UNIVERSITY OF LATVIA

Latvia University of Life Sciences and Technologies

RĪGA STRADIŅŠ UNIVERSITY

THE 3RD INTERNATIONAL CONFERENCE
"NUTRITION AND HEALTH"

Riga, Latvia
December 9–11, 2020

CONFERENCE PROGRAMME AND BOOK OF ABSTRACTS

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ORGANISED BY
UNIVERSITY OF LATVIA,
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RIGA STRADIŅŠ UNIVERSITY

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PREFACE

Three largest universities of Latvia (University of Latvia (UL), Latvia University of Life Sciences and Technologies (LULST) and Riga Stradiņš University (RSU)) have jointly implemented the inter-university master's study programme "Nutrition Science" since 2006 and now present the 3rd international conference "Nutrition and Health" held in Riga on December 9–11, 2020 (the 1st international conference "Nutrition and Health" was organized in 2012, while the 2nd – in 2016).

The aim of the international conference "Nutrition and Health" is to provide an opportunity to Latvian researchers to report their achievements and results; to foreign researchers – to inform the audience about the results of studies on the international level and acquaint the colleagues with the topical research problems; and to the students of master's programme, as well as those interested in problems of nutrition science and health – to improve their theoretical and methodological knowledge in nutrition science, food science, health science and research in these fields.

The conference will offer 92 reports, including 46 oral presentations and 46 poster reports, prepared by the students of master's programme in collaboration with the teaching staff of the partner universities (UL, LULST and RSU), graduates of the programme (PhD applicants and PhD in some areas related to nutrition), researchers representing Latvian and foreign scientific institutions, as well as industry professionals. The subject of reports is related to the key issues of nutrition science (public health, medical nutrition therapy, new and functional food, nutrition and human microbiota, nutrition and the Covid-19 pandemic, etc.).

In correspondence with the topics of the research, the reports will be heard, discussed and evaluated by the experts of Scientific Committee and audience in seven sessions of the conference: Nutrition policy. Public health and epidemiology; Nutrition during human life (maternal and child health); Nutrition science; Nutrition and prevention of chronic diseases; Diet, nutrition during human life; Health-relevant food products; and Food quality and safety.

The audience will benefit from a comprehensive view of nutrition science, observe its cross-sectorial nature and complexity, as well as its role in preventing and treatment of diseases.

After the conference, the reports will be incorporated into scientific articles and published in the "Proceedings of the Latvian Academy of Sciences" Part B. This will enable raising and advancing topical issues discussed in the conference at an international level.

The conference is supported by Latvian food producers: Food Union "Rīgas piena kombināts" (Riga Dairy Producer Ltd) and "Latvijas Maiznieku biedrība" (SIA "Maiznīca Flora", SIA "Dona", SIA "Lielezers", SIA "Lāči" and SIA "Puratos Latvija").

Ida Jākobsone
Conference Chair
Director of the inter-university study programme
"Master of Health Sciences in Nutrition Science"

THE 3RD INTERNATIONAL CONFERENCE
NUTRITION AND HEALTH
(Latvia, Riga, December 9–11)

PROGRAMME

Wednesday, December 9, 2020		
08.40 – 09.00	**Registration – connecting to ZOOM**	
09.00 – 09.30	**Opening Ceremony** ***Chairs:*** **Indriķis Muižnieks**, Rector, University of Latvia **Irina Pilvere**, Rector, Latvia University of Life Sciences and Technologies **Aigars Pētersons**, Rector, Riga Stradiņš University; **Agrita Kiopa**, Vice-Rector of Science, Riga Stradiņš University **Irina Arhipova**, Vice-Rector of Sciences, Latvia University of Life Sciences and Technologies **Valdis Segliņš**, Vice-Rector for Natural Sciences, Technology and Medicine, University of Latvia **Pēteris Trapencieris**, Latvian Academy of Science ***Conference Chair:*** **Ida Jākobsone**	
09.30 – 11.30	**Session 1. Nutrition policy. Public health and epidemiology** ***Chairs:*** **Anita Villeruša** (Department of Public Health and Epidemiology, Riga Stradiņš University, Latvia) **and Toms Pulmanis** (Faculty of Public Health and Social Welfare, Riga Stradiņš University, Latvia)	
09.30 – 09.55	**Plenary lecture 1**	**Santa Līviņa** (Latvia) *Ministry of Health of the Republic of Latvia* NUTRITION POLICY IN LATVIA
09.55 – 10.20	**Plenary lecture 2**	**Janina Petkeviciene**, V. Kriaucioniene (Lithuania) *Health Research Institute, Faculty of Public Health, Medical Academy, Lithuanian University of Health Sciences* CHANGES IN DIETARY HABITS OF ADULT LITHUANIANS DURING THE COVID-19 QUARANTINE
10.20 – 10.30	**O1**	**Ieva Pitkevica**, E. Pumpure, D. Mihailova, M. Laura Gravina, I. Briedīte, D. Rezeberga, I. Kantane, G. Lazdane (Latvia) *Institute of Public Health, Riga Stradiņš University* SOCIOECONOMIC FACTORS AND CHANGES OF EATING HABITS DURING COVID-19 RESTRICTIONS IN LATVIA

10.30 – 10.40	**O2**	**Dace Rezeberga**, G. Lazdane, L. Meija, I. Zile (Latvia) *Riga Stradiņš University* PREGNANT WOMEN'S HEALTH IN LATVIA
10.40 – 10.50	**O3**	**Vera Griņeva**, L. V. Neimane, L. V. Staceviča, G. Grinevs (Latvia) *Riga Stradiņš University* REHABILITATION CENTRE FOOD SERVICE ORGANIZATION ASPECTS AND PATIENT SATISFACTION WITH FOOD QUALITY
10.50 – 10.55	**P1**	**Ieva Vanaga**, O. Koļesova, S. Laivacuma, S. Aratjuņana, A. Koļesovs, B. Rozentāle, L. Vīksna (Latvia) *Riga Stradiņš University* OBESITY AND THE COURSE OF COVID-19 IN PATIENTS HOSPITALIZED IN RIGA EAST CLINICAL UNIVERSITY HOSPITAL
10.55 – 11.00	**P2**	L. Cīrule-Dambe, D. Šantare, I. Daugule, I. Poļaka, S. Paršutins, **Liene Sondore**, I. Kojalo, M. Leja (Latvia) *Faculty of Medicine of the University of Latvia; Riga Stradiņš University* ADHERENCE TO THE NORDIC IN 40-64-YEAR-OLD JĒKABPILS POPULATION
11.00 – 11.30	**Discussion/Questions and break**	
11.30 – 13.45	**Session 2. Nutrition during human life (maternal and child health)** ***Chairs:*** **Laila Meija** (Department of Sports and Nutrition; Institute of Public Health, Riga Stradiņš University, Latvia) **and Gunta Lazdane** (Department of Obstetrics and Gynaecology; Institute of Public Health, Riga Stradiņš University, Latvia)	
11.30 – 11.55	**Plenary lecture 3**	**Joao Breda** *WHO Head, WHO European Office for Prevention and Control of NCDs* TOWARDS HEALTHIER AND SUSTAINABLE NUTRITION IN EUROPE
11.55 – 12.05	**O4**	**Gunta Lazdane**, L. Meija, D. Rezeberga (Latvia) *Riga Stradiņš University* GLOBAL TRENDS IN LIFESTYLE AND NUTRITION DURING PREGNANCY
12.05 – 12.15	**O5**	**Laila Meija**, K. Klaramunta Antila, L. Ušpele, G. Lazdane (Latvia) *Riga Stradiņš University; Pauls Stradiņš Clinical University Hospital* OMEGA-3 AND VITAMIN D STATUS IN PREGNANCY: A RESEARCH IN LATVIA
12.15 – 12.25	**O6**	**Inese Siksna**, I. Lazda, I. Pudule (Latvia) *Institute of Food Safety, Animal Health and Environment "BIOR"* IODINE STATUS OF WOMEN OF REPRODUCTIVE AGE IN LATVIA

12.25 – 12.35	**O7**	**Anna Piskurjova**, O. Aizbalte, L. Meija (Latvia) *Riga Stradiņš University* THE DIETARY HABITS DURING LACTATION
12.35 – 12.45	**O8**	**Inga Elksne**, I. Strele, I.Siksna and D. Gardovska (Latvia) *Department of Doctoral Studies, Faculty of Medicine, Department of Pediatrics, Riga Stradiņš University, Institute of Food Safety, Animal Health and Environment "BIOR"* EARLY EATING HABITS IN INFANTS AND THEIR ASSOCIATION WITH IRON METABOLISM
12.45 – 12.55	**O9**	**Ksenija Nikulcova**, L. Meija (Latvia) *Riga Stradiņš University* PHYSIOLOGICAL EFFECTS OF SUSTAINABLE DIETS DURING PREGNANCY AND LACTATION
12.55 – 13.05	**O10**	**Roberta Rezgale**, B. Bartaševiča, A. Alksnīte, L. Meija (Latvia) *Riga Stradiņš University* LIFESTYLE HABITS IN PREGNANT WOMEN IN LATVIA
13.05 – 13.15	**O11**	**Violeta Bule**, V. Cauce, K. Stašinska, L. Meija (Latvia) *Riga Stradiņš University; Riga East Clinical University Hospital* PRE-PREGNANCY WEIGHT SELF-ASSESMENT AND DIETARY HABIT CHANGES DURING PREGNANCY
13.15 – 13.25	**O12**	**Līva Ušpele**, V. Bule, K. Klaramunta-Antila, G. Jansone, P. Rudzīte, V. Cauce, L. Meija (Latvia) *Riga Stradiņš University, Latvia; Riga Maternity Hospital* KNOWLEDGE OF MEDICAL PROFESSIONALS ABOUT NUTRITION IN PREGNANCY
13.25 – 13.30	**Break**	
13.30 – 16.00	**Session 3. Nutrition science** ***Chairs:*** **Aldis Puķītis** (Gastroenterology, Hepatology and Nutrition Therapy Centre, Pauls Stradiņš Clinical University Hospital, Latvia) **and Polina Zalizko** (Gastroenterology, Pauls Stradiņš Clinical University Hospital, Latvia)	
13.30 – 13.55	**Plenary lecture 4**	K. Ērglis, V. Dzērve, I. Kalviņš, I. Mintāle, M. Ērglis, B. L. Romanovska, E. Skrūzmane, S. Jēgere, **Andrejs Ērglis** (Latvia) *JSC "SISTĒMU INOVĀCIJAS", Jaunmārupe; Institute of Cardiology and Regenerative Medicine, University of Latvia* BIOACTIVE COMPOUNDS EXTRACTED FROM SEA BUCKTHORN FOR CORRECTION OF RESIDUAL CARDIOVASCULAR RISK IN PATIENTS WITH CORONARY ARTERY DISEASE

13.55 – 14.20	**Plenary lecture 5**	**Khrystyna Semen**, J. le Noble, A. Bast (the Netherlands) *Campus Venlo, Maastricht University* ROLE OF DIETARY FLAVANOLS IN OPTIMIZING SPORTS ADAPTATIONS
14.20 – 14.30	**O13**	**Evalds Raits**, A. Kirse-Ozolina, S. Muizniece-Brasava (Latvia) *Faculty of Food Technology, Latvia University of Life Sciences and Technologies; "Kronis" Ltd.* MARKET RESEARCH AND MEAL READY-TO-EAT (MRE) MAIN COURSE DEVELOPMENT IN THE CONTEXT OF MILITARY USE
14.30 – 14.40	**O14**	**Vanda Sargautiene**, R. Ligere, D. Sargautis (Latvia) *Department of Internal Medicine, University of Latvia* METABOLIC ACTIVITY OF THE GUT MICROBIOTA
14.40 – 14.45	**P3**	**Juris Ķibilds**, I. Siksna, I. Lazda, N. Krūmiņa, I. Zeltiņa, B. Vilne, A. Krūmiņa (Latvia) *Institute of Food Safety, Animal Health and Environment "BIOR"* ALTERATIONS OF GUT MICROBIOME IN PATIENTS OF VARIOUS NONINFECTIOUS LIVER DISEASES
14.45 – 14.50	**P4**	**Ksenija Nikulcova**, D. Kustovs, A. Šķesters (Latvia) *Laboratory of Biochemistry, Riga Stradiņš University* ANTIOXIDANT AND ANTIRADICAL PROPERTIES OF FRESHLY SQUEEZED AND INDUSTRIALLY PRODUCED POMEGRANATE JUICE
14.50 – 14.55	**P5**	**Laima Givoina**, D. Kustovs, A. Šķesters (Latvia) *Laboratory of Biochemistry, Riga Stradiņš University* ANTIOXIDANT AND POLYPHENOL CONTENT IN CARROTS STORED UNDER DIFFERENT CONDITIONS
14.55 – 15.00	**P6**	J. Markovs, **Agate Galuza**, G. Knipse (Latvia) *Department of Anatomy and Histology, Faculty of Medicine, University of Latvia* HISTOCHEMICAL AND ULTRASTRUCTURAL ASPECTS OF IRON AND ZINC ABSORPTION
15.00 – 15.05	**P7**	**Alina Beluško**, L. Aumeistere, I. Ciproviča, D. Zavadska (Latvia) *Faculty of Food Technology, Latvia University of Life Sciences and Technologies* CONJUGATED LINOLEIC ACID IN HUMAN MILK: A CASE STUDY FROM LATVIA
15.05 – 15.10	**P8**	**Dimitrijs Kustovs**, D. Garokalna, A. Šķesters (Latvia) *Laboratory of Biochemistry, Riga Stradiņš University* BERRY AND FRUIT WINES AS A SOURCE OF NATURAL ANTIOXIDANTS

15.10 – 15.15	**P9**	K. Majore, **Vita Šterna**, M. Bleidere, S. Reidzane, I. Ciproviča (Latvia) *Department of Plant Breeding and Agroecology, Institute of Agroresources and Economics* IN-VITRO STUDY ON CHARACTERISTICS OF DIFFERENT HULLESS BARLEY CULTIVARS' FLAKES
15.15 – 15.20	**P10**	**Laila Usacka**, L. Plakane, I. Vanaga, K. Kletnieks, B. Jansone, R. Muceniece, U. Kletnieks, L. Pahirko (Latvia) *Residency in Sports Medicine, University of Latvia* POLYPRENOL LIPOSOMES IMPROVE EFFICIENCY OF OXYGEN USAGE IN WELL-TRAINED AMATEUR ATHLETES
15.20 – 15.25	**P11**	**Polina Zalizko**, T. H. Roshofa, V. Mokricka, L. Meija, E. Bodnieks, A. Pukitis (Latvia) *Pauls Stradiņš Clinical University Hospital; Faculty of Medicine, University of Latvia; Faculty of Medicine, Riga Stradiņš University* ANALYSIS OF BODY MUSCLE MASS IN CROHN'S DISEASE PATIENTS
15.25 – 16.00	**Discussion/Questions**	

Thursday, December 10, 2020		
08.40 – 09.00	**Connecting to ZOOM**	
09.00 – 12.00	**Session 4. Nutrition and prevention of chronic diseases** ***Chairs:*** **Ilze Konrāde** (Department of Medicine, Riga East Clinical University Hospital; Riga Stradiņš University Latvia) **and Andrejs Šķesters** (Laboratory of Biochemistry, Riga Stradiņš University, Latvia)	
09.00 – 09.25	**Plenary lecture 6**	**Ilze Konrāde** (Latvia) *Department of Medicine, Riga East Clinical University Hospital; Riga Stradiņš University Latvia* SELENIUM AND THYROID DISEASE: FROM PATHOPHYSIOLOGY TO TREATMENT
09.25 – 09.35	**O15**	**Silvija Abele**, L. Tzivian, L. Meija, V. Folkmanis (Latvia) *Faculty of Biology, University of Latvia* SPECIFIC CARBOHYDRATE DIET (SCD/GAPS) FOR CHILDREN WITH AUTISTIC SPECTRUM DISORDER
09.35 – 09.45	**O16**	**Valerijs Knjazhevs**, L. V. Neimane (Latvia) *Department of Sports and Nutrition, Riga Stradiņš University* RELATIONSHIP OF DIETARY PROVOCATIVE FACTORS WITH THE INCIDENCE OF GOUT ATTACKS

09.45 – 09.55	**O17**	**Diana Araja**, V. Rovite, A. Terentjeva, D. Vaidere, K. Vecvagare, L. Vīksna (Latvia) *Riga Stradiņš University* COVID-19 AND OBESITY: IMPACT OF OVERWEIGHT ON DISEASE SEVERITY
09.55 – 10.05	**O18**	**Ieva Garanča**, L. V. Neimane (Latvia) *Riga Stradiņš University* THE PREVELANCE OF ORTHOREXIA NERVOSA AND EATING DISORDERED ATTITUDE TO FOOD AMONG STUDENTS OF THE STUDY PROGRAMME "NUTRITION" OF THE FACULTY OF REHABILITATION AND STUDENTS OF THE STUDY PROGRAMME "MEDICINE" OF RIGA STRADIŅŠ UNIVERSITY FACULTY OF MEDICINE
10.05 – 10.15	**O19**	**Guna Bīlande**, A. Ramata-Stunda, U. Bērs, M. Borodušķis (Latvia) *Faculty of Medicine, University of Latvia; Jūrmala Hospital; Aiwa Clinic* THE POSITIVE, QUANTIFIABLE EFFECT OF LYL LOVE YOUR LIFE® SPRAY ON BLOOD VITAMIN D3 LEVELS
10.15 – 10.45	**Discussion/Questions and break**	
10.45 – 10.50	**P12**	**Ieva Salina**, R. Lagzdina, E. L. Gibson (Latvia) *Riga Stradiņš University* INFLUENCE OF PLANT-RICH DIET ON HUMAN BODY ACID-BASE BALANCE
10.50 – 10.55	**P13**	**Tatjana Zaķe**, S. Upmale-Engela, I. Kalere, A. Skesters, I. Konrade (Latvia) *Department of Internal Medicine, Riga Stradiņš University* SELENIUM STATUS IN LATVIAN PATIENTS WITH AUTOIMMUNE THYROID DISEASES
10.55 – 11.00	**P14**	**Melita Videja**, E. Sevostjanovs, I. Konrade, M. Dambrova (Latvia) *Latvian Institute of Organic Synthesis; Faculty of Pharmacy, Riga Stradiņš University* 5-DAY INTERMITTENT FASTING REDUCES PROATHEROGENIC METABOLITE TRIMETHYLAMINE N-OXIDE LEVEL AND IMPROVES SERUM BIOCHEMICAL PARAMETERS
11.00 – 11.05	**P15**	**Ieva Kalere**, T. Zaķe, S. Upmale-Engela, F. Cgojeva-Uzulniece, A. Šķesters, I. Konrāde (Latvia) *Department of Internal Diseases, Riga Stradiņš University* SELENIUM INTAKE SCORE IN THYROID PATIENTS

11.05 – 11.10	**P16**	**Zane Lukstiņa**, B. Bodžs, L. Ozoliņa-Molla (Latvia) *Department of Human and Animal Physiology, University of Latvia* COMPARISON BETWEEN EFFICIENCY OF 16/8 TIME RESTRICTED FEEDING AND 5/2 ALTERNATE DAY FASTING IN BODY FAT MANAGEMENT
11.10 – 11.15	**P17**	**Guna Bīlande**, M. Mukāns, I. Troickis, E. Liepiņš, O. Kozlovskis, J. Žarinovs, V. Rozītis, V. Pīrāgs (Latvia) *Faculty of Medicine, University of Latvia; Jūrmala Hospital; Aiwa Clinic* AN UPDATE ON BARIATRIC SURGERY IN LATVIA
11.15 – 11.20	**P18**	**Marina Arisova**, G. Bīlande (Latvia) *Riga Stradiņš University* EVALUATION OF COMPETENCE ABOUT NUTRITION OF PERSONS WITH ELEVATED LEVEL OF URIC ACID
11.20 – 12.00	**Discussion/Questions and break**	
12.00 – 13.50	**Session 5. Diet, nutrition during human life** ***Chairs:*** **Lolita Vija Neimane** (Department of Sports and Nutrition, Faculty of Rehabilitation, Riga Stradiņš University, Latvia) **and Inga Elksne** (Riga Stradiņš University, Latvian Association of Diet and Nutrition Specialists, Latvia)	
12.00 – 12.25	**Plenary lecture 7**	**Iveta Mintale** (Latvia) *Cardiology Centre, Pauls Stradiņš Clinical University Hospital; University of Latvia* HEALTHY DIET AS A PART OF HEALTHY LIFESTYLE – A CORNERSTONE OF CHRONIC DISEASE PREVENTION
12.25 – 12.35	**O20**	**Elizabete Pumpure**, J. Katz, A. Gabster, R. K. J. Tan, C. O'Hara, I. Kantane, G. Lazdane, I-SHARE (Latvia) *Institute of Public Health, Riga Stradiņš University* CHANGES IN EATING HABITS DUE TO COVID-19 RESTRICTIONS IN LATVIA, PANAMA AND SINGAPORE
12.35 – 12.45	**O21**	**Ilze Justamente**, J. Raudeniece, L. Ozoliņa-Molla, D. Reihmane (Latvia) *Department of Human and Animal Physiology, University of Latvia; Department of Human Physiology and Biochemistry, Riga Stradiņš University* COMPARATIVE ANALYSIS OF DAILY EATING HABITS OF ELEMENTARY SCHOOL CHILDREN IN DIFFERENT WEIGHT GROUPS
12.45 – 12.55	**O22**	**Jeļena Raudeniece**, I. Justamente, L. Ozoliņa-Molla, D. Reihmane (Latvia) *Department of Human and Animal Physiology, University of Latvia; Department of Human Physiology and Biochemistry, Riga Stradiņš University* EATING HABITS AND PHYSICAL ACTIVITY IN JUNIOR SCHOOL AGE CHILDREN

12.55 – 13.00	**P19**	**Liga Zuka**, M. Grundmane, A. Ivanovs (Latvia) *Department of Sports and Nutrition, Riga Stradiņš University* DRIVING FACTORS OF CHOICE OF PLANT-BASED MILK ALTERNATIVES AMONG DIFFERENT CONSUMER GROUPS
13.00 – 13.05	**P20**	**Ilze Beitane**, Z. Krūma, T. Ķince, M. Sabovics, S. Iriste, S. Muizniece-Brasava, J. Bujaka, S. Strode, I. Ciprovica (Latvia) *Department of Nutrition, Latvia University of Life Sciences and Technologies* CHALLENGES IN THE DEVELOPMENT OF FOOD PACKS FOR PUPIL LUNCHES AS PART OF THE reCOVery-LV PROJECT
13.05 – 13.10	**P21**	**Linda Laurena**, I. Siksna, A. Krūmiņa (Latvia) *Department of Risk Assessment and Epidemiology, Institute of Food Safety, Animal Health and Environment "BIOR"* ASSESSMENT OF SLEEP DURATION AND ENERGY INTAKE IN LATVIAN ADULTS IN RELATION TO THEIR WEEKLY STEP COUNT
13.10 – 13.15	**P22**	**Santa Sibule**, I. Lazda, I. Siksna, A. Krumina (Latvia) *Riga Stradiņš University* SUPPLEMENTAL VITAMIN D USE IN DIFFERENT EATING PATTERNS
13.15 – 13.20	**P23**	**Gita Krumina-Zemture**, S. Iriste, K. Kviesite (Latvia) *Department of Nutrition, Faculty of Food Technology, Latvia University of Life Sciences and Technologies* SUSTAINABLE FOOD RAW MATERIALS IN HOSPITALITY BUSINESS
13.20 – 13.50	**Discussion/Questions and break**	
13.50 – 17.20	**Session 6. Health-relevant food products** ***Chairs:*** **Zanda Krūma** (Faculty of Food Technology, Latvia University of Life Sciences and Technologies, Latvia) **and Vitalijs Radenkovs** (Processing and Biochemistry Department, Institute of Horticulture, Latvia)	
13.50 – 14.15	**Plenary lecture 8**	**Petras Rimantas Venskutonis** (Lithuania) *Department of Food Science and Technology, Kaunas University of Technology* FUNCTIONAL INGREDIENTS FROM BERRY PROCESSING BY-PRODUCTS AND THEIR APPLICATIONS

14.15 – 14.25	**O23**	**Vitalijs Radenkovs**, T. Püssa, K. Juhnevica-Radenkova, J. Kviesis, F. J. Salar, D. A. Moreno, I. Drudze (Latvia) *Processing and Biochemistry Department, Institute of Horticulture* WILD APPLE (*MALUS SPP.*) BY-PRODUCTS AS A SOURCE OF PHENOLIC COMPOUNDS AND VITAMIN C FOR FOOD APPLICATIONS
14.25 – 14.35	**O24**	**Darius Sargautis**, T. Ķince, V. Sargautiene (Latvia) *Department of Food Technologies, Latvia University of Life Sciences and Technologies* INVESTIGATION OF STRUCTURE FORMATION OF OAT PROTEIN DURING WET EXTRUSION
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PLENARY LECTURES

PL1 NUTRITION POLICY IN LATVIA

S. Līviņa
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Introduction. The nutrition policy in Latvia is based on the plans and guidelines of the European Union and the European Commission, as well as on the initiatives of the World Health Organization.

