ± 146.99 → 1,146.77 kcal ± 135.05), a significant decrease was seen. During the treatment period, exercise therapy was not used concurrently with dietary guidance only. When we looked at the correlation between each data, the amount of BMI at the start showed high correlation with body fat percentage and visceral fat level BMI obesity degree. Weight reduction effect was observed in non-obese and healthy adult subjects by “auricle acupuncture stimulation by particles”. We propose a possible mechanism for the weight-reducing effects that the ear acupuncture stimulation may be a means of instructing weight loss after diet exercise therapy.

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