At the same time, nutrition policy in Latvia is developed considering the current data characterizing public health, results of public health research and statistics describing eating habits within Latvian society.

Overview. The Ministry of Health has developed Public Health Strategy for the next planning period (2021–2027), and one of the main goals is to improve health of Latvian population by prolonging good health condition, preventing premature mortality and reducing health inequalities.

The main causes of death in Latvia for several years have been cardiovascular and oncological diseases. 51% of all deaths in Latvia are due to risk factors related to behaviour, including unhealthy eating habits, smoking, excessive alcohol consumption and a sedentary lifestyle. Consequently, nutrition policy initiatives are important in promoting general public health.

Overall, dietary habits of the Latvian population can be assessed as unbalanced, for example, the data acquired in the survey of habits affecting health of the Latvian population show that consumption of fresh vegetables in Latvia is low. In contrast to adults, adolescents' dietary habits have slightly improved compared to previous studies.

The amount of salt recommended by the World Health Organization is less than 5 grams per day. Data from a study published in 2020[1] indicates that only a small proportion of adults (14.3%) in Latvia consumes the optimal amount of salt. On average, the population of Latvia consumes 10.8 grams of salt per day.

Unhealthy eating habits are directly linked to the prevalence of overweight and obesity in children and adults. The proportion of the population aged 15–74 who are overweight or obese is high – 58.7%, 58.5% for men and 59.0% for women, respectively.

Latvia has implemented a number of legislative measures, such as the regulation on the maximum permissible content of trans fatty acids in foodstuffs, a normative act on nutritional norms for attendees of educational institutions, clients of social care and social rehabilitation institutions, as well as patients of medical treatment institutions, adopted Law on Handling of Energy Drinks, etc. In order to succeed in improving healthy nutrition habits among the Latvian population, "health

in all policies" approach is important. It is necessary to closely cooperate with other public sector stakeholders, municipalities, NGOs and civil society to create conditions, effective programmes and interventions for preserving, promoting and restoring health.

Conclusions. Given that consumption of fruits and vegetables among Latvian adults and schoolchildren still remains insufficient, coupled with a relatively high consumption of sweets, as well as insufficient water intake, it is necessary to continue educating various target groups about everyday eating habits.

At the same time, to succeed in public education and spreading healthy eating habits, it is important to make food labelling easy to understand for every member of society. It is crucial to ensure that healthy foods are available to public by agreeing with the food business operators on the gradual improvement of the composition of foods and the reduction of salt content in products. Simultaneously, taking into account the prevalence of overweight and obesity in Latvia, support mechanisms must be developed for overweight and obese people to promote healthy eating habits and lifestyle. An essential support mechanism for promoting general public health in the long term is the provision of healthy and balanced free lunches for students.

Keywords: nutrition policy, public health, healthy nutrition habits.

References:

1. Study on salt and iodine consumption in the Latvian adult population. Ministry of Health. Riga, 2020.

PL2 CHANGES IN DIETARY HABITS OF ADULT LITHUANIANS DURING THE COVID-19 QUARANTINE

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Introduction. The Lithuanian Government declared the COVID-19 quarantine from 16 March 2020 and extended it several times until 16 June. The quarantine caused significant changes in everyday life. This study aimed to evaluate the effect of the quarantine on lifestyle habits and body weight of Lithuanians.

Methods and materials. An online cross-sectional survey was carried out among individuals older than 18 years in April of 2020. The self-administered questionnaire included health behaviour and weight change data. The link to the questionnaire was distributed using social media, web-pages of some institutions, social networking sites, and emails. In total, 2447 individuals (2149 females and 298 males) participated in the survey.

Results. A considerable number of participants reported that they changed their eating habits. Almost a half of the respondents (49.4%) ate more than usual, 45.1% increased snacking, 62.1% cooked at home more often than before quarantine, and 20.6% increased consumption of fried food. Consumption of fast food was decreased by 41.3% of respondents, whereas eating of commercial pastries was curbed by 26%, and drinking carbonated and sugary drinks by 19.4%; while 37.7% of respondents increased consumption of homemade pastries. More people reduced read meat and fish consumption than increased it, while a higher proportion of participants increased fruit and vegetable consumption than decreased it. A decrease in physical activity was reported by 60.6% of respondents. The proportion of those who increased (14.2%) and decreased (15.9%) consumption of alcohol was similar. Every third (31.5%) respondent, more often those already with overweight, gained weight.

Diet of those who gained weight deteriorated in comparison to those who reported no changes in body weight. More weight-gaining respondents reduced fruit and vegetable consumption and increased red meat, carbonated or sugary drinks, pastries, fast and fried food consumption; increased snacking and cooking. A large proportion of weight-gaining respondents (85.2%) decreased their physical activity.

Conclusions. Our data highlighted the need for dietary and physical activity guidelines to prevent weight gain during the period of self-isolation, especially targeting those with overweight and obesity.

Keywords: nutrition, physical activity, alcohol consumption, body weight, COVID-19, quarantine.

Acknowledgments: The study was a part of the international COVIDiet project.

PL4 BIOACTIVE COMPOUNDS EXTRACTED FROM SEA BUCKTHORN FOR CORRECTION OF RESIDUAL CARDIOVASCULAR RISK IN PATIENTS WITH CORONARY ARTERY DISEASE

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Introduction. Polyunsaturated fatty acids (PUFA) have received increased attention due to a plethora of health promoting properties attributed to them. Particularly, the use of PUFA to reduce the "residual cardiovascular risk" of coronary heart disease patients is of great importance. It is no less important to find a rich source of PUFA with optimal composition of omega-3, 6 and 9 fatty acids and to create efficient manufacturing technology. Sea buckthorn seeds (SBS) are recognized as one of the best candidates to extract PUFA due to its unique fatty acid composition. In addition, SBS oil extraction using supercritical CO_2 technology from sea buckthorns harvested in Latvia have not been studied so far.

Objective. Consequently, the aim of the study was to develop extraction protocol using supercritical CO_2, evaluate extraction yield and analyse extracted oil composition from SBS grown in Latvia.

Methods. After juice pressing, sea buckthorn press cake was freeze-dried (residual moisture content – 8.99%). SBS were separated (using blender and vibrating sieves) and grinded (particle size: 0.35–0.50 mm). SBS was extracted using supercritical CO_2. Five different samples were obtained by changing the temperature (45 or 50 °C), CO_2 flow rate (70 or 80 kg/h) and humidity (5, 6 or 6.5%).

Results. Extraction yield of SBS was 10.4±0.11%. The main compounds of extracted samples were: saturated acids – 11.9–12.2%; unsaturated acids – 87.3–88.1%; monounsaturated fatty acids between 18.7–19.5%, polyunsaturated acids 69.3 – 70%, omega-3 – 32–33%, omega 6 – 35.4–36%, omega 9 – 16.6–17%.

Conclusions. Study results confirm that SBS grown in Latvia are a good source of PUFA, as the extracted oil has the desirable ratio of omega-3/omega-6 fatty acids and notable amount of other fat-soluble bioactive compounds. Furthermore, SBS-extracted oil might play a role in residual cardiovascular risk reduction and could be used in nutraceuticals products. Developed SBS extraction protocol using supercritical CO_2 is environment friendly, provide reasonable extraction outcomes and valuable composition of lipophilic compounds.

Keywords: residual cardiovascular risk, sea buckthorn seeds, unsaturated fatty acids, supercritical CO_2.

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PL5 ROLE OF DIETARY FLAVANOLS IN OPTIMIZING SPORTS ADAPTATIONS

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Introduction. Dietary polyphenols including flavanols have been recognized for their potential to maintain health. Due to their positive impact on the redox homeostasis, endothelial function and inflammatory reactions, these nutrients are known to modulate pathophysiological processes involved in many chronic diseases, as well as to be beneficial in their prevention. In the area of sports nutrition, dietary flavanols have been linked to improving performance and facilitation of recovery.

Results. In our previous research, we demonstrated that participation in the recreational long-distance running events put a strain on the kidney function, as well as significantly upregulate inflammation and oxidative stress. Supplementation with dietary flavanols for two weeks before the half-marathon reduced kidney damage illustrated by less increase in urinary biomarkers of tubular and glomerular kidney injury. It also resulted in marked lowering of IL6 in urine.

Conclusions. Reducing an exercise-related strain on kidney through dietary intervention may become an important strategy to improve sports adaptation and achieve optimal health benefits with exercise. This becomes increasingly important in the light of the high popularity of long-distance running among recreational athletes.

Keywords: flavanols, kidney function, runners.

PL6 SELENIUM AND THYROID DISEASE: FROM PATHOPHYSIOLOGY TO TREATMENT

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Introduction. Selenium is a micronutrient embedded in specific selenoproteins, 25 of which have been identified in humans. In adults, the thyroid is the organ with the highest amount of selenium per gram of tissue. These selenoproteins are essential for the protection against oxidative stress, plays a key role in the immune system regulation and production of active thyroid hormone. Finally, it has been found that selenium status can affect T helper cell differentiation. Therefore, it has been hypothesized that nutritional selenium deficiency may trigger the initiation or progression of thyroid autoimmunity.

Overview. Selenium level in blood is dependent primarily on the recent dietary intake and the bioavailability of selenium form taken up. Dietary selenium is obtained mainly from cereals, grains, meat, fish/seafood, eggs, dairy products, and nuts, which demonstrate a large variability in the selenium content. In addition, daily dose recommendations for selenium vary from one country to another and assessment of selenium status in Latvian general population has not been established before.

The literature suggests that selenium supplementation of patients with autoimmune thyroiditis is associated with a reduction in microsomal antibody levels, improved thyroid ultrasound features, and improved quality of life. Selenium supplementation in mild Graves' orbitopathy is associated with an improvement of quality of life and eye involvement, as well as slowed the progression of Graves' orbitopathy.

Conclusions. Maintaining a physiological concentration of selenium is a prerequisite to prevent thyroid disease and preserve overall health; therefore, selenium supplementation could be clinically beneficial in patients with autoimmune thyroid diseases.

Keywords: selenium, thyroid, disease prevention.

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PL7 HEALTHY DIET AS A PART OF HEALTHY LIFESTYLE – A CORNERSTONE OF CHRONIC DISEASE PREVENTION

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Introduction. Lifestyle management is a substantial tool in prevention of Cardiovascular (CV) and other serious chronic diseases, particularly in high risk patients. Abstaining from smoking, healthy diet, regular physical activity can help to maintain normal body weight, normal arterial blood pressure, cholesterol, glucose and uric acid levels.

Overview. Maintenance of a healthy diet is one of the most important tasks. Poor diet quality is a primary cause of chronic disease and mortality.

Despite the availability of evidence-based national government dietary guidelines in the majority of the countries of the world (WHO 2003), diet-related non-communicable diseases (NCDs) like cardiovascular disease, cancer, obesity and type-2 diabetes are increasing in incidence every year (Hyseni et al. 2017)

The CV Prevention Guidelines contain several pages that are dedicated to behavioural changes – how to facilitate them from 3 sides: individuals, medical staff and authorities. All of them have high level of evidence (IA, IB).

The new 2019 ESC Guidelines on Diabetes, Prediabetes and Cardiovascular Diseases have considered the Mediterranean diet (MedDiet) rich in polyunsaturated and monounsaturated fats as the healthy diet to reduce CV events.

MedDiet is a scientific concept that reflects the traditional dietary pattern that prevailed in the olive-tree growing areas of the Mediterranean basin before the mid-1960s – before globalization influenced the lifestyle, including diet.

In the current context of assessing the health effects of overall food patterns, instead of single nutrients or foods, the MedDiet has become a scientific topic of high interest due to evidence that directly supports substantial health benefits.

Mediterranean diet has an extensive amount of evidence after PREDIMED trial, the diet is easy to follow for a long time, it can help to lose weight, it is very sustainable. A high adherence to MedDiet can significantly reduce the risk of MI, stroke and peripheral artery disease, diabetes, as well as atrial fibrillation. This can curtail a. carotis media thickness and even the incidence of invasive breast cancer.

What does a healthy diet mean in real life? First of all, local, seasonal products of excellent quality, then – an optimal size of the plate, and last, but not least – high-quality fats (olive oil, fish and nuts). It is not just about prioritizing some food groups in comparison to others, but also paying attention to the way of selecting, cooking and eating.

The traditional MedDiet is a high-quality dietary pattern, which is backed by important and consistent epidemiological and trial-based evidence supporting the reduction in clinical cardiovascular events. The transferability of the MedDiet to non-Mediterranean countries can incorporate flexibility but it needs to incorporate all of its traditional components (especially olive oil).

Conclusions. The health properties, palatability, potential for sustainability, and nutritional adequacy of the MedDiet could be an effective, feasible, and sustainable solution for improving the dietary habits of our population.

Keywords: Mediterranean diet, CVD prevention, guidelines, lifestyle, risk factors, behaviour.

PL8 FUNCTIONAL INGREDIENTS FROM BERRY PROCESSING BY-PRODUCTS AND THEIR APPLICATIONS

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Introduction. According to the FAO, roughly one-third of food produced for human consumption is lost, which accounts about 1.3 billion t/year and reflects not only the food processing wastes, but also the "food losses", whereas such waste and processing by-products may be converted into high added value food grade ingredients.

Overview. Many berry species are known for their excellent flavour and abundance of healthy compounds with strong antioxidant capacity and other beneficial properties. However, due to a rapid decay after harvesting, the majority of berry crops are processed into juices and other products. Pressing of juice results in large quantities of by-products, called pomace, press-cake or marc. These residues contain various valuable compounds such as polyphenolics, vitamins; however, currently they are used rather inefficiently and, in many cases, wasted, mainly due to a lack of scientific and technological valorization of their processing methods.

Biorefining of various berry pomaces into high value functional ingredients by using supercritical CO_2 and pressurized liquid extraction and enzyme-assisted extraction/fractionation methods will be discussed. In general, depending on the processing tasks, 2–10 nutritionally valuable products may be obtained. The results indicate that the fractions isolated from berry pomaces contain valuable bioactive compounds, which might find applications in functional foods, nutraceuticals, cosmetics and other products. Firstly, lipophilic fractions, consisting mainly of triacylglycerols as macro-components and tocopherols, phytosterols, and carotenoids as microconstituents, are extracted with supercritical CO_2. At optimal conditions the yields of oily extracts from berries usually are from 3 to 19%. These oils are particularly rich in health beneficial polyunsaturated fatty acids. Higher polarity fractions are extracted from the residues and the total yield of extracts may reach 80%. These fractions contain various phytochemicals; most of them are strong antioxidants and demonstrate other bioactivities and may find various applications.

Conclusions. The concept of biorefining, which is defined as "a sustainable processing of biomass into a spectrum of bio-based products (food, feed, chemicals, materials) and bioenergy (biofuels, power and/or heat)" may be successfully applied to berry pomaces for the development of high added value functional ingredients; technological and economic aspects of upscaling the processes should be in the focus of future research.

Keywords: berry pomaces, applications, biorefining.

PL9 INFLUENCE OF EXTRUSION AND FERMENTATION PROCESSES ON WHEAT BRAN AMINO AND FATTY ACIDS PROFILE, CHEMICAL AND BIOSAFETY, ANTIMICROBIAL AND ANTIFUNGAL PROPERTIES

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Introduction. Wheat (*Triticum* spp.), due to its excellent sensory and technological properties, is one of the most popular crops worldwide.

Discussion. However, the most popular part of the wheat is endosperm, and other layers, till now, are used as low nutritional value feed stock. For this reason, extensive amount of wheat processing by-products (WPBP) remain not effectively valorized and rarely directed to human nutrition [1], or converted to additional functional value feed stock. It should be pointed out that most of the bioactive compounds (polyphenols, lignans etc.) are concentrated in cereal outermost tissues [2,3]. However, on the other hand, also undesired compounds (mycotoxins etc.) occur in these fractions [4,5]. Also, the use of WPBP in food industry is complicated, because, higher quantity of WPBP included to the main formula, causes lower overall acceptability, darker colour, poor consistency and texture, low water binding capacity, low gas holding capacity etc. For all these reasons, to improve properties of WPBP, pre-treatment technologies are used. A design of extrusion and fermentation with *L. casei* and *L. paracasei* strains technologies combination for WPBP valorization to higher value food/feed stock was tested. In case to select the most appropriate technology various parameters of the processed and nontreated WPBP were analysed: acidity and microbiological parameters, sugars (fructose, glucose, sucrose and maltose) concentration, free amino and fatty acids profile, biogenic amines formation, influence of the different

treatments on WPBP texture and colour coordinates, antimicrobial and antifungal characteristics, as well as influence of the different treatments on a wide range of mycotoxins concentration.

Conclusions. Finally, it was confirmed that combination of extrusion and fermentation with *L. casei* and *L. paracasei* strains could be used as a perspective innovative pre-treatment for WPBP, capable to potentially enhance its composition, safety characteristics, antimicrobial and antifungal properties.

Keywords: wheat bran, extrusion, fermentation, mycotoxins, biosafety, antimicrobial activity, antifungal activity.

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PL10 HOME-MADE VERSUS OUTLET CATERING: COMPARATIVE ANALYSIS OF ENVIRONMENTAL IMPACT AND INVOLVED COSTS FOR DAILY MENU PRODUCTION

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Introduction. The modern life in consumer societies involve less leisure time in exchange for higher family revenue. The catering services for individuals, groups and collectives address the public need for professional foodservice and simplify the domestic chore of family cooking. Outdoor catering services represent, for modern families, an attractive option in comparison with daily in-home meals scheduling, production and serving routine.

Objective. The present study aims to conduct a comparative analysis of in-house, home-made foods (HM) and outlet catering (OC) professional foodservices with regard to daily menu scheduling and production considering the environmental impact (ecological footprint assessment) and the total costs.

Results and conclusions. The menu's ecological footprint depends on item recipes, serving size and cooking procedures. The lunch menu footprint has the highest value, both in case of home-made meal and outlet catering. The breakfast menu creation reveals a minimum environmental impact of 4.84 gm^2 for a family of 4 persons, respectively, 59.05 gm^2 in a restaurant with sitting capacity of 50.

The catering items based on animal sources (steak, nuggets, and mousse au chocolate) showed the highest ecological footprint impact (31.2 gm^2, 58.6 gm^2, 31.6 gm^2 respectively in home-case routine of culinary preparation). The intensive preparation, such deep fat frying, and the complex recipes with more than 4 ingredients more than double the ecological footprint impact.

The plant-based foods used as ingredients for recipes, such as vegetables (mushrooms, salad, carrots, onions etc.) and fruits (oranges, grapes) reduce the ecological footprint impact and are recommended in the eco-friendly menus.

In terms of costs, the home-made procedures of menu creation cost almost double in comparison with outlet catering operation in a restaurant or canteen due to the non-efficient investment in kitchen features and labour costs, a non-visible cost incurred by one family member dedicating time for creation of the daily menu.

Keywords: ecological footprint, outlet catering, ready-to-eat meals.

ORAL PRESENTATIONS

O1 SOCIOECONOMIC FACTORS AND CHANGES OF EATING HABITS DURING COVID-19 RESTRICTIONS IN LATVIA

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Introduction. Covid-19 has changed the daily life of many and is a test for food supply, health and social care system [1].

Objective. The goal of this study is to identify the most fragile groups of population regarding the nutrition during the restrictions caused by Covid-19.

Methods. A cross-sectional online survey was carried out from July 26 to September 3. The study was approved by the Ethical Committee of RSU (Approval No. 6-1/06/25). The collected data were analysed using MS Excel and IBM SPSS Statistics 26.0. Statistical methods: descriptive statistic, crosstabulation, chi square test, Fisher's exact test.

1173 answers were received from persons in the age group from 18 to 68 years living in Latvia.

Results. For 178 respondents (15.3%), the restrictive measures linked to Covid-19 caused increased concerns of food shortage. 141 responders (12.2%) noted a decrease in their ability to consume their preferred food. There was no statistically different influence between age groups and place of residence either regarding the amount of food, or the preferred food. However, when linking the changes of economic situation caused by Covid-19 and ability to consume the preferred food, there was a statistically significant difference between households. When comparing the answers on the amount of consumed food, empty food stores and age, responders of 40–54 years of age noted that they eat less and that their food stores were empty more frequently than other age groups. Almost one fifth of respondents had increased consumption of foods of low nutritional value, especially those aged 25–39 and the households whose economic situation deteriorated. It is a worrying signal, especially in combination with the fact that almost 50% of respondents increased the food consumption in general.

Conclusions. Covid-19 has tested eating behaviour of people, as well as food supply system. This study provides additional information for evidence-based measures to ensure nutrition and health during the crisis.

Keywords: socioeconomic changes, diet, eating habits, Covid-19 restrictions.

Acknowledgments: This study is a part of International Sexual Health and Reproductive Health Survey (ISHARE) realized in Latvia as a component of the National Research Programme project "Impact of COVID-19 on health care system and public health in Latvia; ways in preparing health sector for future epidemics" (No. VPP-COVID-2020/1-0011).

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O2 PREGNANT WOMEN'S HEALTH IN LATVIA

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Introduction. During recent years, population of Latvia has decreased, and so has the number of women of childbearing age and the number of deliveries.

Overview. Healthy diet, daily exercise, appropriate weight gain during pregnancy have an impact on life-course and health of a woman and her child. Several factors influencing pregnancy and its outcome are checked during pregnancy. In Latvia, regular weight measurement is included in antenatal screening program, gestational diabetes is screened by using 75 g/2-hour oral glucose tolerance test for a broad risk group. Information on healthy behaviour is a part of regular care provided by a gynecologist, a midwife or a family doctor. To provide uniform information in 2017 guidelines for care providers "Proper maternal nutrition during pregnancy planning and pregnancy" [1] were developed, Ministry of Health issued recommendations for pregnant women "Healthy diet during pregnancy and breastfeeding". In 2019, with financial support of European Social Foundation, guidelines and patient care pathways in perinatal medicine were developed. Guidelines on Gestational Diabetes and Diabetes were among the most topical guidelines in relation to long term outcomes for women and children.

Characteristics of pregnant population and newborns in 2015–2019 in Latvia [2]

	2015	2016	2017	2018	2019
Deliveries (abs N)	21505	21504	20461	18984	18458
Caesarean section (%)	21.5	21.7	22.7	21.4	22
Overweight (%)	3.0	3.6	3.5	3.5	5.0
Newborn weight (%)					
4000–4499g	14.7	14.6	15.2	15.3	15.3
4500–4999g	2.5	2.5	2.5	2.6	2.5
5000>	0.3	0.3	0.3	0.3	0.3
Gestational diabetes (%)	2.1	3.0	3.9	4.6	5.5

Conclusions. The number of overweight pregnant women in Latvia is increasing. Implementation of nutrition guidelines and screening/follow up guidelines remains a challenge for policy makers and care providers and requires innovative solutions.

Keywords: pregnancy, weight, guidelines, Latvia.

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O3 REHABILITATION CENTRE FOOD SERVICE ORGANIZATION ASPECTS AND PATIENT SATISFACTION WITH FOOD QUALITY

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Introduction. Conceivably, patients are not satisfied with nutritional quality at the Rehabilitation Centre, however, an objective assessment of satisfaction index about nutritional quality is lacking.

Objective. To study the level of patients' satisfaction with the nutritional quality at the Rehabilitation Centre, and to establish how the aspects of nutritional organization influence the level of patients' satisfaction with nutrition.

Methods. The research was performed by conducting a survey – a quantitative cross-sectional study. The research was conducted at the National Rehabilitation Centre "Vaivari" from 01.03.2020 to 30.04.2020. The total number of patients able to participate in the survey was reduced to 80 people, 75% people took part in the survey. During the emergency state, only 25 respondents of medical staff could participate in the study. 16 respondents (doctors) filled in a questionnaire, i.e., is 80% of the expected number of respondents. This number can reflect the situation within this group of people.

The questionnaires are based on the Nutrition Day questionnaire for medical staff and patients (*Nutrition day 2008*). To use the questionnaire, the author has requested permission of international initiative of Nutrition Day (*ESPEN and Medical University of Vienna*). The following statistical data processing methods were used: descriptive statistics and statistical inference for estimating differences.

Results. 63.4% of patients of the Rehabilitation Centre are satisfied with the quality of food, 36.3% – unsatisfied. The results of the practical study show that organizational aspects of nutrition in the in-patient clinic are affecting the level of patients' satisfaction with the quality of food.

Conclusions. The practical study confirmed that in certain period of time the majority of respondents – more than a half – were satisfied with nutrition in Rehabilitation Centre, while one third – was unsatisfied. It indicates that nutrition impacts patients' satisfaction. The analysis of the obtained data brought the conclusion that aspects like systematic monitoring of nutritional status, nutritionist consultations, dynamic patient monitoring, medical staff awareness about nutrition issues, as well as incompleteness of regulation field affect patients' satisfaction with the quality of nutrition at the Rehabilitation Centre.

Keywords: patient satisfaction, food quality.

O4 GLOBAL TRENDS IN LIFESTYLE AND NUTRITION DURING PREGNANCY

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Introduction. Nutrition during pregnancy has an impact on life-course and health of a woman and her child.

Objective. The goal of this analysis is to summarize the global trends in lifestyle and nutrition during pregnancy and to use it for comparing the situation in Latvia to other European countries and the world.

Results. In response to the global and regional policy documents [1, 2], many countries have developed national nutrition policies including the part on nutrition during pregnancy. The main actions taken by countries to improve the nutritional status of women before and during pregnancy are (a) improvement of nutrition education and counselling, (b) promoting a healthy diet, (c) adequate weight gain and (d) use of fortified foods. They result in adoption a lifestyle optimizing health and reducing risk of birth defects, suboptimal foetal development, and chronic health problems in both a mother and a child. However, there is no consensus between researchers and countries for advice on gestational weight gain given to pregnant women. While globally undernutrition and the related problems are topical, in most of the EU countries the biggest challenge during pregnancy is lack of physical activity, overweight and obesity leading to a number of foetal problems, as well as non-communicable diseases in mother and offspring. Despite the fact that healthcare providers are encouraged to consult on behaviour and nutrition during preconception period and pregnancy, this important opportunity is often missed. Several professional organizations have developed toolkits including mobile health behavioural interventions in assisting healthcare provider in this task; however, the impact analysis presents quite diverse results.

Conclusions. Despite amount of evidence gathered on importance of behaviour and nutrition during pregnancy, the implementation of research on the effectiveness of application of existing tools and approaches in improving health of pregnant women is encouraged and requires links with socioeconomic factors.

Keywords: lifestyle, nutrition, pregnancy, healthcare.

Acknowledgments: This analysis is a part of the Latvian Council of Science-supported Fundamental and Applied Research Project "Excess weight, dietary habits and vitamin D and Omega-3 fatty acid status in pregnancy" No. lzp-2019/1-0335.

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O5 OMEGA-3 AND VITAMIN D STATUS IN PREGNANCY: A RESEARCH IN LATVIA

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Introduction. Studies show that vitamin D omega-3 fatty acids have health benefits for the child – improvement of the nervous system and other organ system development, and for the mother – reducing the risks of adverse pregnancy outcomes (pre-eclampsia, premature birth, etc.). Data indicate that women in reproductive age in Latvia have an insufficient intake of fish and vitamin D deficiency.

There is no published data about vitamin D, PTH, omega-3 fatty acid status in Latvian pregnant women.

Objective. The objective of this study is to determine the 25-OH vitamin D, PTH, omega-3 and other fatty acid blood levels in Latvian pregnant women.

Materials and methods. It is a cross-sectional study of women until 7th day postpartum and pregnant women. Face-to-face interviews are being held in outpatient clinics and hospitals in various regions of Latvia. Blood is tested for vitamin D, PTH and 25 different fatty acids, in addition omega-6/omega-3 ratio, AA/EPA ratio is determined.

Expected results and practical use. Status of vitamin D, PTH and omega-3 during pregnancy. Estimated prevalence of deficiencies and association with dietary intake, supplement intake. The risk for vitamin D deficiency is higher for women who spend little time outside, do not eat fish, have dark skin and whose BMI>30 kg/m^2. Blood test for vitamin D level is not mandatory for all pregnant women in Latvia, however, it is recommended. Low omega-3 index is expected.

The results of this study will help to improve and adapt evidence-based recommendations and create targeted strategies for intervention to optimize vitamin D and omega-3 status in pregnant women.

Keywords: pregnancy, vitamin D, omega-3 fatty acids.

Acknowledgments: The current study is implemented within the framework of the project No. lzp-2019/1-0335 funded by Latvian Council of Science.

O6 IODINE STATUS OF WOMEN OF REPRODUCTIVE AGE IN LATVIA

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Introduction. Possible iodine deficiency and national iodization plan has been long discussed in Latvia. However, there has been no large-scale population study using urinary analysis to date. Nutritional data usually gives an insight of consumed amounts of nutrients, moreover, combined with analytical data provides more precise and realistic results. Adequate iodine consumption is very important for women in reproductive age, as iodine deficiency (ID) during pregnancy can result in pregnancy loss, intrauterine growth retardation, and lower IQ in the offspring.

Objective. This study analyses iodine status of women aged 19–49.

Methods. Data was obtained from national survey on salt and iodine consumption in Latvia 2020. Iodine status was detected from analysis of 24-h urinary samples. Sources of iodine were identified from food diaries and food frequency questionaries. Iodine excretion from urinary data were calculated on 24h, taking into account that just 90% of iodine are excreted.

Results. Median iodine levels for women aged 19–49 were 81.15 mcg, with iodine less consumed by younger women. More iodine was consumed during winter and autumn seasons, but less in spring and summer. Place of residence, income and education level did not have an impact on iodine levels in women. 78% of women consumed iodine less than recommended but 4.5% consumed an excessive amount of iodine. The main sources of iodine are milk and milk products, drinking water, fish and seafood. Fish and seafood are not included in nutrition very often – for women, one portion a week. More fish are consumed during winter season, which explains a higher excreted iodine during winter.

Conclusions. Iodine deficiency is a serious public health concern. Inadequate iodine consumption from food, as well as low numbers of iodized salt consumers result in iodine deficiency in women of reproductive age in Latvia.

Keywords: iodine, urinary iodine, nutrition, women, iodine deficiency.

Acknowledgments: The current study was funded by the Republic of Latvia Ministry of Health.

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O7 THE DIETARY HABITS DURING LACTATION

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Introduction. A healthy and diverse diet is especially important for breastfeeding mothers, however, often the intake of some important food groups is known to be insufficient during lactation period.

Objectives. The aim of the present study was to investigate the nutritional preferences during the first six breastfeeding months among lactating women.

Methods. The research was implemented by RSU, CDPC and WHO between April 2017 and March 2018. The cross-sectional study was carried out involving 69 breastfeeding women from outpatient clinics in Riga. The questionnaire "The Dietary Habits and Influencing Factors of Latvian Pregnant Women" was used to determine eating patterns of lactating women and changes in dietary patterns during breastfeeding.

Results. Only 13% (n=9) of respondents reached the minimum recommended number of fruit portions per day. And only 2.8% (n=2) consumed eating three portions of vegetables a day. 62.3% (n=43) of respondents did not eat fish in general or consumed it less frequently than once a week. Industrially processed meat products (sausages, cured whole muscle cuts or other restructured meat products) were consumed in the amount from one to three portions a day by 36.2% (n=25) of respondents. On average, women used three portions of milk, sour milk products and curd a week. The average frequency of cheese intake was 9 portions a week. 53.4% (n=31) of respondents consumed between 30 g and 128 g of cheese a day. Only 2.9% (n=2) of respondents used iodized salt.

Conclusions. To maintain a satisfactory mineral and vitamin status and reach the recommended daily fibre amount, lactating women should be encouraged to follow eating pattern that includes regular consumption of vegetables and fruits, because there is no evidence that mothers should entirely avoid these products during breastfeeding unless the infant reacts negatively as a consequence.

Keywords: lactation, nutrition, restrictions.

O8 EARLY EATING HABITS IN INFANTS AND THEIR ASSOCIATION WITH IRON METABOLISM

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Introduction. Infants experience rapid growth and development during the first year of life. Iron deficiency is one of the most common micronutrient deficiencies during the first year of life.

Objective. The study is aimed at investigating the early dietary habits of Latvian infants and their relation to iron metabolism.

Methods. The study is composed of 2 parts: study A includes 344 and B – 73 participants. Dietary data were collected using an interview. To determine iron status blood samples were taken. The P value < 0.05 was considered statistically significant.

Results and conclusions. Almost all infants (89%, n=18) were breastfed in the first month of life, 21% (n=15) was exclusively breastfed for the first 6 months of life. The average age for introducing complementary food was 5 months. The greatest food diversity was introduced at 4–6.9 months of age. Iron intake was on average 7.4 mg. Iron deficiency was detected in 9.6% (n=7) of infants and iron deficiency anaemia in 4.1% (n=3). Blood iron level was reduced in 30% (n=8) of infants fed with cow's milk, compared to 6% (n=2) who didn't (p=0.0171). For infants who took iron predominantly from non – animal products serum ferritin was within normal range: 100% (n=20) of infants receiving < 10% iron from animal foods, 78% (n=18) receiving 10–20% and 71% (n=12) receiving > 20% iron from animal foods (p=0.0405). Serum ferritin is within the normal range for 93% (n=26) of infants who did not consume legumes, compared to 72% (n=21) who consumed (p=0.0425).

Dietary habits of infants living in Latvia partly correspond to the guidelines. 63% of infants do not obtain enough iron from food and iron deficiency is observed in 9.6% of infants and anaemia in 4.1%. Changes in iron metabolism have been proven to be related with: early introduction of cow's milk, exclusive breastfeeding, breastfeeding, infant formula, legumes.

Keywords: early eating habits, blood iron level, diet, metabolism.

O9 PHYSIOLOGICAL EFFECTS OF SUSTAINABLE DIETS DURING PREGNANCY AND LACTATION

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Introduction. The importance of lifestyle and dietary habits during pregnancy and breastfeeding for health of mothers and their offspring is widely supported by the most recent scientific literature. Requirements for some macronutrients such as energy and protein and micronutrients such as iron, iodine, calcium, folic acid, and vitamin D increase during pregnancy and lactation to maintain maternal homeostasis and foetal growth [1,2,3].

Problem. Risks of inadequate nutrition and impaired physiological functions due to a lack of sustainable food sources and dietary patterns during pregnancy and lactation.

Objective. To provide a proof of concept of the physiological and functional effects of a sustainable diet during pregnancy and breastfeeding, considering that both poor nutrition and overnutrition cause impairment of metabolic and physiological functions.

Methods. The work package of the ERAF project No. 23-11.17 e/20/224, SYSTEMIC "Nutrition" includes a specific task "Physiological manifestations of a sustainable diet". The analysis originates from data on the impact of climate change on food composition, as well as on the individual needs. In addition, the most recent research on biological activities of dietary compounds in relation to the chemical or molecular structure doses and related bioavailability will be specifically considered. We will identify nutritional factors (macro or micronutrients, phytochemicals, microorganisms, antinutrients), potentially at risk of over- or underexposure in the context of climate change and define the needs to exert biological functions in pregnant and breastfeeding women, taking into consideration food sources, processing and bioavailability. Then we will evaluate the physiological impact of different dietary patterns.

Results and application. Overview of nutritional sources and nutrient consumption during pregnancy and breastfeeding allows to characterize the provision of nutrients and dietary diversity and an overview of current and potential dietary models for a balanced diet and nutrient intake in these populations, taking into account alternative food sources. The results will be applied to the FOOD 2030 strategy of EU.

Keywords: diet, pregnancy, lactation.

Acknowledgments: The authors recognise contribution of ERAF project No. 23-11.17 e/20/224, SYSTEMIC, and the current study has been implemented within the framework of the project No. 1.1.1.5/17/I/002.

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O10 LIFESTYLE HABITS IN PREGNANT WOMEN IN LATVIA

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Introduction. Healthy lifestyle has a major impact on outcome of pregnancy, as well as short- and long-term health effects of mother and child. Unhealthy lifestyle habits are risk factors of noncommunicable diseases.

Lifestyle in Latvian population is mainly sedentary. 35% of women spend their free time doing passive leisure activities. 9% of women exercise at least 4–6 times a week for 30 minutes. 51.9% of women exercise only a few times a year. 12% of women are daily smokers. 73.6% of women have used alcohol during the previous year. There is no published data about lifestyle habits of Latvian pregnant women.

Objective. The aim of the study was to assess self-reported lifestyle habits such as diet, exercise, smoking, alcohol use in pregnant women in Latvia.

Materials and methods. A cross sectional survey of 393 women took place in maternity departments (n=257) and maternity outpatient clinics (n=136) in Latvia. Information about lifestyle habits was obtained from self-reported survey answers. Statistical data was processed in IBM SPSS statistics.

Results. 28.5% (n=112) of women smoked before pregnancy and 2.8% (n=11) of women continued smoking during pregnancy.

13.2% (n=52) of women reported consuming alcohol during pregnancy, the amount did not exceed 1 alcohol unit per week.

Women expecting their first child spent 6.30 hours a day doing sedentary activities, the second child – 5.59 hours, the third or subsequent children – 5.16 hours. Some mild physical activity (walking, riding a bike, etc.) was done daily by 51.1% of women expecting their first child, 57.4% – the second child, 68.2% – the third or subsequent children.

60.8% of women reported changing their eating habits during pregnancy, 71.2% of these women were overweight before pregnancy. 53.4% reported not trying to eat healthier during pregnancy.

Conclusions. Unhealthy lifestyle habits such as smoking, drinking alcohol, unhealthy eating during pregnancy, as well as insufficient physical activity are prevalent in pregnant women in Latvia. Intervention is necessary before pregnancy to prevent adverse effects associated with these unhealthy lifestyle habits.

Keywords: pregnancy, lifestyle.

Acknowledgments: The study was implemented in the framework of project supported by Latvian Council of Science No. lzp-2019/1-0335.

O11 PRE-PREGNANCY WEIGHT SELF-ASSESMENT AND DIETARY HABIT CHANGES DURING PREGNANCY

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Introduction. Worldwide, obesity is increasing among women in reproductive ages [1], rising the prevalence of pregnant woman with excess weight. It is important to understand the role of psychological and social factors of abnormal pre-pregnancy weight, as it is associated with adverse maternal and infant health outcomes [2]. This study provides an insight in excess weight prevalence and related dietary habit changes among pregnant women in Latvia.

Methods. This study was conducted at Riga Stradiņš University. A cross-sectional survey of 854 pregnant women took place in maternity outpatient clinics and maternity departments in Latvia. Questionnaire included weight and eating pattern changes during pregnancy, received dietary advices. Statistical data was processed in IBM SPSS statistics.

Results. There are 30.2% (n=258) of pregnant women in this study with body mass index > 25 kg/m^2. 26% (n=66) of them consider their weight to be normal. Being underweight is seen by 5.3% (n=45) of pregnant women. Only 35.5% of pregnant women who are overweight or obese received recommendation for weight loss before pregnancy. Most of recommendations were provided by gynaecologist or general practitioner (13.1%). Almost half of the women (45.6%), who felt overweight, improved their dietary habits.

Discussion. Antenatal period is a good time for dietary habit changes, as women are more motivated to adopt new healthier habits [3]. However, it may be challenging, as they have more relaxed attitude to weight gain [4] and lack knowledge of specific dietary recommendations or may not have the skills required to improve their diet.

Conclusions. According to our study results, women who felt overweight had non-significant ($p<0.037$) changes in their eating habits. Specific dietary advice targeting pre-pregnancy weight could be developed and applied in a non-judgmental manner.

Keywords: weight, dietary habits, pregnancy, BMI.

Acknowldegements: The current study was supported by Latvian Council of Science project No. lzp-2019/1-0335.

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O12 KNOWLEDGE OF MEDICAL PROFESSIONALS ABOUT NUTRITION IN PREGNANCY

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Introduction. Optimal nutrition is necessary to maintain and improve maternal and foetal wellbeing. Knowledge about nutritional requirements during pregnancy is important for medical professionals to be able to provide good antenatal care. In 2016, Ministry of Health of Republic of Latvia has issued recommendations on nutrition before and during pregnancy.

Objective. The aim of the research is to evaluate knowledge of medical professionals about general recommendations on nutrition in pregnant women.

Materials and methods. In a cross-sectional study, medical professionals were surveyed using an online questionnaire, which comprised questions about general nutritional requirements and recommendations during pregnancy stated in recommendations issued in 2016 by Ministry of Health of the Republic of Latvia.

Expected results and practical use. Results display some pitfalls in general knowledge of medical professionals about nutrition and dietary supplementation requirements in pregnancy.

The results will further help to improve educational programmes for medical professionals involved in antenatal care.

Keywords: pregnancy, nutrition, antenatal care.

Acknowledgments: The study has been implemented within the framework of the project No. lzp-2019/1-0335 funded by Latvian Council of Science.

O13 MARKET RESEARCH AND MEAL READY-TO-EAT (MRE) MAIN COURSE DEVELOPMENT IN THE CONTEXT OF MILITARY USE

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Introduction. One-day ration can be supplied to the soldier in a form of 1 ration pack for 24 hours or 3 packs of meal ready-to-eat (MRE), that equals one 24-hour ration [1]. Based on physical activity level and consequently energy requirements, there are two categories of military operations: normal operations, comparable to urban police work or firefighting, and combat operations which represent missions involving light-infantry [2].

Objective. The aim of this study was to analyse EU market on the subject of main course (MC) product in flexible packaging (n=184), in the context of military use, and to develop thermostabilized MC aligning with modern health and nutrition recommendations for military use, i.e. protein, carbohydrate, fat, total energy intake and essential amino acid composition.

Results and conclusions. The greatest variety of ready-to-eat meals with shelf-life over 1 year are produced in the United Kingdom (n=48) and most of the MC meals are preserved using freeze-drying (n=135). While 90% of analysed products meet certain criteria for a physically active consumer (i.e. soldier), only 1% of the products is able to fulfil protein requirements. In this study, 9 MC meals with shelf-life of 3 years were developed, providing the necessary protein amount for highly physically active consumer and covering its daily essential amino acid requirements.

Keywords: nutrition value, protein content, amino acid, retort pouch.

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O14 METABOLIC ACTIVITY OF THE GUT MICROBIOTA

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Introduction. Recent studies have shown that microbial metabolites have crucial effect on intestinal health.

Overview. Short chain fatty acids (SCFAs), the major investigated metabolites of microbiota, are directly associated with anti-inflammatory properties. However, the gut microbiota is diverse and dynamic. Specific composition of the beneficial gut bacteria may not always provide the same health effect, as bacterial activity and virulence are affected by factors such as diet, stress, age, medications used etc.

In addition, the microbial competition in the gut significantly affects the production of metabolites. Many bacterial members of the human gut microbiota produce one or more types of antagonistic toxin systems, ranging from small-peptide bacteriocins, colicins, enzymes, other secreted proteins, etc.

Thus, the investigation of bacterial antagonistic interactions is a crucial step allowing to assess the effect of bacterial metabolites on human health and diseases.

Conclusions. The purpose of this review is to highlight the factors that affect the productivity of bacteria in the gut and the importance of studying not only the composition of the gut microbiota alone, but also examining the deeper interrelated pathways of bacterial metabolism and its effect on gut health.

Keywords: bacterial metabolism, gut microbiota.

O15 SPECIFIC CARBOHYDRATE DIET (SCD/GAPS) FOR CHILDREN WITH AUTISTIC SPECTRUM DISORDER

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Objective. To investigate the potential of specific carbohydrate diet and supplements in reducing autistic spectrum disorder (ASD) symptoms in children.

Methods. This was a prospective, quantitative, three-month-treatment study of a nutritional and dietary intervention. Participants – 17 children from Latvia and UK with a diagnosis of ASD or autistic symptoms waiting to be diagnosed (Intervention group n=10, Control n=7). This study involved a specific carbohydrate dietary plan – Specific Carbohydrate Diet/Gut and Psychology Syndrome diet (SCD/GAPS) – and a few nutritional supplements (essential fatty acids, ascorbyl palmitate, probiotics, vitamin D, vitamin C). Autistic and digestive symptoms were evaluated by parents using validated questionnaires.

Results. Compliance of families for dietary guidelines was 40–80%. Gastrointestinal symptoms improved in both groups, especially abdominal pain and bloating. By the end of the study, the overall ATEC (Autism Treatment Evaluation Checklist) score decreased by 23% in the Intervention group, with the largest improvement in Socialising and Health/Behaviour symptom subgroups. ABC (Aberrant Behaviour Checklist) score decreased by 29% in the Intervention group, with the largest improvement in Irritability and Hyperactivity subgroups. Overall, PGI (Parent Global Impressions) evaluation showed 43% improvement in comparison to the Control group (14%), p=0.02.

Conclusions. Specific carbohydrate diet is safe and effective approach for reducing some symptoms of ASD in children.

Keywords: autism, autistic spectrum disorder (ASD), nutrition, Specific Carbohydrate Diet (SCD), Gut and Psychology Syndrome (GAPS).

O16 RELATIONSHIP OF DIETARY PROVOCATIVE FACTORS WITH THE INCIDENCE OF GOUT ATTACKS

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Introduction. Many modern studies have emphasized that dietary modification is relatively less effective in controlling hyperuricemia than the use of urate-lowering drugs.

Systematic reviews have also convincingly shown that drug treatment for uric acid control is more effective than other interventions. Nevertheless, statistical data shows the prevalence of several diet-related factors before the gout attack period and vice versa, the absence of these factors reduces the risk of gout attack.

Objective. To evaluate the equivalence of a person with a diagnosed gout to lifestyle models for prevention of gout attack.

Study participants: The study included 69 people diagnosed with gout according to EULAR criteria, 43 men and 26 women aged 35 to 78, who agreed to participate in the study.

Methods. General questions of the survey: age, gender, anthropometric indicators, Food Frequency Questionnaire (EPIC-Norfolk FFQ) and a survey to assess the patient's knowledge of gout management recommendations using the Likert scale. Data of people with clinically diagnosed gout, which were complete, were collected and statistically processed in Microsoft Office Excel and SPSS 22.0 programs.

Results and conclusions. As the frequency of alcohol consumption increases, the number of attacks per year also increases at rs=0.611 (p=0.0001). Moderately close correlations were found between pork (rs=0.636), white bread (rs=0.544) and added sugar to tea, coffee, and porridge (rs=0.591) with a gout attack rate of $p<0.0001$. There is a moderately close statistically significant negative correlation between the frequency of use of uric acid lowering drugs and the number of seizures per year (rs=-0.581) $p<0.0001$.

Regular medication use reduced the effect of alcohol on the development of gout attack in the group of respondents who did not have any attack during the year by 19%, OR 0.081 (95CI 0.007 0.921) $p<0.05$ A person diagnosed with gout has a low level of resemblance to gout prevention lifestyle models.

On the one hand, most patients take uric acid medications regularly, on the other hand, alcohol intake and eating habits contradict the dietary recommendations of gout patients, despite a formal awareness of their protective effect.

Keywords: gout, gout attack, alcohol consumption, uric acid lowering drugs, nutrition.

O17 COVID-19 AND OBESITY: IMPACT OF OVERWEIGHT ON DISEASE SEVERITY

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Introduction. In Latvia, the incidence of the COVID-19 was relatively low during the first six months of infection intervention (March–August, 2020), but the epidemiological data of the two following months showed a sharp increase in morbidity. In these circumstances, the importance of identifying and analysing the factors influencing the course of the disease is growing. The National Research Programme "Covid-19 mitigation" project VPP-COVID-2020/1-0023 is dedicated to identification of relevant factors correlated with COVID-19 infection paradigms [1]. In scope of this project (inter alia) patients are surveyed and several biological parameters are determined. The preliminary data indicate several predispositions, one of which is overweight and obesity. Data collection is expected to be completed by the end of November 2020 and presented at the Conference. In light of this research, a scientific literature review is performed to obtain comparative data on impact of overweight on the course and severity of the COVID-19 disease.

Methods. To achieve the aim of this research, a MEDLINE search is carried out. The papers identified are reviewed following the Synthesis Without Meta-Analysis (SWiM) methodology [2], and are classified according to the focus of the enquiry, and whether they are quantitative or qualitative in nature.

Results and discussion. Due to topicality and variability of the situation, new scientific publications appear consequently, and the dominant majority of them identifies the overweight and obesity as an impact factor on hospitalisations, clinical complications and mortality. Simultaneously, the COVID-19 can induce long-lasting complications and chronic conditions, such as the post-viral chronic fatigue syndrome (CFS), which is a serious, complex, multi-system disorder, characterised by symptoms lasting at least six months, with severe incapacitating fatigue not alleviated by rest, and other symptoms, which lead to substantial reductions in functional activity and quality of life [3]. The CFS is also one of the research issues of the project [1], and results are expected in near months.

Conclusions. In the context of further epidemiological uncertainty and the possibility of severe post-viral consequences, preventive measures are becoming increasingly important. Physical activities, a balanced diet, and emotional stability can be effective tools to mitigate, prevent and avoid the COVID-19 consequences.

Keywords: COVID-19, obesity, overweight.

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O18 THE PREVELANCE OF ORTHOREXIA NERVOSA AND EATING DISORDERED ATTITUDE TO FOOD AMONG STUDENTS OF THE STUDY PROGRAMME "NUTRITION" OF THE FACULTY OF REHABILITATION AND STUDENTS OF THE STUDY PROGRAMME "MEDICINE" OF RIGA STRADIŅŠ UNIVERSITY FACULTY OF MEDICINE

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Introduction. Dietitians and doctors are under social pressure to be a model for a balanced diet, healthy appearance and lifestyle, so there is a hypothesis that they have a higher risk of eating disorders and Orthorexia Nervosa (ON) than the society as a whole. Many studies to date have proven the hypothesis, but there are also studies that have shown that the risk of eating disorders and ON is not higher in this professional population than in the general population. Similar studies have not been conducted in Latvia, the risk of eating disorders and ON amongst those professionals should be examined.

Objective. To determine the differences of the attitude towards eating, eating disorders and ON among the students of the study programme "Nutrition" and the study programme "Medicine" at Riga Stradiņš University.

Participants. The study involves 97 students from the study programme "Nutrition" of the Faculty of Rehabilitation, Riga Stradiņš University, and 303 students from the study programme "Medicine" of the Faculty of Medicine. The exclusion criteria are male, pregnant or breastfeeding women.

Methods. A survey questionnaire combining two questionnaires: Eating attitude test (EAT-40) and ORTO-15 for determination of the ON, and student-specific questions such as age, height, body weight, study course, and faculty. Data was processed in Microsoft Office Excel and SPSS 22.0.

Results and conclusions. There is a statistically significant negative correlation between test EAT-40 score and the ORTO-15 test score in the study programme "Nutrition" ($r_s = -0.44$, $p < 0.01$) and programme "Medicine" ($r_s = -0.36$, $p < 0.01$), showing that high total score of the EAT-40 test indicating a high risk of eating disorders is closely related to the low score of the ORTO-15 test indicating ON risk. Students of the study programme "Nutrition" have a higher risk of ON and a lower risk of eating disorders in comparison to students of the study programme "Medicine". In both study programmes, a longer study time reduces the risk of eating disorders but does not affect the risk of ON.

Keywords: eating attitude, eating disorders, nutrition students, medicine students, Orthorexia Nervosa.

O19 THE POSITIVE, QUANTIFIABLE EFFECT OF LYL LOVE YOUR LIFE® SPRAY ON BLOOD VITAMIN D3 LEVELS

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Background. Vitamin D is a fat-soluble vitamin with a variety of functions in the human body. It is responsible for far more than just bone or teeth health. In northern countries, including Latvia, ultraviolet radiation from the sun is insufficient to produce vitamin D in the skin, so it should be used as an additional dietary supplement or medication.

Objective. The aim of the study was to determine the effectiveness of total vitamin D or 25(OH)D accumulation in the body within 30 days using LYL sunD3 and LYL EFFUSIO® products for people with vitamin D deficiency.

Materials and methods. This is a randomized, placebo-controlled, independent study. Participants were men and women aged 18–60 years with vitamin D deficiency (10–29.9 ng/ml). Two groups received different vitamin D products with a therapeutic dose of 4000 IU twice daily, after meals, in the morning and in the evening, while third group received placebo.

Results. After one month of use, the increase in the total serum vitamin D was observed in 92% of therapeutic group participants. The use of LYL micro™ in the dose used during the study increased serum concentration of vitamin D by 132.4% (an increase by 23.97 ng/ml on average), LYL EFFUSIO® – by 124.2% (an average increase by 23.64 ng/ml), meanwhile the control group was characterised by a decrease of vitamin D levels by 14.6% (an average decrease by 4 ng/ml). After a month of use, more pronounced increase in the level of vitamin D was observed in study participants with lower initial levels of total vitamin D. No correlation with diet or diet influences on the changes in the level of vitamin D was observed.

Conclusions. LYL micro™ (4000 IU/twice per day) and LYL EFFUSIO® (4000 IU/twice per day) can effectively increase the total level of serum vitamin D in people with vitamin insufficiency and deficiency as soon as within a month of use.

Keywords: vitamin D, vitamin D supplements, 25(OH)D.

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O20 CHANGES IN EATING HABITS DUE TO COVID-19 RESTRICTIONS IN LATVIA, PANAMA AND SINGAPORE

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Introduction. Good nutrition is crucial for health, particularly in times when immune system might need to fight back. Limited access to food might lead to an increased consumption of highly processed food due to COVID-19 restrictions leading to increased health-related risks.

Objective. The aim of the study was to compare differences in eating habits before and during COVID-19 restrictions among three countries: Latvia, Panama and Singapore.

Methods. The International Sexual Health and Reproductive Health Survey (I-SHARE) is an international consortium and cross-sectional online survey that took place in all three countries from July to October aimed to measure sexual and reproductive health, nutrition and mental health during the COVID-19 social distancing measures. In Latvia, it is a component of the National Research Programme project "Impact of COVID-19 on health care system and public health in Latvia; ways in preparing health sector for future epidemics". The study was approved by the local Ethics Committees. Data have been summarized and analysed with MS Excel and IBM SPSS 26.0.

Results and discussion. The total number of respondents for nutrition questions were n=1173 in Latvia, n=558 in Singapore and n=944 in Panama. The table below presents the data on three key nutrition questions:

Question	Latvia	Panama	Singapore
(1) Worried more if a household will have enough food	74.0%	37.7%	48.0%
(2) Increased food consumption			
A bit	39.4%	45.7%	42.7%
A lot	9.9%	11.1%	11.7%
(3) Increased fast food consumption			
A bit	15.5%	30.7%	35.9%
A lot	2.2%	11.9%	20.1%

As we can observe, the concerns whether a household will have enough food were more typical in Latvia. There was a tendency of increased food consumption in

roughly 50–60% of respondents across the countries, but the increase of fast food consumption differed among countries in a broad range.

Conclusions. There are various aspects that can affect availability of food with good nutritional value irrespectively of socioeconomic status and geographical location. The comparison among the three countries demonstrated that there were similarities and differences in each country, confirming the necessity to implement multi-level multi-faceted framework of action in order to support nutrition during COVID-19 and reduce health risks related to nutrition.

Keywords: nutrition, eating habits, Covid-19 restrictions.

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O21 COMPARATIVE ANALYSIS OF DAILY EATING HABITS OF ELEMENTARY SCHOOL CHILDREN IN DIFFERENT WEIGHT GROUPS

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Introduction. A balanced diet and maintenance of healthy eating habits promote health, growth, and intellectual development of children across the life course. Healthy eating behaviours become less common as young people move through adolescence, less frequently having breakfast, decreasing fruit and vegetable consumption and increasing soft drink consumption with age. This study aims to explore eating habits among different weight groups in elementary school children.

Materials and methods. 104 children (aged 8–9 years) from 13 schools across Latvia were enrolled in this study. Data were collected within the period from 2017 to 2019. Anthropometric data were collected by standard procedures. According to the World Health Organization, body mass index percentile scale children were divided into four groups: underweight (UW) (n=5), normal weight (NOR) (n=68), overweight (OW) (n=8) and obese (OB) (n=23). Study participants filled out questionnaires about nutritional habits, nutrition data were analysed for 92 children. Data were processed with SPSS 22.

Results. It was determined that 22.1% of children were obese and 7.7% were overweight at the start of the study in 2017. Regular breakfast consumption decreased from 66.7% every day in 2017 to 55.6% in 2019 ($p=0.005$). The largest decrease was observed in OB group, from 73.9% to 42.9% ($p=0.004$), correspondingly. Regular consumption of vegetables and dairy products also decreased over two years. In 2019, 30.5% of children reported that they eat vegetables less than once a week compared to 11.4% in 2017. The largest decrease was observed in NOR and OB groups ($p<0.05$). The consumption of various sweet snacks did not change, whereas consumption of sweetened drinks (23.8% vs 8.4%) and salted snacks (15.2% vs 5.3%) decreased over time. The intake of salted snacks decreased the most in NOR and OB children ($p<0.05$). However, there was no statistical difference in different product consumption between different weight groups at three various time points.

Conclusions. Children start to skip breakfast more frequently as they grow older. Similarly, there is decrease in consumption of vegetables and dairy products. Also, dietary intake of soft drinks and salted snacks has decreased, while there is no change in consumption of sweet snacks.

Keywords: eating habits, body mass index, pupils, elementary school.

O22 EATING HABITS AND PHYSICAL ACTIVITY IN JUNIOR SCHOOL AGE CHILDREN

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Introduction. Healthy eating habits (EH) and physical activities (PA) in children are the key factors to healthy and qualitative life in adulthood, as both factors promote adequate development and growth throughout the childhood. Furthermore, unhealthy EH and sedentary lifestyle are associated with increasing risk of non-communicable diseases in even younger population [1,2].

Objective. The aim of the study was to assess dietary and PA habits which are prevalent in junior school age children in Latvia.

Methods. The Physical Activity and Children Overall Health study enrolled 1788 children from 59 Latvian schools. Evaluation of EH included an estimation of cluster unhealthy EH like skipping breakfast, irregular meals, fruit and vegetable consumption, choice of snacks and beverage and eating culture. PA level was determined by detailed analysis of structured PA on schooldays by self-reported questionnaire.

Results. Regular 4 and 5 meals per day were characteristic only for 24.6% of children. 59.2% ate breakfast every day. 25.3% of children had the 3–4 portions of vegetables recommended for healthy EH, and 40% of children had 3 portions of fruits per day. Only 41% of children choose to drink water during the day. 55.7% of children chose fruits as snack. 28.9% were used to having a meal while watching TV or using other mobile devices, besides, those children chose to put less vegetables on their plate ($p<0.001$) and consumed more calorie dense snacks ($p<0.001$). In total, 32.5% of children had 3 or more unhealthy EH. Unhealthy EH were more common among boys compared to girls ($p=0.003$). 44.6% of children enjoy being active or use every chance to be active as they really relish it. 70% of study participants had additional PA besides the physical education at school. Furthermore, 80.4% of them did sports training 2–4 times a week. In structured PA on schooldays less than a half of the children reached the World Health Organization's recommendation of 60 min MVPA per day. A significant relation was found between increasing PA and decreasing number of unhealthy EH ($p<0.001$). Data were analysed with SPSS.

Conclusions. Unhealthy EH and low PA levels are common among junior school age children. Higher PA level is related to healthier EH in children.

Keywords: junior school age children, physical activity, eating habits.

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O23 WILD APPLE (*MALUS* SPP.) BY-PRODUCTS AS A SOURCE OF PHENOLIC COMPOUNDS AND VITAMIN C FOR FOOD APPLICATIONS

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Introduction. The phytochemical profile and positive health effects of the fruits and by-products of domesticated *Malus domestica* Borkh. apple cultivars have been extensively investigated.

Objective. The present study was designed to evaluate the hydrophilic composition and antioxidant activity of the compounds recovered from wild apple *Malus* spp. by-products.

Methods and materials. The phytochemical analysis of the 30 and 96% ethanolic extracts using LC-DAD-ESI-MS/MS has led to the detection and isolation of 25 hydrophilic compounds. Amongst the polyphenols, chlorogenic acid, B-type procyanidins, and phloretin-2-glucoside dominated.

Results and conclusions. The results of HPLC-DPPH$^{\bullet}$ radical scavenging showed that the major contributors to the antioxidant activity of wild apple by-products were found to be cyanidin-glucoside, luteolin-glucoside, and B-type (−)-epicatechin, which showed the lowest EC_{50} values of 0.65, 0.70, and 0.80, respectively. The abundance of vitamin C, including ascorbic and dehydroascorbic acids was confirmed using UHPLC-QqQ-MS/MS technique. The results showed that the wild apple by-products have the potential to be used in the production of natural antioxidants. Using a common solid-liquid extraction technique, 100 kg of press cake yielded 200 g of procyanidins, 100 g of chlorogenic acid, 87 g of phloridzin and 60 g of vitamin C, compounds that could potentially be used for the production of lipid oxidation inhibitors and agents with antimicrobial activities as medicines and food additives.

Keywords: crab apples, *Malus* spp., polyphenols, vitamin C, antioxidants.

O24 INVESTIGATION OF STRUCTURE FORMATION OF OAT PROTEIN DURING WET EXTRUSION

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Introduction. Meat substitutes obtained from plant-based sources are recognized as healthy and environmentally friendly food products. Rising market demand for products from plant-based protein has increasingly been stimulated to develop new protein sources and technologies for meat substitutes, especially produced by means of wet extrusion process. Oats, which have an elevated nutritive value including one of the best amino acid compositions within the crops, could be identified as a promising new raw material source for meat substitutes obtained by extrusion. However, little is known about oat protein behaviour during extrusion process, its ability to form structure suitable for use in food application. In addition, intrinsic oat components, in particular, starch, fibre and fats, the amounts of said components along with process parameters heavily influence the form, firmness and taste of the extruded product.

Objective. The study focuses on oat protein concentrate extrusion process performed with a single screw laboratory extruder.

Methods and materials. The extrusion temperature was in the range from 80°C to 140°C. The moisture content of oat protein varied from 45 to 55%. Starch and lipid incorporation rate was in the range from 3 to 45%, and of 10 to 20%, respectively.

Results and conclusions. The study revealed that the oat protein concentrate composition with the relatively high lipid content forms weak structure, preventing aggregation of product particles. Starch content heavily influences structure firmness and facilitates formation of homogeneous structure. The study demonstrates that opportunities exist, indicating the pathways for future research.

Keywords: oat protein, extrusion, meat substitutes.

O25 CHARACTERIZATION OF THE QUALITY PARAMETERS OF DEHYDRATED FERMENTED CABBAGE JUICE

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Introduction. In the production process of fermented cabbage, known as sauerkraut, cell juices of cabbage are released due to the influence of NaCl in the osmotic pressure. It is highly saturated with biologically active and nutritious compounds [1], but most of it is considered as a by-product – residue.

Discussion and results. Innovative and sustainable solutions are sought to find ways how to utilize this valuable by-product. In this experiment, fermented cabbage juice was spray-dried, and maltodextrin in different concentrations (0; 5; 10%) was used as a wall material. Physical (pH, moisture), chemical (total phenolic content, antiradical activity, organic acids) and microbiological (total plate count, lactic acid bacteria) analyses were carried out. In total, six organic acids were identified, the major ones being oxalic, quinic, lactic and acetic acids. The total phenolic content is influenced by the concentration of maltodextrin used. In the samples with no wall material the total phenolic content was 738 mg 100 g^{-1} dry weight, whereas in the samples with 10% wall material 339 mg 100 g^{-1} dry weight. The total phenolic content strongly corelates with antiradical activity.

Conclusions. In our study, the total viability of microorganisms and lactic acid bacteria ($8.9x10^3$ – $4.2x10^4$ CFU g^{-1}) did not reach the probiotic potential according to FAO and WHO [2]. Comparing samples with no maltodextrin to 10% maltodextrin concentration, salt content was 14.3% to 8.9%, moisture content 7.03% to 5.3%, solubility in water 82.8% to 81.74% respectively. Further studies and experiments are necessary to find the most appropriate wall material and drying conditions for this innovative and high-potential dehydrated fermented cabbage juice.

Keywords: fermented cabbage juice, spray drying, maltodextrin concentrations.

Acknowledgements: This study was supported by European Innovation Partnership for Agricultural Productivity and Sustainability Working Group Cooperation Project No. 18-00-A01612-00002.

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O26 INFLUENCE OF DIFFERENT COFFEE BREWING METHODS ON BIOCHEMICAL COMPOSITION OF FRUIT JUICE AND COFFEE DRINK

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Introduction. Fruit juice and coffee drink is an interesting combination providing the necessary bioactive compounds and caffeine for the whole day. The coffee brewing method changes both the amount of caffeine and the taste of fruit juice and coffee drink. Caffeine in coffee gives a bitter taste, but the least bitter taste is felt in cold-brewed coffee, making it an ideal ingredient for fruit juice and coffee drink.

Objective. The aim of this research was to evaluate the influence of preparation technologies in creating an innovative fruit juice and coffee drink with a high content of bioactive compounds.

Methods. Four different types of medium roasted "Lofbergs" coffee beans were compared, as well as two brewing techniques: French press (hot coffee) and cold-brew. Content of vitamin C, pH, soluble solids content, titratable acids, total phenol content, DPPH antiradical activity and sensory analyses were determined for all prepared samples.

Results. Vitamin C in the juice with coffee ranged from 10.36 to 22.60 mg 100 g^{1}, the highest vitamin C content was preserved in pasteurized juice and coffee drink with cold-brew coffee preparation technique. Soluble solids ranged from 12.3 to 12.6%, titratable acids from 0.79 to 0.87%, pH from 2.68 to 2.88, total phenols – from 54.31 to 129.26 mg $100g^{-1}$, and the highest total phenol content it was possible to reach in pasteurized fruit and coffee drink with smooth and sweet coffee beans prepared with cold-brew technique. DPPH antiradical activity was from 126.24 to 177.89 mg $100g^{-1}$ in the tested samples, the highest DPPH antiradical activity was detected in pasteurized fruit and coffee drink with sweet and nutty coffee beans prepared by using cold-brew technique.

Conclusions. The best sensory profile was for coffee and juice drinks with "Lofbergs" Medium Roast Fruity and Velvety Rwanda coffee beans prepared by using cold-brew technology.

Keywords: fruit juice, cold-brew coffee, vitamin C, caffeine, soluble solids, titratable acids, total phenols, DPPH.

O27 *LONICERA CAERULEA* L. AS A SOURCE OF BIOLOGICALLY ACTIVE COMPOUNDS FOR ENRICHMENT OF SOUR MILK PRODUCTS

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Introduction. *Lonicera caerulea* L., also known as honeysuckle berry, is a fruit commonly planted in eastern Europe, Russia, Canada and Asia. Berries are rich in biologically active compounds. The high content of anthocyanins, phenolic compounds, vitamins and minerals makes these berries a valuable raw material for development of functional foods.

Methods and materials. The objects of research were three honeysuckle varieties ('Zoluška', 'Siņaja Ptica', 'Goluboje Vereteno') and four hybrids (No. 2A; No. 3; No. 5; No. 8), and sour milk product (kefir), enriched with various amounts (3–10%) of fruit puree. Chemical analyses of total phenolic compounds, vitamin C, tannins, flavonoids, anthocyanins and antiradical activity were performed to determine the qualitative indicators of raw materials and products. The degree of liking of the sour milk product enriched with honeysuckle berries puree was assessed by using sensory analysis: hedonic and line scales.

Results. The results obtained show that among the varieties the highest content of anthocyanins (1103.5 mg 100 g^{-1}), total phenols (693.3 mg 100 g^{-1}), flavonoids (753.9 mg 100 g^{-1}), and tannins (1.6 mg 100 g^{-1}), is found in 'Siņaja Ptica' berries, while 'Goluboje Vereteno' berries contain the highest content of vitamin C (51.4 mg 100 g^{-1}). Among the hybrids, No. 8 berries were the most valuable, the chemical composition differed only by 2% (anthocyanins) to 10% (flavonoids), being lower than those of 'Siņaja Ptica' berries. Both samples also showed the highest antiradical activity: by ABTS on average 1.7 TE mol 100 g^{-1} and by DPPH 1.1 TE mol 100 g^{-1}. According to the sensory evaluation using line scales, the kefir with 10% honeysuckle puree was rated the highest, where colour and appearance were evaluated with scores of 9.9, taste 7.3, acidity 7.2 and aftertaste with 6.8.

Conclusions. The honeysuckle berries could be used as a promising source of natural antioxidants in future research aimed at developing different new products that could meet consumer expectations.

Keywords: honeysuckle, phenolics, anthocyanins, antiradical activity, milk products.

O28 EVALUATION OF PLANT-BASED TEXTURE-MODIFIED FOODS FOR DYSPHAGIA

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Introduction. Dysphagia is a disorder that prevents a person from swallowing food properly. It has been estimated that around 590 million people around the world suffer from this disorder and need texture-modified foods to ensure proper nutritional intake on daily basis.

Objective. The aim of this research was to create new texture-modified products and to evaluate their bioactive compound, vitamin and mineral compound content.

Methods. Nine new products (four puree-soups and five deserts) were developed from plant-based ingredients mostly grown in Latvia with added source of protein, canola oil, ascorbic acid and other ingredients. Samples were vacuum-cooked and afterwards sterilized at 115°C for 5 min. Samples were tested on their bioactive compound content (total carotenes, total phenol content, ABTS, DPPH antiradical activity), vitamin content (A, B_1, B_2, B_6, B_9, D_3, E), mineral compound content (Zn, Fe, Cr, I, Ca, K, Mg, Mn, Mo, Na, Cu, Se, Cd).

Results. The obtained data showed that bioactive compound content varied from sample to sample, which was expected due to the varied ingredient list of each product. Mineral compound content analysis showed low levels of iodine, molybdenum, selenium. The vitamin analysis showed traces of vitamin D_3 and low levels of B group vitamins. Cheese soup showed the highest content of iron and zinc per 100 kcal of product.

Conclusions. Overall, the analysed composition of products showed us that the natural background of these products is insufficient for ensuring the human body with all the necessary vitamins and minerals, and the best solution could be the supplementation of these products with complexes of vitamins and minerals.

Keywords: special medical purpose food, cook-vide.

Acknowledgments: This research was supported by European Innovation Partnership for Agricultural Productivity and Sustainability Working Group Cooperation project No. 18-00-A01612-000006 "Development of medicinal food for patients of malnutrition/dysphagia, creating new, nationally significant product with a high added value" (2018 to 2021).

O29 CONTENT OF BIOACTIVE AND MINERAL COMPOUNDS IN ENTERAL TUBE FEED PRODUCTS MADE FROM PLANT-BASED INGREDIENTS

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Introduction. Enteral nutrition gives an opportunity to ensure nutrient intake in cases where it is inadequate due to a variety of medical reasons. The currently available products for enteral nutrition are supplemented with synthetic ingredients. The effectiveness of these products is undeniable in the medical industry, however, there is a concern about synthetic vitamin and mineral compound bioavailability in comparison to naturally occurring ones.

Objective. The aim of this research was to create plant-based formulations of liquid tube feed and test their bioactive compound and mineral compound content and compare them to the values recommended in the European regulations for special medical purpose food, that is not intended to satisfy the nutritional requirements of infants.

Methods and materials. For this research, five liquid formulas were made from fruit, berry and vegetable semi-finished products mostly grown and produced in Latvia with added whey protein isolate, canola oil, cod liver oil, iodized salt and ascorbic acid. Samples were vacuum cooked and afterwards sterilized at 120°C for 5 min. Content of vitamin C, total carotenes, total phenols and mineral compounds: P, K, Na, Ca, Mg, Fe, Mn, Zn, Cu and Se was determined.

Results. When reviewing data on mineral compound content, all samples showed <20 mg kg^{-1} per sample of Se, also the content of Zn was below the requirements. Content of Zn ranged from 0.27 to 0.33 mg 100 $kcal^{-1}$ of sample; however, content of Mg (345.2 to 420 mg 100 $kcal^{-1}$ of product) and K (29.2 to 39.2 mg 100 $kcal^{-1}$ of product) had exceeded the maximum levels. The obtained data on vitamin C content exceeded the (EU) 2016/128 recommended maximum content of 22 mg 100 $kcal^{-1}$ at least 5 times per sample, due to the added L-ascorbic acid that was supplemented, and in previous experiments showed unsatisfying levels of vitamin C.

Conclusions. Hereafter it would be advisable to increase the content of mineral compounds such as Zn, Se and do other modifications to ensure adequate proportions of nutrients. This research shows that creating a fully nutritionally satisfying food for special medical purposes by using mainly plant-based and natural ingredients proposes a challenge.

Keywords: special medical purpose food, cook-vide.

Acknowledgments: This research was supported by programme "Scientific Capacity Building Latvia University of Life Sciences and Technologies", project No. A05-06 "Development of special dietary foods with high bioavailability" (2017 to 2019) and European Innovation Partnership for Agricultural Productivity and Sustainability Working Group Cooperation project No. 18-00-A01612-000006 "Development of medicinal food for patients of malnutrition/dysphagia, creating new, nationally significant product with a high added value" (2018 to 2021).

O30 ASSESSMENT OF THE BIOACTIVE COMPOUNDS IN RED WINES AVAILABLE FOR PURCHASE IN LATVIA

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Introduction. Wine is one of the most consumed alcoholic beverages in the world since the ancient times [1]. Although excessive use of alcohol can cause serious health problems, it has been concluded that moderate wine consumption can improve health [2]. The positive health effects of wine are based on the antioxidative activity of polyphenolic compounds. Red wine contains more polyphenolic compounds than white, so it is considered healthier [1].

Objective. The aim of the research was to analyse the total phenol and flavonoid content and antiradical activity of a selection of red grape and berry wines available for purchase in Latvia.

Methods and materials. A selection of 15 red grape and berry wines purchased in Latvian supermarkets were analysed. The total phenol content was determined using the Folin-Ciocalteu spectrofotometric method with minor modifications. The total flavonoid content was determined using the colorimetric flavonoid determination method. Antiradical activity was determined using DPPH reagent and ABTS radical cation determination method.

Results and conclusions. The results show that the total phenol content ranges from 109.08±10.17 GAE mg per 100 mL^{-1} sample FrMik (Lavel Blanc, France) to 348.66±5.13 GAE mg per 100 mL^{-1} sample LvAro (Zilver, Latvia). The total flavonoid content ranges from 95.42±10.22 CE mg per 100 mL^{-1} sample LvUp4 (Aizpute Winery, Latvia) to 277.28±28.61 CE mg per 100 mL^{-1}, 270.05±21.91 CE mg per 100 mL^{-1} samples AuCaS (Jacobs Creek, Australia) and LvAro (Zilver, Latvia). Via DPPH method the highest antioxidant activity was detected for samples LvAro (Zilver, Latvia) and ItPri (Casa Charlize, Italy) – 21.27±0.63 TE mM per 100 mL^{-1}, 20.79±0.31 TE per 100 mL^{-1}. Via ABTS method the highest antiradical activity was shown by samples ItPri (Casa Charlize, Italy) and FrCar (J. P. Chenet, France) – 42.96±1.09 TE mM per 100 mL^{-1}, 39.35±1.06 TE mM per 100 mL^{-1}.

Keywords: red wine, berry wine, phenolic compounds, antiradical activity.

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O31 IMPACT OF THE ROAST LEVEL ON CHEMICAL COMPOSITION IN COFFEE FROM COLOMBIA

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Introduction. During the roasting process, a cascade of chemical reactions accrue, from which non-volatile compounds degrade and form new compounds with potential aroma attributes. The roasting process also significantly influences the concentration of biologically active compounds.

Objective. The aim of the research was to evaluate the chemical composition and volatile profile changes during the roasting process in coffee.

Methods and materials. Coffee from Caldas, Chinchina in Colombia was roasted in local coffee roastery in Latvia. Three different roasting levels (light: 195°C for 10 min.; medium: 200°C for 11 min.; dark 210°C for 12 min.) were selected. The moisture, pH, acrylamide, total phenolic and flavonoid content, individual phenolic compounds and the volatile compound profile were analysed.

Results. The total phenolic and flavonoid content decreased with increasing roast level. Also, the individual phenolic compound content had a negative correlation with roast level. Acrylamide concentration reached the highest peak at medium roast level and lowest at dark roast level. From the volatile compound profile point of view furaneol (pineapple-like odour) and benzyl alcohol (floral, rose odour) was detected only in light roast coffee, while 2-methoxy-4-vinylphenol, 2-methoxy-phenol and nonanoic acid (associated fatty, smoky and spicy odour) was present only in dark roasted coffee. With increasing roast level organic acid concentration decreased, while furan and phenol compound concentration increased.

Conclusions. The light roasted coffee showed higher total and individual phenol, flavonoid content and more complex volatile compound profile compared to medium and dark roast. Dark roasted coffee had the lowest acrylamide concentration and organic acid content, which would be more suitable for coffee consumers with sensitive stomach.

Keywords: coffee, roasting, volatile compounds, phenolic compounds.

Acknowledgments: The present research has been supported by the programme "Strengthening Research Capacity in the Latvia University of Life Sciences and Technologies" project "The changes of biologically active compounds of Specialty coffee under the influence of technological processes" (Z22) and Kalve Coffee Roasters.

O32 THE EFFECT OF BIODEGRADABLE PACKAGING ON SHELF-LIFE OF PASTEURISED EGG MASS

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Introduction. Packaging protects products from shocks, secondary contamination, ambient temperature, exposure to UV light, microbiological deterioration, and other external factors.

Objective. The aim of this study was to determine the effect of two types of packaging on the change in quality indicators pasteurised liquid egg mass.

Methods and materials. The main storage criterion is the temperature of 0 to +4°C degrees. Traditionally, the shelf-life of pasteurised liquid egg mass is up to 28 days, which hinders the increase in exportation of this product. The liquid eggs mass was pasteurised on the equipment Ovobel AR56SH, the pasteurisation process continuing for 60 minutes, maximum temperature from 65°C to 68°C (holding time: 180 seconds). The technological process allows the final product to be packaged using high-density polyethylene (HDPE), in the tests forty-two units of samples were used, which was not sufficient to obtain a stable fulfilment of the requirements and Tetra Rex® Bio-based packaging was used as an alternative, forty-two units of samples. Tetra Rex® Bio-based is produced solely from a combination of plastics derived from sugarcane and paperboard. The changes in quality of samples during storage were characterized by measuring total bacterial count (CFUg-1) at the start of shelf-life from 200 up to 30×105 units, with method LVS ISO 4833-1:2014 and the study gives the results of a change in the *pH* (*pondus Hydrogenii*) value in the analysis of the HDPE package and fixes the stability of the *pH* value in Tetra Rex® Bio-based packaging. Data in test were processed with Anova: Single Factor statistical model and Correlation method.

Results and conclusions. The obtained data emphasize the importance of packaging type, which could provide a stable quality of ready-to-use products for a duration of up to forty-five days.

Keywords: bio-based packaging, plastic packaging, liquid egg mass, shelf-life.

O33 LACTOBIONIC ACID POTENTIAL IN ICE CREAM PRODUCTION

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Introduction. Lactobionic acid (LBA) is a new and added value product obtained by whey fermentation. Thermal, antioxidative, gelling, stabilizing, prebiotic properties and high solubility of LBA indicate its potential in food production. Despite there is wide information on LBA stabilizer and emulsifier properties, no work has addressed its use in ice cream production.

Objective. The goal of this study was to evaluate LBA application in ice cream production and determine its optimal concentration in formulation.

Methods and materials. In the current study LBA (97%) ("ACROS ORGANICS", United States), commercial mixture of emulsifier and stabilizers ("Palsgaard Extrulce 304", Denmark), milk (2.5% fat, LTD "Jaunpils pienotava"), cream (35% fat, LTD "Jaunpils pienotava"), skimmed milk powder (LTD "Euromilk", Poland), sugar (LTD "Nordic sugar", Lithuania), glucose (LTD RUF, Germany), and water were used. The ice cream with LBA (0.2, 0.3, 0.4, and 0.5%), with commercial mixture of emulsifier and stabilizers (0.4%) and a control sample without any stabilizer and emulsifier were prepared.

Results. A significantly higher ($p<0.05$) viscosity of ice cream mixture was established in the samples with LBA and commercial mixture compared to control. LBA additive influenced hardness of the ice cream. An increased concentration of LBA was reflected in a significant increase ($p<0.05$) of hardness. The LBA presence in the formulation significant decreased ($p<0.05$) the mean diameter of air bubbles, which decreased compared to the sample with commercial mixture and control. LBA significantly reduced ($p<0.05$) the melting rate of ice cream.

Conclusions. The optimal LBA concentration for ice cream production detected during current research was 0.3%, as a result, the quality (sensory parameters and rheological properties) of developed product was close to the traditional ice cream produced with commercial mixture.

Keywords: Lactobionic acid, ice-cream, hardness, melting rate, sensory properties.

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O34 EFFECT OF STORAGE CONDITIONS ON BIOLOGICALLY ACTIVE COMPOUNDS IN PURPLE-FLESHED POTATOES

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Introduction. Potatoes (*Solanum tuberosum* L.) are important crop and source of health-beneficial phenolic compounds that are naturally appearing secondary metabolites and present biological activity. Phenolic content is affected by environmental stress factors which might decrease health-beneficial compounds, and at same time might increase toxins called glycoalkaloids as a result of plant self-protection against stress. It is stated that safe glycoalkaloid concentration level in the fresh potato tubers does not exceed than 200 mg/kg^{-1} [1].

Objective. The aim of the current study was to evaluate the effect of the storage under light on the biologically active compounds in purple-fleshed potatoes.

Methods and materials. Purple-flesh variety potatoes 'Blue Congo' was harvested on test fields of Institute of Agricultural Resources and Economics in Latvia. Before treatment, samples were stored at +4°C 80±5% relative air humidity. Storage under light was performed in heating cabinet at temperature of +22°C, relative air humidity of 85%, full-spectrum light intensity of 2000 lux and total time of 7 days. Total phenolic content and antioxidant activity was measured on the basis of spectrophotometric method, moisture was determinate according to standard LVS 272:2000, and total glycoalkaloid content was measured according to method adapted by Skrabule et al. [2]. Mathematical processing and interpretation of data was done in MS-Excel, SPSS 22.0.

Results and conclusions. This study found that purple-fleshed variety 'Blue Congo' potatoes during storage under artificial light experienced a decrease of total phenolic content and antioxidant activity, moisture level remained intact, meanwhile, total glycoalkaloid content increased.

Keywords: purple-fleshed potatoes, phenolic compounds, glycoalkaloids, antioxidant activity, storage under light.

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O35 EFFECT OF PRE-TREATMENT ON QUALITY OF SMOKED BALTIC SPRATS

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Introduction. Baltic sprats (*Sprattus sprattus balticus)* are nutritionally valuable as a good source of protein, vitamins D_3 and B_{12},minerals (calcium, iodine, selenium, phosphorus), and unsaturated fats (omega-3 fatty acids) [1]. Consumers demand various types of fish – raw (fresh and frozen), roasted, smoked, with constant quality all year round. Therefore, producers should ensure the sensory and other parameters like colour, texture, and safety. The quality of finished products depends on raw material quality, which changes with the season. The application of pre-treatment can help stabilize: quality (sensory, texture, pH, colour) and technological parameters (smoking losses, drying) [2]. The most popular pre-treatment methods are the use of acetic acid, salt (NaCl), and granulated $CaCl_2$ in various concentrations and proportions.

Objective. The aim of the study was to evaluate effect of various pre-treatment methods on smoked Baltic sprat pH, colour, texture, sensory properties, and smoking loss.

Methods and materials. Prior to smoking, fish (fresh and previously frozen) was treated in a solution of the selected additives in various proportions for 30 min. Untreated sprats were used as a control sample. After traditional smoking, fish was immediately cooled and stored until analysis at 2±2°C.

Results and conclusions. Smoking losses for fresh and frozen sprats without pre-treatment methods are similar (about 29%). The use of pre-treatment allowed reduction of smoking losses. Thus, the combination of NaCl and acetic acid resulted in about 26% smoking loss. During subsequent storage of smoked fish, drying losses were observed. If no pre-treatment was applied, the drying losses after 24-hour storage at 2±2°C were 1.6%, while soaking fish in the solution of NaCl and $CaCl_2$, the drying loss decreased to 0.3%.

Both pre-treatment method and freezing affected fish pH. The pH of smoked fresh sprat was 6.73, whereas for the smoked frozen sprat it was 6.38. The most similar to untreated fish was pH of fish pre-treated using only NaCl (6.48). But sensory testing using Just About Right method demonstrated that the use of acetic acid made fish more acid (a little too strong), which changed the natural taste and made the texture firmer (a little too hard).

Keywords: smoked sprats, fresh and frozen sprats, pre-treatment, smoking, texture, pH, sensory attributes.

Acknowledgments: This work was supported by the programme "Strengthening research capacity in the Latvia University of Life Sciences and Technologies" project No. Z43.

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O36 CONSUMPTION OF HERBAL TEAS AND EXPOSURE TO MYCOTOXIN CONTAMINATION IN LATVIA

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Introduction. Herbal teas have been frequently applied in medicine and also used as daily beverages. Environmental and biologic factors may influence the contamination status of such products with mould producing mycotoxins during the pre-harvest periods, post-harvest processing and storage.

Methods and materials. In this study, chamomile, linden, peppermint and fruit herbal teas were analysed for multi-mycotoxin contents using 2-dimensional liquid chromatography combined with high resolution mass spectrometry.

Results. *Penicillium, Aspergillus*, *Fusarium* and *Alternaria* mycotoxins were found in most of the analysed tea samples at low concentration levels and low frequency excepting for one peppermint tea sample, which was contaminated with sixteen co-occurring mycotoxins. The human carcinogens, aflatoxins (AFs) were detected in only four herbal tea samples. Relatively low levels of AFB_1 at 0.98 μg kg^{-1} and AFG_1 at 0.40 μg kg^{-1} were determined in an herbal blend of chamomile with rooibos, peppermint. The multi-contaminated peppermint sample with 16 mycotoxins was positive for four AFs present at the following concentrations: AFB_1: 5.62 μg kg^{-1}, AFB_2: 1.71 μg kg^{-1}, AFG_1: 6.02 340 μg kg^{-1}, and AFG_2: 2.36 μg kg^{-1}.

The exposure rate to mycotoxins was compared to that of other European countries based on the recent survey data of herbal tea consumption in Latvia.

The microbial quality was also evaluated by study of the total fungi and indicated rather high contents of the total mould enumeration. The mean values of the mould unity contents counted in chamomile, peppermint and other herbal teas were around 1.29×10^4 CFU g^{-1}, 8.52×10^4, CFU g^{-1}, and 2.40×10^4 CFU g^{-1}.

Conclusions. The dietary risk assessment provided within the current study indicated a low rate of potential probable daily intake of mycotoxins in most cases for peppermint and chamomile teas. From the survey data, it can be concluded that herbal tea consumption varies over the seasons with higher consumption during cold season. For further investigation, high tea consumers and seasonal variability should be considered.

Keywords: herbal teas, consumption, 2-dimensional liquid chromatography, mycotoxins, exposure studies.

O37 THE EFFECT OF ACTIVATED CARBON ON THE BIOCHEMICAL SPECTRUM OF DIFFERENT CHOKEBERRY PROCESSING PRODUCTS

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Introduction. *Aronia melanocarpa (Michx.)* Elliott, called black chokeberry, has been the subject of many studies due to its high content of phenolic compounds, antioxidant properties and potential positive effects on human health. Chokeberry is one of the most valuable sources of nutritional antioxidants among fruits and berries. The presence of tannins in chokeberry products affects their taste properties, so various technological solutions are being sought to mitigate it.

Objective. The aim of the study was to investigate and compare the proportion of biologically active compounds (total phenolic, anthocyanins, tannins, vitamin C) remaining in chokeberry products after processing. The influence of activated carbon on the quality indicators of processed products has been studied.

Methods. The study was conducted in three stages: product development, chemical analysis and sensory evaluation. Fresh, frozen chokeberry and processed products: juice, press cake, press cake extract, candies and syrup were analysed. For the juice treatment, activated carbon was added as a powder and left to settle for 2 hours, then the juice was filtered and used for analysis.

Results. The study found that fresh chokeberries contain 1126.4 mg 100 g^{-1} of anthocyanins, 2411.5 mg 100 g^{-1} of total phenols, 3.4 mg 100 g^{-1} tannins; berry antiradical activity is 7.9 milimol TE 100 g^{-1}. Compared to fresh berries, a reduction of compounds was observed after freezing: anthocyanin content on average by 13%, total phenols by 10.6%, tannin content by 18% and antioxidant activity by 2.7%. The content of the analysed compounds in the juice treated by activated carbon decreased from 25% (total phenol content) to 66% (anthocyanins). Despite the reduced amount of tannins in the sample, the sensory evaluation score of juice with activated carbon was 6.6, but the raw juice was evaluated with 7.7.

Conclusions. It can be concluded that biologically active substances remain in various processed chokeberry products in different amounts, and berries can be used in the production of functional foods.

Keywords: *Aronia melanocarpa (Michx.)*, total phenol, anthocyanins, tannins, antioxidant activity.

POSTERS

P1 OBESITY AND THE COURSE OF COVID-19 IN PATIENTS HOSPITALIZED IN RIGA EAST CLINICAL UNIVERSITY HOSPITAL

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Introduction. The COVID-19 pandemic has been declared on 11 March 2020. Based on the World Health Organization data, one of the factors in development of severe COVID-19 is obesity, which causes chronic inflammation and immune dysfunction.

Objective. This study is aimed at assessing the frequency of obesity among COVID-19 patients hospitalized in Riga East Clinical University Hospital (Latvian Centre for Infectious Diseases) and its relationship with the course of the disease.

Methods and materials. Demographic data and clinical and laboratory parameters of 100 patients upon admission were used. Patients were hospitalized between March and June of 2020. The mean age was 58±19 years, 57% were males. In all patients, COVID-19 was confirmed by the SARS-CoV-2 PCR test in the oropharyngeal swab. The association of obesity with leukocyte and lymphocyte count, C-reactive protein, ALT, and LDH was evaluated using the Mann-Whitney test. The association with development of pneumonia, admission to the intensive care unit (ICU), or poor outcome was evaluated using the Chi-Square Test.

Results. Obesity was diagnosed in 8 patients (8%). No association was found between death and obesity. No statistically significant differences in the development of pneumonia were observed between patients with and without obesity (6 of 8 patients with obesity, 75% and 54 of 87 patients without obesity, 62%). Admission to ICU was similar in patients with obesity (1/8, 13%) and without it (10/90, 11%).

Among the blood parameters, ALT showed reliable differences between two study groups (56 U/l in patients with obesity versus 18 U/l without obesity, U=85.0, p=0.012). LDH also showed a marginal trend (132.0 U/l in patients with obesity versus 120.8 U/l without obesity, U=34.0, p=0.066).

Conclusions. Although no association was found between obesity and the incidence of pneumonia, admission to ICU, and death, patients with obesity had a higher degree of tissue damage in contrast to patients without it. It indicates that obesity might be the cause of differences in the course of COVID-19.

Keywords: Covid-19, obesity, pneumonia, inflammatory reaction.

Acknowledgments: The retrospective study has been conducted within the framework of the National Research Programme VPP-COVID-2020/1-0023.

P2 ADHERENCE TO THE NORDIC IN 40-64-YEAR-OLD JĒKABPILS POPULATION

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Introduction. WHO Health Evidence Network Synthesis Report in 2018 stated that there is evidence of clear health benefits for both, the Mediterranean diet (MD) and Nordic diet (ND); European Region Member States are to consider the existing ND-based dietary guidelines for either adoption or enhancement of the nutrition policies.

Objective. To evaluate adherence to the ND in average 40-64-year-old Jēkabpils population.

Methods and materials. The study was carried out as a sub-study of the "Multicentric randomised study of *H. pylori* eradication and pepsinogen testing for prevention of gastric cancer mortality (the GISTAR study)". Participants aged 40 to 64 years were enrolled in the study centre located in Jēkabpils from October 2019 to January 2020. Individuals were invited, using patient lists of general practitioners in the area of local recruitment centre and contacted through phone and/or mail. Participants signed an informed consent form and were examined by a study physician upon enrolment. Participants completed 22-item self-administered questionnaire in Latvian or Russian. The questionnaire included translated and adapted New Nordic Diet score questionnaire. One score point was assigned for each match according to the published references: adherence to ND: as low (score 0–3), medium (score 4–5) or high (score 6–10).

Results. 391 participants completed the questionnaire, 27 had not answered all questions and were excluded from ND analysis. Adherence to ND was evaluated as low in 111 (30.4%), medium in 145 (39.7%) and high in 109 (29.9%) cases. In both diets, there was a statistically significant difference in adherence between genders (Chi-Squared Test, $p<0.001$) but no significant effect of age. On average, respondents received 45.2% of the ND maximal score ($p<0.001$).

Conclusions. The above findings should be taken into account when developing recommendations to be implemented in Latvia.

P3 ALTERATIONS OF GUT MICROBIOME IN PATIENTS OF VARIOUS NONINFECTIOUS LIVER DISEASES

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Introduction. Gut microbiome is an important factor taking part in many physiological processes within the human body, such as energy metabolism, stress responses and maturation of immune cells [1]. Dietary patterns can shape both human health and composition of gut microbiome, thus, nutrition, health and microbiome are all closely connected [2]. Liver is the organ in closest contact with gastrointestinal tract, being involved in digestion and also exposed to metabolites from bacteria inhabiting the intestines [3].

Objective. In this study, we aim to characterize the relationship between compromised liver function (various chronical non-infectious liver diseases) and gut microbiome composition, also considering the effects of nutrition.

Methods and materials. This study compares gut microbiome composition and nutrition patterns of 50 healthy subjects (control group) with >50 subjects diagnosed with various non-infectious liver diseases. Nutrition patterns were recorded using a food frequency questionnaire, a 24-hour dietary recall and a two-day food diary. Gut microbiome composition was determined using a DNA metabarcoding approach. DNA was extracted from stool samples and V4-V5 variable region of bacterial 16S rRNA gene was amplified using universal primers [4, 5] and sequenced on Illumina MiSeq. Sequences were processed and taxonomically classified in QIIME2 software [6] to yield the composition of each subject's gut microbiome. Statistical analysis was performed in order to identify relationships between health status, general physiological/morphological/socio-economic parameters, nutritional patterns and microbiome composition.

Results and conclusions. Here we provide the relationships that we identified between the health and nutritional parameters and gut microbiome among the healthy and non-healthy groups of subjects. Differentially abundant taxa between subject groups and associations between nutritional intake and microbiome composition are described.

Understanding the links between human microbiome and health will provide opportunities to better understand the interaction of human body and the microscopic inhabitants of its various niches, and ultimately should lead to new and improved prevention and treatment strategies for the respective diseases. Additionally, this study adds much-needed data of microbiome of the Latvian population, allowing to further explore microbiome characteristics of this population.

Keywords: gut microbiome, liver disease, diet.

Acknowledgments: This study was funded by the Latvian Council of Science project "Gut microbiome composition and diversity among health and lifestyle induced dietary regimen", project No. lzp-2018/2-0266.

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P4 ANTIOXIDANT AND ANTIRADICAL PROPERTIES OF FRESHLY SQUEEZED AND INDUSTRIALLY PRODUCED POMEGRANATE JUICE

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Introduction. Insufficient antioxidant capacity in the body creates the possibility of oxidative stress. The stress-forming components are active forms of oxygen and nitrogen, as well as free radicals. Pomegranate juice could be a good addition of antioxidants to the body's internal antioxidant potency – mainly hydrophilic antioxidants.

Problem. Differences in antioxidant and antiradical properties of freshly squeezed and industrially produced pomegranate juice.

Objective. Determination of the total amount of antioxidants, evaluation of their ability to reduce the potential of free radicals, and thus the amount of oxidative stress, analyzing both freshly squeezed pomegranate juice, which is freely available, and industrially produced juice.

Methods and materials. The research was performed at the Biochemistry Scientific Laboratory of Riga Stradiņš University. Five pomegranates from Spain, Turkey, Azerbaijan, South Africa and Egypt purchased at Riga Central Market and stores; four industrially produced pomegranate juices from Azerbaijan, Turkey, Georgia and Ukraine were analyzed. Folin-Ciocalteu reagent was used to determine the total polyphenol content [1]. The antiradical capacity in pomegranate juice samples was determined using DPPH method [2]. Determination of the ability of antioxidants to reduce the trivalent iron ion Fe^{3+} into iron (II) ion Fe^{2+} performed using FRAP method [3]. The data obtained in the study were processed and analyzed using MsExcel program.

Results and conclusions. The total content of phenolic compounds, antioxidant activity and their ability differ between pomegranates from different growing regions, as well as between industrially obtained juices from different countries – the effect is due to several factors. Higher values in all three methods were obtained for juices from South Africa, Turkey, Spanish pomegranates and commercially available juices from Turkey, Georgia and Azerbaijan.

Practical use of results: Consumption of juices with a high content of antioxidants could be a good addition of antioxidants to the body's internal antioxidant potency. This knowledge can be used by nutritionists in their practice.

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P5 ANTIOXIDANT AND POLYPHENOL CONTENT IN CARROTS STORED UNDER DIFFERENT CONDITIONS

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Introduction. In the present day, carrots are among of the most important root vegetables in the world. Carrots are not only universal root vegetables, but a valuable source of antioxidants in the human diet. The purpose of this study was to determine the differences in the content of vitamin E (α-tocopherol) and total content of polyphenol derivatives in carrots of six different breeds ('Bolero', 'Cidera', 'Maestro', 'Nantes', 'Narbonne', 'Stanford') that had been stored under three different conditions – under the cover of sand in a cellar (+10–+11°C, 82% humidity), in a refrigerator (+3°C) and a freezer (-18°C).

Methods. The research was performed in the Scientific Laboratory of Biochemistry of Riga Stradiņš University. In order to determine the content of polyphenol derivatives in samples of carrot juice, the standardized Folin-Ciocalteu method was used [1]. For determining the content of vitamin E (α-tocopherol) a chromatographic analysis was performed using a *Waters 2695 Alliance* HPLC system [2].

Results and conclusions. The highest concentration of polyphenol derivatives after three months of storage was found in the sample of 'Cidera' breed of carrots, stored in the cellar under the cover of sand. Comparing the samples stored in the refrigerator and the freezer, the highest concentration of polyphenol derivatives was found in the refrigerator-stored samples. After five months of storage, the highest concentration of polyphenol derivatives was found in the sample of 'Narbonne' breed of carrots stored in the cellar under the cover of sand. In case of five months of storage, a higher concentration of polyphenol derivatives was found in the samples stored in the freezer as opposed to the refrigerator. Comparing the effects of storage conditions on the concentration of vitamin E (α-tocopherol), it was found that regardless of the length of time, the highest concentrations were found in the samples stored in the cellar, followed by the samples stored in the freezer, with the lowest concentration found in the samples stored in the refrigerator.

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P6 HISTOCHEMICAL AND ULTRASTRUCTURAL ASPECTS OF IRON AND ZINC ABSORPTION

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Introduction. Iron and zinc are essential micronutrients for growth and sustained health. At the same time, adverse health implications may result from heavy metal overload. This requires a complex system of homeostatic control for subcellular distribution and vesicular storage of heavy metals [1]. Late endosomes (LE) are highly specialized organelles, rich in lysobisphosphatidic acid (LBPA). LBPA reportedly serves as calcium buffer in LE [2].

Objective. The aim of the current study was to evaluate the role of endo-lysosomal compartment of the enterocyte in the heavy metal homeostatic regulation.

Methods. An everted duodenal segment of Lohmann brown cockerels mounted on a glass rod, was submerged in 7 ml Tris-buffer containing a different concentration of either iron or zinc (0.512 mM and 2.56 mM of iron and zinc). Intestinal accumulating mucosa preparations were incubated for 30 min. at 41°C. For histological examination, duodenal sections were colored with Perls' Prussian blue stain for iron detection. For ultrastructural study, samples were fixed in glutaraldehyde and exposed for 30 min. to Perls' ferrocyanide solution before routine osmication and embedding. Histochemically, the zinc was shown by a modified Timm sulphide silver method. LE and lysosomes in the enterocytes were highlighted by immunohistochemistry using an anti-CD68 and anti-TRPV1.

Results. Stainable iron and zinc were found in enterocytes exposed to either iron or zinc containing buffer. Iron and zinc deposits appeared as a narrow string of punctae. TRPV1 and CD68 immunoreactivity also had a punctuate appearance. Both CD68 and TRPV1-positive material and deposits of metal within villous enterocytes were consistently localized in the subapical compartment in the vicinity of the brush border. Ultrastructure showed electron dense granules inside small vacuoles in the subapical cytoplasm of enterocytes. The effect of either 2.56 mM zinc or iron on enterocyte ultrastructure was greater than of 0,512 mM. Increased number of vacuoles filled with electron dense deposits indicated metal trapping.

Conclusions. This report alludes to the considerable capacity of subapical vesicles to accumulate the heavy metals absorbed by the enterocytes and the reported possible role of LBPA as heavy metal chelator in the acidic metal stores of endo-lysosomes.

Keywords: iron, zinc, enterocytes, endo-lysosomes, absorption.

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P7 CONJUGATED LINOLEIC ACID IN HUMAN MILK: A CASE STUDY FROM LATVIA

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Introduction. Conjugated linoleic acid (CLA) is a common term for a group of linoleic acid isomers with a conjugated double bond system. CLA is naturally found in ruminant fats, milk and dairy products. Rumenic acid (C18:2, n9c, n11t) is the prevailing isomer of CLA [1]. It is reported that rumenic acid has a beneficial effect on human health which modulates inflammation and prevents the risk of cardiovascular diseases and diabetes [2]. CLA is also presented in human milk, it comes from immediate maternal diet, body stores or endogenous synthesis from vaccenic acid [3, 4]. Previously, the CLA level has not been analysed in human milk among lactating women in Latvia.

Objective. To analyse the CLA level in human milk.

Methods. Pooled diurnal mature human milk samples were collected from 48 participants. Rumenic acid was determined using gas chromatography and expressed as a weight percentage of all measured fatty acids (38 in total). Statistics were performed using MS Excel 2019.

Results/Discussion. Median rumenic acid level in human milk samples was 0.10%. This is lower compared to the data from Poland, where rumenic acid level had reached 0.40% in human milk from participants with an unlimited intake of dairy products and level of 0.20% for rumenic acid in human milk among the participants who had restricted dairy fat intake [5]. Our results were considerably lower compared to the data from the Netherlands where the level of rumenic acid had reached 0.25% in human milk among the participants with a conventional diet and level of 0.29% among the participants consuming organic meat and dairy products [6].

Conclusions. Our results were considerably lower compared to the data from other European countries. Nevertheless, further research is needed, including evaluation of maternal diet during lactation, because studies indicate that maternal diet significantly affects CLA level in human milk.

Keywords: human milk, conjugated linoleic acid, rumenic acid.

Ethical approval: Riga Stradiņš University Ethics Committee (No. 6-1/01/6).

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P8 BERRY AND FRUIT WINES AS A SOURCE OF NATURAL ANTIOXIDANTS

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Introduction. For centuries, grapes have been used for traditional medical purposes, preventing or treating diseases such as nausea, diarrhoea, gastroenteritis, skin disorders. More recently, the therapeutic effect of red wine has been reported, and moderate intake has been related to improved blood lipid parameters, endothelial dysfunctions, platelet aggregation, and other risk factors for cardiovascular diseases [1]. While there is a significant number of studies on grape wines and their participation in the regulation of RedOx homeostasis, the number of publications on berry and fruit wines, whose basic processes are similar to grape juice production and fermentation, is small.

Objective. Our interest was to find out whether the antioxidants in the juice and wine fermented from this juice have remained at the original level.

Methods and materials. Berry and fruit juices, prepared for wine fermentation, as well as finished wine samples were received from the winery "Pūces vīni". To characterize the antioxidant and antiradical capacity in juices and relevant wines, we determined the polyphenol content using the Folin-Ciocalteu method [2], while the antiradical capacity was determined using the DPPH method [3], and the antioxidant activity – using the FRAP method [4]. The data obtained in the study were processed and analysed using Ms Excel program.

Results and conclusions. Blackcurrant, redcurrant, apple, rhubarb, gooseberry homemade juices, and their respective wines have been analysed. The highest concentration of polyphenol concentration, antiradical capacity, and antioxidant activity was determined in the blackcurrant juice and wine, while the lowest was observed in the rhubarb juice and wine. Similarly, there was no reduction in antiradical activity (DPPH) or antioxidant capacity (FRAP) in the wine fermentation process of the respective juices. To conclude, various berry and fruit wines are a particular source of phenolic compounds that, besides antioxidant and antiradical properties, also possess other important health benefits.

Keywords: wine, antioxidants, antiradicals, polyphenols.

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P9 IN-VITRO STUDY ON CHARACTERISTICS OF DIFFERENT HULLESS BARLEY CULTIVARS' FLAKES

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Introduction. Barley (*Hordium vulgare* L.) grain is considered as an important food ingredient because of the presence of vital biochemical constituents – β-glucan, protein, resistant starch, phenolic compounds etc. B-glucans are found to lower the cholesterol level in plasma, to enhance lipid metabolism, to lower the glycaemic index and the treat of colon cancer [1]. Hulless barley cultivars are more suitable to the human diet, because the hulls can be easily removed, minimal grain processing in food production helps to retain the full benefit of the whole grain. Several studies conclude that hulless grains have higher levels of digestible energy, and higher protein content compared to hulled grains [2], however, different cultivars have unique and specific grain chemical composition and physical properties. Hulless barley is still a less-studied cereal in comparison with hulled barley and oats.

Objective. The aim of this study was to evaluate the fermentation characteristics for different barley cultivars' flakes *in vitro* and to detect the fermentation pattern of β-glucan, soluble dietary fibre and resistant starch.

Methods and materials. Samples of six hulless barley cultivars' flakes (30 g) with different β-glucan (4.17–6.59%), soluble dietary fibre (18.1–32.0%) and resistant starch content (0.74–10.65%) were boiled in water (120 ml) for 10 min., then were treated under *in vitro* digestive conditions, measuring the amount of fermented flakes solids, as well as individual components. Correlation between β-glucan, soluble dietary fibre, resistant starch content and amount of fermented flakes solids were evaluated.

Results and conclusions. The amount of fermented flakes solids varied from 38.3 to 61%, depending on barley cultivars. Medium strong correlation between β-glucan and amount of fermented flakes solids was determined.

Keywords: in vitro digestion, dietary fibre, β-glucan, protein, resistant starch.

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P10 POLYPRENOL LIPOSOMES IMPROVE EFFICIENCY OF OXYGEN USAGE IN WELL-TRAINED AMATEUR ATHLETES

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Introduction. Polyprenols are natural substances known for their capacity as cell membrane protectors from peroxidation, as well as their role in muscles due to statin-induced muscle damages [1]. However, there is a lack of information about the effect on the performance of athletes.

Objective. To study the effects of polyprenol on the athlete performance.

Methods. A total of 30 male athletes participated in this study, 16 of whom were taking 30 mg polyprenol liposome caps for 69±5 days and 14 of whom were not. All of the participants underwent VO_2max exhaustive incremental cycling testing before and after the use of polyprenols. VO_2 peak and cardiorespiratory variables were measured. For the PU (polyprenol users), the VO_2 peak (peak oxygen consumption) increased by 2.8 ml/min/kg in comparison with the C (control group), and the O_2/HR (oxygen pulse) increased by 0.9 ml/beat, while in the C decreased by 0.4 ml/beat from before to after the use of polyprenols ($p<0.05$). The SVc (cardiac output) in the PU increased by 2.9 ml, while that in the C decreased by 7.4 ml. The average test time increased by 1 min in the PU, whereas it did not change in the C.

Results and conclusions. In conclusion**,** polyprenols increased athletes' ability to tolerate exercise in a cycling test and improved oxygen consumption efficiency by increasing VO_2 peak and O_2/HR.

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P11 ANALYSIS OF BODY MUSCLE MASS IN CROHN'S DISEASE PATIENTS

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Introduction. Malnutrition is an objective disease activity parameter for patients with inflammatory bowel disease (IBD), particularly Crohn's disease (CD), and is an indicator of lesion expansion or inflammatory activity. Active disease is correlated with the systemic response of the body's immune system, activating a hypermetabolic state and protein degradation (Argiles J. M. 2015). These conditions lead to malnutrition, which significantly increases the risk of impaired clinical outcomes, such as delayed recovery or increased mortality (Landi F. 2019).

Methods and materials. This prospective pilot study included hospitalised patients aged ≥18 years, with an established diagnosis of CD, with no medical history of surgical interventions. CD patients were divided into those with low and high clinical activity indexes, according CD activity index (CDAI). Patients were assessed twice, using the Nutritional Risk Score (NRS2002) and Malnutrition Universal Screening Tool (MUST), and body bioelectrical impedance analysis (BIA) measurements were taken. A control group consisting of heathy age- and sex-matched individuals was used for comparison.

Results. Twenty-three hospitalised patients (median age 36.5 IQR: 28.5–51.5 years) were enrolled, the median CDAI was 128 (IQR=6.0-207.0). The study group comprised 39% (n=9) patients with low CD activity and 61% (n=14) of patients with high disease activity. According to NRS2002 and MUST, 70% (n=16) CD patients were nutritionally at risk and in need of nutritional support. Comparing BIA results between CD patients and the control group, the median BMI was lower for the CD (21.10 [IQR=19.2–23.3]) than for the control group (23.4 [IQR=21.5–25.8]) (p=0.014). In addition, visceral fat mass was lower in CD (–4,00 [IQR=–12.1 to 5.6]) than in the control group (7.85 [IQR=-0.9–18.2]) (p=0.003). In terms of deviation from standard weight, 39% (n=9) of CD patients showed reduced % body fat. Reduced muscle mass was observed in 48% (n=11) of CD patients.

Conclusions. CD patients with high disease activity had a noticeably increased risk of malnutrition. Most CD patients in both the low and high disease activity groups had a reduction in muscle mass. Identification of the reduction in soft lean muscle mass in CD patients can be used as an anticipatory indicator of disease activity.

Keywords: IBD, Crohn's disease, body muscle mass, malnutrition, screening tools.

P12 INFLUENCE OF PLANT-RICH DIET ON HUMAN BODY ACID-BASE BALANCE

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Objective. The following research question was proposed: does reduced consumption of simple carbohydrates and saturated fatty acids, as well as increased ingestion of fresh fruit and vegetables increase urine pH?

Methods. Forty-six healthy omnivorous participants entered the study and were randomly allocated to two groups, usual daily or intervention diet, in a cross-over design. Each diet was followed in two 5-day phases, separated by a 9-day break. Participants recorded diet diaries and tested morning urine samples for pH at the start and end of each phase. After drop-outs, data from 12 in the intervention-first group and 21 in the intervention-second group were used for analyses. Mean ages were 29.5 and 30.7 years for the first group and second group respectively; the average body mass index (BMI) was 22.0 in both groups.

Results. Urine pH before and after the daily diet did not change (means 6.22 vs. 6.10), whereas urine pH increased from before to after the intervention diet (6.19 vs. 6.50, p=0.02). During the usual daily diet, the average potential renal acid load (PRAL) per day was +62 mEq, compared to –51 mEq on the intervention diet (p<0.0001). Mean daily fibre intake was higher during the intervention diet than the usual daily diet (respectively 23 g/d vs. 14 g/d; p<0.0001). Mean potassium intake was higher during the intervention than the daily diet (respectively 4500 mg vs. 2016 mg (p<0.0001). Mean magnesium intake was higher during the intervention vs. the daily diet (respectively 400 mg vs. 237 mg/d; p<0.0005). Mean sodium intake was considerably lower during the intervention vs. the daily diet (respectively 634 mg/d vs. 2279 mg/d; p<0.0001).

Conclusions. We suggest that the intervention diet with reduced intakes of simple carbohydrates and saturated fatty acids, as well an increased amount of fresh fruit and vegetables could account for increased urine pH level. This intervention diet provided optimal consumption of mineral substances (K, Ca and Mg) and fibre. On the intervention diet, intakes of sodium, saturated and trans fatty acids were decreased. The positive effect of the intervention diet on the human body acid-base balance could have favourable effects on health if sustained.

Keywords: acid-base balance, pH diet, urinary pH, ash diet, PRAL, alkaline diet.

P13 SELENIUM STATUS IN LATVIAN PATIENTS WITH AUTOIMMUNE THYROID DISEASES

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Introduction. Selenium deficiency, along with genetic predisposition and environmental triggers, may play a role in the pathogenesis of Hashimoto's thyroiditis (HT) and Graves' disease (GD).

Objective. We aimed to assess selenium status in Latvian patients with newly diagnosed, treatment-naïve GD and HT.

Methods. Eleven hyperthyroid GD patients, 40 HT patients (32 euthyroid and 8 hypothyroid), and 21 age- and sex-matched healthy subjects were recruited into this study. Plasma selenium concentration was determined fluorometrically by using fluorescence spectrophotometer.

Results. Median plasma selenium levels were 85.03 (60.09–116.60) μg/L for HT patients, 71.33 (59.05–104.42) μg/L for GD patients and 80.35 (67.15–113.67) μg/L for the controls. Selenium concentrations did not differ significantly among the three groups (p=0.763). Likewise, no differences were observed in selenium levels between euthyroid and hypothyroid HT patients (85.03 (60.09–116.56) and 94.78 (47.46–117.02) μg/L, respectively; p=0.886). We found a significantly lower selenium concentrations in HT patients with higher TPOAb levels (≥400 IU/mL) in comparison to patients with lower antibody titers (<400 IU/mL) (72.75 (52.10–88.43) vs. 89.04 (65.53–117.51) μg/L, respectively; p=0.05). In addition, levels of selenium failed to correlate with other characteristics such as age, titers of TPOAb, TgAb, and TSHRAb, TSH, FT3, FT4 (all p>0.05).

Conclusions. Selenium status in Latvian patients with newly diagnosed GD and HT is at suboptimal level, although no difference in selenium levels between autoimmune thyroid disease patients and controls was observed. Interestingly, HT patients with higher TPOAb levels had a lower selenium concentration, suggesting that these patients might benefit from selenium supplementation.

Keywords: selenium, autoimmune thyroid disease.

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P14 5-DAY INTERMITTENT FASTING REDUCES PROATHEROGENIC METABOLITE TRIMETHYLAMINE N-OXIDE LEVEL AND IMPROVES SERUM BIOCHEMICAL PARAMETERS

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Introduction. Unhealthy dietary patterns and lack of appropriate physical activity is an emerging problem leading to worldwide obesity epidemic and causing increased risk of non-communicable diseases. Trimethylamine N-oxide (TMAO) has been proposed as a link between unhealthy diet and adverse cardiovascular outcomes after it was identified as a diet-derived metabolite promoting development of atherosclerosis and increasing cardiovascular risk. Consecutively, increased attention is paid to various dietary interventions that would both help to lose weight and improve overall cardiometabolic health.

Objective. The aim of this study was to investigate how 5-day intermittent fasting with caloric restriction and limited protein consumption affects plasma TMAO level and biochemical parameters.

Methods. 12 healthy volunteers (6 males, 6 females; mean age 36±10 years;) were subjected to 5-day time restricted intermittent fasting regimen with 6-hour feeding period, followed by 18-hour fasting period. Moreover, limited calorie intake (1st day – 1200 kCal; 2nd–5th day – 800 kCal a day) was set, and volunteers were asked to consume only vegetables, legumes, mushrooms, nuts and plant oils. Volunteers were weighted, and blood samples were collected before and after the dietary intervention, to evaluate the effect of intermittent fasting on weight loss, plasma TMAO level, lipide profile, glucose metabolism, insulin sensitivity and other plasma markers of metabolic health.

Results. Compared to baseline measurements, 5-day intermittent fasting and caloric restriction led to 3±1 kg weight loss and subsequent BMI reduction by 1±0.3 units. Moreover, plasma biochemical measurements revealed reduction of fasting glucose level and improved plasma lipid profile. Insulin sensitivity was increased in each of 12 volunteers, and insulin-like growth factor-1 and C-peptide plasma levels were significantly decreased. In addition, 5-day intermittent fasting resulted in a 2-fold decrease of plasma TMAO level (from approximately 6.3 μM to 3 μM).

Conclusions. Even short-term dietary changes focused on time restricted intermittent fasting and caloric restriction lead to overall improvement in plasma biochemical parameters. In addition, our study suggests, that 5-day intermittent fasting results in decreased TMAO level below the cardiovascular risk threshold.

Keywords: TMAO, intermittent fasting, caloric restriction, weight loss, insulin sensitivity, cardiovascular disease prevention.

Acknowledgements: This study was funded by the Latvian Council of Science project "Trimethylamine-N-oxide as a link between unhealthy diet and cardiometabolic risks" No. Izp-2018/1-0081.

P15 SELENIUM INTAKE SCORE IN THYROID PATIENTS

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Introduction. The thyroid gland is part of the endocrine system and produces thyroid hormones, which play an important role in metabolic health. To enable normal thyroid hormone synthesis and function micronutrients are needed, in particular iodine and selenium. However, thyroid dysfunction is common with autoimmune thyroid diseases (AITD) being the most prevalent of organ-specific autoimmune diseases and affecting 2–5% of the population. Common AITD include Graves' Disease and Hashimoto Thyroiditis. Several studies suggest beneficial effect of selenium supplementation on thyroid autoimmunity.

Objective. We aimed to evaluate tools for selenium intake estimation in patients with thyroid diseases.

Methods. Biochemical tests were performed, and food frequency questionnaire (FFQ) used to analyse selenium intake and calculate Selenium Intake Score (SIS) [1]. Results are shown as median (Interquartile range). IBM SPSS was used to calculate results.

Results. A total of 89 subjects was analysed in this study, 74 of them women, median age 30.5 years (26.0–46.0). Hashimoto thyroiditis was present in 48.3%, Graves' Disease in 12.6% of subjects, 39.1% were controls. Median serum selenium concentration was 79.04 µg/L (60.09–112.58). Median SIS in the total study population was 164 (123–225). Serum Selenium correlated with SIS: Spearman's rho 0.28, p=0.012. SIS was 164.4 (121.7–213.9) in control group, 166.6 (125.8–230.2) in Hashimoto thyroiditis group and 166.0 (108.7–243.4) in Grave's Disease group, p=0.868. The main food groups contributing to higher SIS were fish and seafood, poultry, pork and pasta/rice.

Conclusions. Food frequency questionnaire showed to be an adequate tool to estimate Serum intake in thyroid patients. Meat products, fish, pasta or rice are recommended as natural sources of dietary selenium. Further studies need to be carried out to evaluate the relevance of selenium intake and supplementation in patients with different thyroid diseases.

Keywords: selenium, thyroid, autoimmunity.

Acknowledgments: This work was supported by Latvian Council of Science grant No. lzp-2018/2-0059.

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P16 COMPARISON BETWEEN EFFICIENCY OF 16/8 TIME RESTRICTED FEEDING AND 5/2 ALTERNATE DAY FASTING IN BODY FAT MANAGEMENT

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Introduction. Numerous studies worldwide have proven calorie restriction to be an effective approach to regulate body's fat accumulation. In the last decade, the approach of limiting nutritional intake frequency but not calorie intake, so-called intermittent fasting, has gained growing popularity. Intermittent fasting is an umbrella term for various meal timing schedules that cycle between voluntary fasting (or reduced calorie intake) and non-fasting over a given period [1]. There are numerous studies of intermittent fasting, however, data comparison is complicated by the different dietary protocols used in the studies, which delays a consensus in scientific community for a common understanding of the effectiveness of intermittent fasting in weight management.

In our study, we are comparing two of the most popular intermittent fasting regimens – 16/8-time restricted feeding, where person is allowed to consume nutrition in an eight-hour eating window followed by a 16-hour fasting period, and 5/2 alternate day fasting, where there are two non-consecutive fasting days in a week.

Objective. The aim of the study was to evaluate, which of the intermittent fasting regimens – time restricted fasting or weekly fasting – causes more pronounced favourable changes in body weight and body composition.

Methods. A total of 16 healthy young women (under 30 years of age) participated in the study – eight in every intermittent fasting group for six consecutive weeks. Several anthropometric parameters were measured, calculated and analysed: body weight, height, body mass index, umbilical waist circumference, sagittal-abdominal diameter and relative body fat (calculated using Yuhasz equation [2] for six skinfold thickness measurement sites). The percentage difference between the initial values and the final values was calculated and compared between both groups.

Results. We found no statistically significant difference between both 16/8 and 5/2 intermittent fasting regimens according to percentage difference between the initial values and the final values compared between both groups.

In addition, although several authors previously have reported that intermittent fasting is an effective weight loss strategy despite *ad libitum* energy consumption in eating windows (for recent review see [3]), in our study, one out of 16 participants showed no reduction in relative body fat and four out of 16 participants showed an increase in relative body fat.

Conclusions. As there is no significant difference for overall change in parameter values in a six-week period between both intermittent fasting regimens, we conclude that both are equally suitable for weight loss purposes.

Keywords: intermittent fasting, women, weight, body mass index, body fat.

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P17 AN UPDATE ON BARIATRIC SURGERY IN LATVIA

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Background. Obesity is a chronic metabolic disease characterised by an increase of body fat stores. It is a gateway to ill health, and it has become one of the leading causes of disability and death, affecting not only adults but also children and adolescents worldwide. Bariatric surgery is a permanent method of morbid obesity treatment, but there is a lack of structured data and publications about it.

Objective. The aim of the study is to bring an update on bariatric surgery in Latvia within the last 5 years.

Methods and materials. A cross-sectional study on characteristics of weight loss surgery performed within the last 5 years in Latvia. Data from the hospital surgery data base 2015–2019 was used in this study.

Results. The two major types of surgery applied for patients in Latvia are gastric bypass (or Roux-en-Y gastric bypass) and vertical sleeve gastrectomy. Besides, some other surgeries like mini-gastric bypass or single-anastomosis gastric bypass were also performed.

In total, there were 2037 bariatric surgeries performed, starting from 276 surgeries in 2015 and reaching 593 surgeries in 2019. 57.7% (n=1177) were bypass surgeries, 39.7% (n=808) were gastric sleeve, and only 2.6% (52) were other bariatric surgeries, most of which were done during 2019 since mini-gastric bypass surgery is gaining popularity.

In 2019, 89% of all the patients were females. 57% (n=340) of all surgeries were gastric bypass, 38% (=225) gastric sleeve and only 5% (n=28) were others. Only 22% (n=133) of all the patients in 2019 were local patients, most of the patients were foreigners 78% (n=460).

Conclusions. Bariatric surgery is gaining popularity in Latvia and has a great potential to become a medical tourism product. Most of the patients are female and gastric bypass is the most common surgery performed.

Keywords: obesity, bariatric surgery, metabolic surgery, gastric bypass, sleeve gastrectomy.

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P18 EVALUATION OF COMPETENCE ABOUT NUTRITION OF PERSONS WITH ELEVATED LEVEL OF URIC ACID

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Background. Nutrition has an impact on the development of hyperuricemia and gout due to excessive consumption of purine-rich products, products high in fructose, and alcohol.

The change of dietary habits is one of the non-pharmacological approaches recommended in addition to the pharmacological treatment of gout.

Objective. The aim of the study is to assess the nutritional competence of individuals with elevated uric acid levels through analysing information about participants' daily dietary habits, the sources of information and the means how these individuals search for information about the desired dietary changes, their readiness to implement the needed changes.

Methods and materials. This is a quantitative cross-sectional study. 53 participants, men and women aged 35–75 with elevated serum uric acid, provided answers to self-assessment questionnaire.

Results. 47% of the participants include the meat in their daily meal and only 26% consume vegetables daily. The pure water consumption does not exceed 4 glasses or 800 ml daily. 75% of the participants are using alcohol, and half of them 2–4 times a month. Strong alcohol and beer are the preferred beverages.

All the participants obtained nutritional advice mostly from family doctor, nurse or family member. Most commonly used sources of information to look for nutritional advice are a consultation with family doctor during the planned visit, finding information on Internet and in a periodical. None of the respondents have sought nutritional advice from a nutrition specialist.

62% of the respondents followed the recommendations, but despite the recommended interventions in dietary habits, the diet of people who made the changes was almost the same as the diet of those who did not. 38% have not complied with the received dietary recommendation.

Conclusions. As a result of the study, the dietary competence of people with elevated uric acid levels was assessed as low. The people's readiness to implement dietary recommendations in their daily life is relatively low. However, society needs easy un accessible information of non-pharmacological approaches and dietary habits that can be applied to decrease levels of uric acid.

Keywords: hyperuricemia, nutrition guidelines, gout, non-pharmacological approaches, self-management.

P19 DRIVING FACTORS OF CHOICE OF PLANT-BASED MILK ALTERNATIVES AMONG DIFFERENT CONSUMER GROUPS

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Introduction. Current dietary trends combined with projected population growth to about 10 billion by 2050 will exacerbate risks to people and the planet. World needs a major food transformation programme to facilitate the transition to a healthy and sustainable diet by 2050 [1]. Milk production continues to increase, hence there has been a considerable interest in development of plant-based alternatives to traditional bovine milk [2].

Methods. A quantitative cross-sectional study was conducted using an Internet survey and results were obtained from 408 subjects in Latvia. The attitudes of different consumer groups (omnivores, flexitarians and vegetarians/vegans) were analysed towards plant-based milk substitutes, as well as the promotional factors of the consumption of these products.

Results. Based on our results, in the group of omnivores, the consumption of plant milk is primarily led by the interest in novel foods and a change to a healthy diet. In the group of flexitarians, the main drivers of the use of plant-based milk substitutes are the same as for omnivores, but they also are looking for products that are more environmentally friendly. In the vegetarian/vegan group, the main driving factors are completely different. The consumption of plant milk is primarily led by environmental protection, animal welfare, as well as the fact that they believe animal milk to be unhealthy.

Conclusions. These results suggest that most of the subjects are omnivores and the main driving forces for using plant-based alternatives are not linked with environmental sustainability. Results prove that transition to healthy diets by 2050 will require widespread, multisectoral and multilevel action by the government and private sector.

Keywords: food sustainability, plant milk, plant-based milk substitutes, consumer preferences.

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P20 CHALLENGES IN THE DEVELOPMENT OF FOOD PACKS FOR PUPIL LUNCHES AS PART OF THE RECOVERY-LV PROJECT

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Introduction. With the onset of the pandemic in March 2020, education of schoolchildren was provided remotely, which raised a number of issues and challenges in providing of meal for pupils. Latvian municipalities addressed this by creating food packs for one week, taking into account the nutritional recommendations of the Ministry of Health designing a one-week food pack. However, various aspects, such as the provision of nutrients and energy, were not taken into account in the designing of the food pack composition. Given that the situation in Latvia has once again escalated, there would be a necessity to find well-thought-out solutions to ensure the pupils' lunch outside of the school activities.

Objective. The aim of this study was to develop the recommendation-based one-week food packs for 1st to 4th grade pupils, providing the necessary amount of nutrients and energy.

Overview. In designing of one-week food packs, various aspects must be taken into account: 1) provision of nutrients and energy to selected age pupils; 2) diversity of food products; 3) recommended quantities for specific product groups; 4) limited costs of the food packs; 5) the storage conditions of the products must comply with the room temperature; 6) the volume/weight of products offered for sale; 7) food recipes.

Results. In light of these aspects, 4-week food packs were developed on the basis of the nutritional recommendations, the food recipes were elaborated and provision of protein, fat, carbohydrates, calcium and iron was analysed. Finally, the recommendations for food manufacturers were drawn up for product packaging volumes/weights and materials used for food packs.

Keywords: food packs, nutritional recommendations, recipes, nutrients and energy.

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P21 ASSESSMENT OF SLEEP DURATION AND ENERGY INTAKE IN LATVIAN ADULTS IN RELATION TO THEIR WEEKLY STEP COUNT

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Introduction. Epidemiological studies have shown a link between sleep duration and dietary choices. The level of physical activity can also impact the duration of sleep and energy intake.

Objective. The aim of the study was to evaluate how subjects' weekly step count affects their energy intake, sleep duration and BMI.

Methods. The sample consisted of Latvian adults aged 18–61 (n=51) who participated in the "Gut microbiome composition and diversity among health and lifestyle induced dietary regimen" study in 2019 and 2020. Participants were divided in two groups – 1) 25 adults with a weekly step count of 63,000 steps and more; 2) 26 adults with weekly step count of 7,000 steps or less. Data on physical activity was collected using an adapted version of the International Physical Activity Questionnaire (IPAQ). Data from IPAQ was not used due to participants' overestimation of their physical activity; instead, the self-reported weekly step count was used. The dietary data was collected using food 24-h dietary recall. Participants self-reported their sleep duration and their weekly step count which was recorded by their smartphone or smartwatch. Sample size was limited due to small number of participants who reported their weekly step count.

Results. The preliminary data suggests that the participants with a higher weekly step count tend to have longer sleep duration and lower BMI. The data also suggests that participants with a higher weekly step count consume less energy than participants with a lower weekly step count.

Conclusions. A higher weekly step count contributes to longer sleep duration, consumption of less calories and lower BMI in comparison to those with a lower weekly step count. The link between different dietary regimens and weekly step count should be further investigated during data analysis.

Keywords: nutrition, energy, sleep, step count, physical activity.

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P22 SUPPLEMENTAL VITAMIN D USE IN DIFFERENT EATING PATTERNS

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Introduction. Vitamin D is a fat-soluble nutrient that has various important functions in the body to maintain health and prevent disease. Nutritional supplements are probably the main source of vitamin D and are considered to be the best way to acquire vitamin D during the darkest seasons, when exposure to sunlight is low. Lower serum vitamin D concentrations have been consistently reported across different regions in obese subjects compared with normal-weight counterparts. Despite evidence, there are scarce population-based data regarding the relationship between BMI status and vitamin D supplement use in different diets.

Objective. The aim of the study was to find out the habits of vitamin D use among vegans, celiac disease patients and control group who did not follow any specific diet.

Methods and materials. The study population included 143 individuals: 31 men and 112 women in the age group from 18 to 63 years. Food propensity questionnaire was used to determine the frequency of vitamin D use.

Results. The mean body mass index for the vegan group was 21.0, in celiac group-23.4 and in control group it was 24.9. In vegan and celiac groups, the mean BMI was lower for women than for men, no differences were observed in the control group. More often, vitamin D supplements were used by control group (80%) and vegan group (84%) and less frequently – in celiac group (60%). In all three groups, more women than men use vitamin D.

Conclusions. In this sample of adults, vitamin D supplement use significantly differed according to gender. Our study concluded that the group with lower BMI had a higher prevalence of vitamin D supplement use compared with the celiac patient group, were BMI was higher. This nutritional disparity may also contribute to low vitamin D concentrations seen in obesity.

Keywords: Vitamin D, vitamin D supplements, celiac disease, vegan.

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P23 SUSTAINABLE FOOD RAW MATERIALS IN HOSPITALITY BUSINESS

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Introduction. An environmentally conscious consumer encourages enterprises to develop sustainability in all their business processes. Today, the hospitality industry attaches a great importance to the invention of fundamentally novel packaging materials – non-toxic, easily disposable, environmentally friendly. The edible dinnerware materials used in catering facilities (especially at huge public events) together with food products do not pollute the environment, simplify the issues of product dosing and portioning. There are 4 groups of disposable dinnerware materials used in catering: 1) plastic; 2) paper/cardboard; 3) bio plastic; 4) flora materials.

Objective. The aim of the study was to develop disposable plates from food raw materials as an alternative to plastic plates.

Methods. The survey method has been used to determine: 1) consumer's willingness to consume disposable plates from food raw materials; 2) hospitality enterprise managers' readiness to use disposable plates from food raw materials in their business activities. Laboratory experiment has been used to: 1) develop the technological process of plates from food raw materials (rye flour, peas flour, buckwheat flour); 2) determine the hardness of disposable food plates (TA.XT.plus Texture Analyzer (Stable Micro Systems Ltd, Surrey, UK; Warner-Bratzler guillotine with scissors)).

Results. 85 % of respondents support the decision of the European Commission to ban plastic disposable tableware from 2021, but 45% of respondents would like to have meals in a catering company, where meals would be served on disposable tableware made of food ingredients (rye flour, peas flour, buckwheat flour).

Conclusions. Disposable food plates can be successfully used for up to 1 hour for serving fruit, cold dishes, including salads with different sauces and desserts. In turn, the plates stored at a room temperature and humidity for 2 weeks showed no differences in structure, appearance or taste compared to the freshly baked plates.

Keywords: hospitality industry, food raw materials, sustainability.

P24 STUDY OF RHIZOBIA IMPACT ON NUTRITIONAL ELEMENT CONTENT IN LEGUMES

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Introduction. The Earth's atmosphere contains about 78% of nitrogen, it is one of the crucial elements in living forms and most of its compounds are physiologically active, but the greatest proportion of plants are not able to take it directly from atmosphere. One aspect of the sustainable and environmentally friendly and healthy food production and long-term crop productivity is biological fixation of atmospheric nitrogen. The most common way for binding atmospheric nitrogen is development of an efficient symbiotic system between legumes and rhizobia bacteria.

Objective. The aim of this study was to compare how the use of different legumes and Rhizobia bacteria symbiosis systems impacts the nutritional and other element content in studied soya and faba beans.

Methods. Experiments were carried out with soya and faba beans. Seeds of soya were inoculated with commercial preparation of rhizobia just before sowing, control remained without inoculation. Plants were analysed during flowering stage (roots, stems and leaves) and after harvest (seeds). Due to absence of indigenous rhizobia in the soils of Latvia, no nodules were observed on the roots of control soya plants during plant growth. Soya plants developed from treated seeds had nodules on their roots and it is an evidence of the development of symbiotic system between nitrogen fixing bacteria and plant.

Seeds of faba beans used for the experiments were inoculated with preparation of Rhizobia (Collection of Latvia University of Life Sciences and Technologies), with commercial mycorrhiza fungi preparation, and part was left as a control without inoculation. The content of nutritional elements was analysed in vegetative parts of plants during flowering stage and in seeds after the harvest.

Samples of seeds were air-dried and analysed with inductively coupled plasma mass Spectrometry (ICP-MS). Microwave-assisted acid digestion using trace grade nitric acid and hydrogen peroxide was applied for sample preparation. The total nitrogen and carbon content was determined with EuroVector EA3000 element analyser.

Results and conclusions. From the obtained results it is observable that there is an impact of Rhizobia strains on legume plant seeds. An increased nitrogen uptake, as well as changes in another element content are observed. The treatment of legume plants with Rhizobia causes decrease of P in seeds, additionally, the changes are present in iron and manganese that are involved in nitrogen metabolism enzymes (cytochromes, nitrate reductase). The ratios of calcium, magnesium, sodium and potassium are also affected.

Keywords: Rhizobia, legumes, nitrogen fixation, nutritional elements.

P25 LONG-TIME FERMENTATION IMPACT ON RYE BREAD TECHNOLOGICAL AND PREBIOTICAL PROPERTIES

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Introduction. The technology of fermented rye bread in Latvia is a value of traditions. Microorganisms play an important role in the fermentation process of sourdough bread, mainly due to lactic acid bacteria (LAB). Traditional rye bread in Latvia is prepared using scald and sourdough. Total fermentation time could be from 6 to 48 hours depending on bakery.

Overview. The predominant LAB in sourdough systems is lactobacilli, the majority of heterofermentative species, and usually sourdough contains two to five LAB species [1]. Studies on the microflora of rye bread sourdough in Latvia show lactic acids species as *L. plantarum*, *L. delbrueckii*, *L. coryniformis, L. curvatuss spp* as predominant during the formation of spontaneous rye sourdough [2].

One of the metabolites in sourdough LAB is exoplysacharides (EPSs), typically homopolysaccharides (HoPSs). It has been found that by analyzing various strains of lactobacilli, 20% of them are able to produce EPS from sucrose – mainly fructans and glucans are produced. Typically, sourdough contains at least one Lactobacillus strain that can produce EPS [3]. The exopolysaccharides produced by LAB are able to bind water, thereby improving the quality of the bread – the volume of the final product is improved, the staling of bread is delayed, thus extending the shelf life [4].

Recently, studies on the effect of exopolysaccharides on the viscosity properties of wheat bread have been updated. An increasing number of studies has shown that EPS produced by LAB can improve the growth of probiotics (Bifidobacteria and Lactobacteria) in the human body, improving immune function [5]. A prebiotic is defined as "a selectively fermented ingredient that allows specific changes, both in the composition and/or activity in the gastrointestinal microflora that confers benefits upon host well-being and health". Of particular interest with regard to possible prebiotic functions are EPS produced by LAB [6].

Conclusions. Long rye bread scald fermentation technology can improve the texture, quality and shelf life of bread, as well as functionally affect the human immune system.

Keywords: exopolysaccharide, prebiotic, lactic acid bacteria (LAB), sourdough.

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P26 STUDY OF SPROUTED HULLESS BARLEY GRAINS AND THEIR USES FOR THE DEVELOPMENT OF FUNCTIONAL SWEET SNACKS

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Introduction. Today, the consumption of confectionery continues to grow. Snacks are being supplemented with products that can be considered as functional products. Barley (*Hordium vulgare* L.) grains, notably, hulless barley is considered as an important food ingredient because of the presence of vital biochemical constituents – β-glucan, protein, phenolic compounds etc. [1]. Along with fruit and vegetables, barley grains are a suitable ingredient for producing snacks with functional properties. In many parts of the world, grain germ and sprouted grains are used as a biologically high-quality food [2].

Objective. The aim of study was to evaluate the benefits of sprouted barley grains and the possibilities of using them in production of barley-fruit-vegetable snacks.

Methods and materials. The chemical composition and biologically active compounds – the total content of phenols, flavonoids and tannins, as well as antioxidant activity of untreated and sprouted hulless barley grains were determined. Several samples of sweet bars with hulless barley variety 'Kornelija' flour and sprouted barley grain, dried fruit and vegetables were prepared. To establish the opinion of consumers, a sensory analysis of the bars has been performed, using Hedonic scale.

Results. The results showed that protein content of barley-fruit-vegetable bars varied from 7.85% to 10.93% and β-glucans' content varied from 0.77% to 2.79%, their nutritional value varied from 193.3 to 386.2 kcal.

Total fibre content of unsprouted, 24 h and 36 h sprouted grains was 26.30%, 25.80% and 24.60% respectively. The total phenol content of barley grains was determined from 212.55 to 305.95 mg 100 g^{-1}, flavonoid content from 237.26 to 290.25 mg 100 g^{-1}, tannin content from 1.25 to 2.75 mg 100 g^{-1}. The assessment shows that the flour bars had a drier and presumably crumblier consistency and a bitter aftertaste. According to the sensory analysis – Hedonic scale, the bars were evaluated from 5.6–7.4 (dislike or dislike to average like). The evaluators preferred bars made from ground sprouted hulless barley grains 'Kornelija' rather than flour, and rated the bars with the highest nutritional value. These bars contained honey, Japanese quince syrup, carrot powder and dates. The added fruits and vegetables provided different flavours of the bars and increased their nutritional value.

Keywords: hulless barley, sprouted grains, dried fruits and vegetables.

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P27 CHICKPEA AQUAFABA AS EGG SUBSTITUTE IN MERINGUE COOKIES

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Introduction. The contemporary society has a growing interest in the replacement of animal-origin products with products of vegetable provenance that would yield equivalent energy value and composition.

Objective. The study aimed to evaluate the effect of the chickpeas aquafaba as egg white substitute on the quality of meringue cookies.

Methods and materials. Foam stability, pH, and total dry matter were analysed in two different chickpea aquafaba ("M peas" and "R peas") and egg white material. For both types of meringue cookies chickpea aquafaba and powder sugar ratio was 1:1, but egg white and powder sugar ratio – 0.8:1. Foaming time for "M peas" – 9.59 min, "R peas" – 5.56 min, and egg whites – 5.57 min. Cookies were baked in a convection oven at 100±10°C for 75 min. and subsequently left for 24 h to cool the meringue to room temperature in 22±2°C. To meringue cookies, structural parameters like crunchiness, stickiness were determined by texture analyser and intensity of sensory properties (aroma, crunchiness, stickiness, sweet and pea taste) were evaluated by 29 panellists.

Results. Comparing the samples, the most stable foam was obtained from the egg white. Chickpea aquafaba samples "M peas" and "R peas" pH were pH 6.15 and pH 5.95 respectively, while in egg white it was significantly higher – pH 8.41. Dry matter for analysed samples was in the range from 6.26% (M peas) and 14.90% (egg white). Sensory evaluation showed that raw material – chickpea aquafaba and egg white has no significant influence on sweet taste ($p=0.6173$) and chewiness ($p=0.2053$) intensity, while there is a significant influence ($p<0.05$) on aroma, crunchiness and pea taste. Structure analyses showed that meringue cookies made from chickpea aquafaba were crispier than the ones made of egg whites, but also stickier.

Conclusions. In conclusion, chickpea aquafaba is a perspective raw material to substitute egg white in recipes.

Keywords: replacement, animal-origin products, chickpea, egg substitute.

P28 QUALITY EVALUATION OF CREAMED RAPESEED HONEY WITH ROWANBERRIES

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Introduction. There is a significant increase in consumer interest in natural and organic product lines, and society seeks healthier solutions to satisfy the craving for sweets. Honey serves as a sweetener in the food industry and can be used as an additive in confectionery, baby food, beverages, snacks, yoghurts and other foods. Various additives, such as nuts or berries tend to be added to diversify the taste of honey. The aim of research is to investigate the quality changes of creamed honey with added rowanberry products during storage.

Objective. The research subject consists of creamed rapeseed honey, lyophilized rowanberry powder (1%, 3% and 5%) and rowanberry puree (5%, 10% and 15%).

Methods. The samples are stored for 4 months at a room temperature (21±2°C). When evaluating the physicochemical parameters, the most appropriate way to prolong the shelf life of the product and maintain its quality is to add lyophilized rowanberry powder to creamed honey [1].

Results. The results of this research show that the content of total phenols in creamed honey with rowanberry is significantly dependent on the amount of added rowanberry, as well as the processing technology of berries. The highest phenol content 72.8–103.1 GAE mg $100g^{-1}$ throughout storage period was found in the sample, which contained 5% of lyophilized rowanberry powder [2].

The microstructure of creamed honey with lyophilized rowanberry was stable throughout storage, whereas the crystal structure of creamed honey with rowan berry puree was disrupted due to increased moisture content.

Conclusions. The most appropriate way to prolong the shelf life of the product and maintain its quality is to add sublimed crushed mountain ash to creamy honey. The addition of lyophilized rowanberries is a more appropriate way to increase the total phenolic content and antiradical activity (ABTS, DPPH) of the product.

Keywords: creamy rapeseed honey, rowanberry, phenol content, microbiological parameters.

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P29 PHYSICOCHEMICAL AND RHEOLOGICAL PROPERTIES OF NON-FAT ICE CREAM

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Introduction. Ice cream is a popular dessert in Latvia, even if today, as consumers are watching their calorie intake, ice cream begins to lose its leading position due to being rich in fats. Therefore, the development of low-fat or non-fat ice cream can be a good alternative for consumers. At the same time, reduced fat is a challenge to a producer, because it strongly affects the texture and sensory properties of ice cream.

Objective. The aim of the current study was to assess the physicochemical and rheological properties of the whey-based non-fat ice cream depending on the ingredient proportions used in the formulation.

Methods and materials. A total of 13 ice cream formulations was developed and evaluated, changing proportions of the main ingredients: sugar, whey concentrate, gelatine and pumpkin puree. Chemical composition, hardness (after 6 h of hardening and subsequent two-week storage), overrun and rheological properties were analysed during the research.

Results. An increased amount of pumpkin puree, sugar and whey protein concentrate decreased hardness of ice-cream. A similar effect was observed for overrun; better results were obtained in samples with higher amount of pumpkin puree and whey protein concentrate. Both increased amount of pumpkin puree and gelatine increased complex viscosity. However, it was little affected by the amount of added whey concentrate. An increased proportion of pumpkin changed value of storage and loss modulus at –6°C. The highest storage and loss modulus among the studied ice creams was found in the sample containing the smallest amount of concentrated whey additive, which was followed by the sample with the lowest sugar content.

Conclusions. It was confirmed that overrun and hardness of ice cream can be significantly influenced by the proportion of protein concentrate and/or pumpkin puree in the product formulation, stabilizing and strengthening air cells. Thus, non-fat ice cream structure and rheological properties can be improved applying fat-replacers: gelatine, pumpkin pure, and whey protein concentrate.

Keywords: pumpkin puree, whey protein concentrate, gelatine, texture, overrun, rheological properties.

P30 MACRO ELEMENTS AND TRACE ELEMENTS IN TRITICALE GRAINS CULTIVATED IN LATVIA

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Introduction. Triticale (× *Triticosecale* Wittm.) is a man-made cereal variety that is very suitable for growing in variable environmental conditions due to its stable yield, tolerance to marginal conditions, resistance to diseases, quality of grain (Green et al., 2002). Triticale is resistant to solid smut (*Tilletiaceries*) and therefore can be used for production of new food products from organic grains (Kronberga et al., 2013). Triticale is mainly used for animal feed as energy resource, but considering its valuable grain composition, it can also be expedient as a food ingredient, for example, for bread or biscuits (Frau et al., 2016, Straumite et al., 2017).

Objective. The aim of the study was to determine concentrations of 13 macro and trace elements in 27 samples of different triticale genotypes ('Dinaro', 'Falmaro', 'Atletico'), comparing them with rye and wheat, depending on the cultivation condition – year of growth (2011–2013) and agricultural practice (conventional/ organic).

Methods. Cd, Pb, Cr, Ni, and Al concentrations were determined by electrothermal atomic absorption spectrometry and K, Na, Zn, Cu, Ca, Mg, Mn, and Fe concentrations by flame atomic absorption spectrometry.

Results and conclusions. The distribution of Cd, Mn and Zn concentration differed statistically significantly in the organically and conventionally (with different N supply) grown grain, as proved by the results of the Mann-Whitney test (respectively, $p=0.012$, $p=0.005$, $p=0.049$).Comparison of trace and macro elements in triticale and its origin cereal varieties was provided by Kruskal-Wallis Test, pairwise comparison with Bonferroni corrections. It was established that Cd differed statistically significantly in rye and triticale ($p=0.001$); K differed statistically significantly in wheat and triticale ($p=0.004$); Mg and Zn differed statistically significantly in rye and triticale ($p<0.001$).

Keywords: triticale, trace and macro elements, agricultural practices, conventional, organic.

P31 COMBINED EFFECT OF MICROENCAPSULATED HORSERADISH JUICE AND HIGH PRESSURE TREATMENT ON PORK QUALITY DURING STORAGE

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Introduction. High pressure processing (HPP) is well suited to combine consumer demand for meat products with minimal heat treatment and without compromising product safety. Herbs have antioxidant and antimicrobial properties.

Objective. The aim of this study was to evaluate the application of hurdle technology combining microencapsulated horseradish root and leaf juice with HPP (300 MPa; 15 min.) for extending the shelf life of raw pork meat.

Methods. Water activity (a_w), pH, colour parameters, hardness, and microbiological parameters of meat were evaluated during 21-day storage.

Results. Total plate count (TPC) in HPP-treated samples was significantly smaller ($p<0.05$) comparing to untreated samples during storage until the day 14. On the day 21, the TPC in processed samples still remained slightly lower, however, at this point the significance was not established between samples. Water activity dynamics in the HPP-treated microencapsulated pork meat samples differed significantly from other samples. Hardness decreased during storage, but no significant differences were found between samples. In turn, the L* values and pH of the meat were not significantly influenced by the added microencapsulated juice, but by high pressure treatment.

Conclusions. Treatment with microencapsulated horseradish juice had a positive effect on the TPC and a_w of the meat sample.

Keywords: pork, horseradish, HPP, shelf life.

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P32 PHENOLIC COMPOUNDS IN ORGANIC AND CONVENTIONAL WINTER WHEAT (*TRITICUM AESTIVUM* L.) WHOLEMEAL

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Introduction. Winter wheat wholemeal is an important component of human diet and may serve as a significant source of antioxidants.

Objective. The aim of this study was to determine and analyse individual phenolic compounds in five winter wheat varieties 'Fredis', 'Edvins', '94-5-N', 'Skagen', 'SW Magnific' wholemeal, grown according to organic and conventional agricultural practices.

Methods. Ten individual phenolic compounds (vanilin, rutin, catechin hydrate, quercetin, p-coumaric acid, ferulic acid, 3.4-dihydroxybenzoic acid, 2-hydroxycinnamic acid, trans (3)-hydroxycinnamic acid, gallic acid) were detected using high-performance liquid chromatography (Schimadzu Prominence HPLC).
Results. Catechin hydrate and quercetin were the main phenolic compounds in the grain of all tested winter wheat varieties. Significant differences ($p<0.05$) among the analysed winter wheat cultivars in the concentration of individual phenolic compounds were observed. Concentrations of vanillin in organic and conventional winter wheat wholemeal were significantly lower (0.28±0.02 to 0.65±0.04 μg g^{-1} DW), although the differences in the levels of phenolic were not high.

Conclusions. The obtained results showed a statistically significant trend ($p<0.05$) towards higher levels of phenolic compounds in organic wheat wholemeal samples.

Keywords: HPLC, phenolic compounds, winter wheat.

P33 PHENOLIC COMPOSITION AND ANTIOXIDANT ACTIVITY OF FROZEN HORSERADISH ROOTS DURING STORAGE

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Introduction. Horseradish (*Armoracia rusticana L.*) contains various bioactive compounds. Freezing is a good way to preserve bioactive compounds in different plants.

Objective. The aim of this study was to investigate the changes of phenolic compounds and antioxidant activity in frozen and long-stored horseradish roots depending on the freezing method.

Methods and materials. Horseradish roots were frozen by conventional freezing (at –18±3°C) and blast freezing (at –40±3°C) followed by storage at –18±3°C for 12 months. Fresh horseradish roots were used as a control. The total phenolic content, total flavonoid content, total flavan-3-ol content, total phenolic acid content, total flavonol content, and antioxidant activity ($DPPH^{\cdot}$, $ABTS^{+}$ and reducing power) were determined by spectrophotometric methods. The individual phenolic compounds were determined using high-performance liquid chromatography (HPLC).

Results and conclusions. The main individual phenolic compounds were phenolic acids and flavonoids. The content of these compounds was significantly ($p<0.05$) affected by both the type of freezing and the storage time. Conventional freezing was a better choice to more effectively maintain catechin hydrate and rutin. In turn, the use of blast freezing can more effectively preserve kaempferol, luteolin, gallic and caffeic acid. The freezing method did not significantly ($p<0.05$) affect the total phenolic content and antioxidant activity.

Keywords: horseradish, phenolic compounds, antioxidant activity, freezing, storage.

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P34 QUALITY OF DIFFERENT COLORED TOMATOES DEPENDING ON GROWING SEASON

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Introduction. Tomatoes have been widely used in nutrition, as well as in nutritional medicine. Red tomatoes are used for anaemia, they contain antioxidant lycopene, while the high content of organic acids promotes digestion. Yellow tomatoes have valuable amounts of beta-carotene, the pigment that gives orange and yellow tomatoes their colour and helps to neutralize free radicals. The of brown tomatoes are smaller than an average tomato, but they are sweeter, due to higher content of fructose. Cherry tomatoes are among the smallest commercially available tomatoes, but they are known for being rich in carotenoids, lycopene and phenolic compounds.

Objective. The aim of the study was to evaluate how the content of biologically active substances changes depending on the tomato growing season.

Methods and materials. The study examined four varieties of tomatoes ('Bolzano' F1-yellow, 'Chocomate' F1– brown, 'Encore' F1 – red, 'Strabena' F– red, cherry) grown in the industrial greenhouse "Mežvidi", using additional light. The content of biologically active substances – lycopene, β-carotene, total phenolic compounds, as well as content of soluble solids was analysed in two vegetation periods – autumn season (November) and spring season (March), using spectrophotometrical or refractometrical methods.

Results and conclusions. The obtained results showed that tomatoes harvested in the autumn season contain more biologically active substances than in the spring season. In the autumn season, cherry tomatoes 'Strabena' contain the highest content of pigments, total phenols and soluble solids, so the taste index of this variety is also the highest. In the spring season, the pigment content is significantly lower (on average by 20–30%), but the decrease of phenol and soluble solid content (Brix) is not as significant – on average, 2–4%. Of the large-fruited tomatoes at the beginning of vegetation (autumn season), the highest amounts of pigments are contained by the red tomatoes ('Encore') – lycopene content 4.63±0.04 mg$100g^{-1}$; yellow tomatoes 'Bolzano' are rich in phenolic compounds – 128.46±3.25 GAE mg 100^{-1}, but brown tomatoes 'Chocomate' had the highest content of soluble solids – 4.48±0.05 Brix. Comparing the obtained results in the tomatoes harvested in the spring season, the content of biologically active substances had decreased on average by 10–15%, regardless of the colour and variety of the tomatoes.

Keywords: biological active substances, tomatoes, vegetation period.

P35 ASSESSMENT OF HONEY FLORAL ORIGINS BY USING CHROMATOGRAPHY, MASSPECTROMETRY AND NUCLEAR MAGNETIC RESONANSE

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Introduction. Honey has antibacterial properties, so it is widely used in folk medicine. Due to its versatility, this sweetener is a market-demanded product, but naturally occurring honey is expensive compared to other sweeteners. In order to protect the interests of consumers and regulate the fair price of honey in today's market, the methods of honey authenticity and quality indicators are constantly evolving. One or more modern instrumental analyses are increasingly used, aiding determination of several quality characteristics. The authenticity of honey is also assessed by applying chemometric methods [1].

Methods. Three modern instrumental analysis methods were applied to monofloral and polyfloral honey samples of Latvian origin. Liquid chromatography – high performance mass spectrometry (LC-HRMS) was performed to quantify 18 different polyphenols and flavonoids. Isotope ratio mass spectrometry (IRMS) was performed to determine carbon isotope ratio and NMR working frequency of 300 MHz for ^{1}H was performed to acquire ^{1}H-NMR spectra from 0 to 10 ppm with bin width of 0.005 ppm.

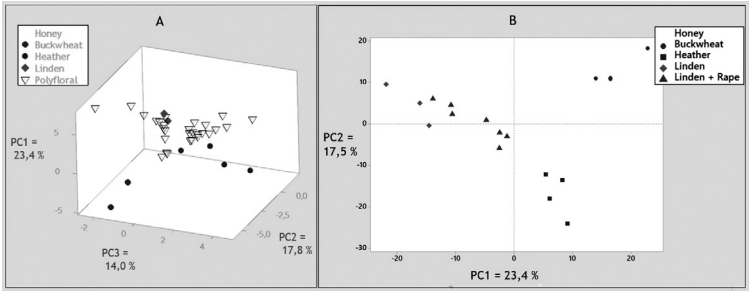

Fig. 1. PCA model for A) monofloral buckwheat, heather, linden and polyfloral honey 3D scatterplot of IRMS and HPLCHRMS data; B) monofloral buckwheat, heather, linden and polyfloral containing linden and rape honey scatter plot of data of ^{1}H-NMR spectra.

Results. The results obtained by instrumental methods were processed using chemometric methods. Principal component analysis (PCA) was performed and PC score values were used to construct score plots.

Conclusions. The method has a potential application for distinguishing monofloral buckwheat, heather and linden from polyfloral honey.

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P36 APPLICATION OF BARLEY VARIETY 'KORNELIJA' IN DEVELOPMENT OF FERMENTED DAIRY PRODUCTS

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Introduction. Consumers today are looking for new food products with added nutritional value. Producers and scientists develop new recipes, combinations and technologies with an aim to enrich products with fibres, vitamins and probiotics. Since naked barley contains a high concentration of β-glucans and soluble dietary fibre, it is considered as a natural thickener substitute, consequently, it has a good potential for fermented dairy food development.

Objective. The goal of the current research was to study the application of hulless barley grains for development of fibre-enriched fermented dairy product.

Methods and materials. In the current study, the suitability of dried and chopped hulless barley grain `Kornelija` for probiotic product development was evaluated. Yoghurt was fermented with freeze-dried starter (*Lactobacillus delbrueckii* ssp. *bulgaricus, Streptococcus thermophilus*) by adding barley grain that was ungerminated, germinated 24 hours and 36 hours (conc. 2%, 3%, 4%). Yoghurt was fermented at 42±1°C up to pH 4.8±1.0. pH of samples during fermentation, the count of lactic acid bacteria, viscosity and concentration of fibres was determined.

Results and conclusions. Results of the current study show that dried and chopped barley grain – ungerminated, as well as germinated 24 and 36 hours, fortifies yoghurt with fibre, promotes growth of lactic acid bacteria in the product, increases the viscosity and shortens fermentation time.

Keywords: hulless barley, lactic acid bacteria, viscosity, fibres, germinated grains.

P37 BIODIVERSITY OF FUNGI COLONIZING AND INFLUENCING THE QUALITY AND SAFETY OF RAW MATERIAL OF OREGANO (*ORIGANUM VULGARE* L.)

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Introduction. Oregano (*Origanum vulgare* L.) is one of paramount aromatic and medicinal plants in the world because of it antifungal and antibacterial activity of phenolic compounds. It is used in production of extracts and essential oils, as a spice, in perfumery, pharmacy, culinary, food and beverage production, in beekeeping, ornamental horticulture, for colouring textile, in SPA rituals, etc. The quality of raw material depends on the provision of optimal environmental and growing conditions. Many fungal species infect medicinal plants during cultivation. For oregano, they can be the reason of damage of yield and quality.

Objective. In the autumn of 2020, studies on diversity of fungi colonizing and damaging leaves of oregano was carried out.

Methods and materials. The samples of plant material were selected from an *ex situ* collection of spice- and medicinal plants` genetic resources, attached to the Latvia University of Life Science and Technologies.

Results and conclusions. Three types of different disease symptoms were observed on the leaves of oregano: irregular necrotic spots; oblong, necrotic spots on the shore and on the tops of the leaf blade; necrotic, concentrically zoned spots with lighter centre. Fungi, potential causing agents, were isolated from tissue of diseased leaves and were identified. Some of them influence not only the biomass creation of oregano, due to premature defoliation of infected leaves, but also the safety of raw material, because the fungi produce substances of toxic character that accumulate in plant tissues even during their growth.

Keywords: oregano, quality of raw material, herb diseases, leaf spot.

P38 POTENTIAL FOR EARTHWORM POWDER USE IN FOOD

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Introduction. The world is changing, and with the escalating environmental problems, depletion of resources and growing population, the insects may soon appear on our menu as one of the protein sources. Insects have been identified as a more sustainable alternative when compared to other more traditional animal protein sources. Research is underway and insect-based products with high nutritional value are being developed, manufacturers have started to produce and offer consumers these new products. Earthworm powder obtained from earthworms (*Lumbricidae*) grown in Latvia is positioned as one of the protein sources, which also in significant amounts contains other valuable nutrients (fibre, minerals, and vitamins). It can be added to various products to increase their nutritional value.

Objective. In the light of the above, it becomes relevant to explore the attitudes of consumers, consequently, this study aims to collect opinions of consumers regarding edible insects (including earthworms) and products derived from them.

Methods and materials. Data were collected from consumers during exhibitions and events. Respondents were randomly selected based on gender and age. They were offered to taste the products with earthworm powder and answer the questionnaire, which contained 7 questions.

Results and conclusions. The results showed that alternative sources of protein from insects have potential in the Latvian diet, however, traditions must be taken into account. Products with earthworm powder are characterized as palatable, with a slightly different appearance and unusual aftertaste.

Keywords: entomophagy, edible insects, earthworms, consumers' attitude.

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P39 COLORIMETRIC MEASUREMENTS OF VEGETABLE OILS BY SMARTPHONE-BASED IMAGE ANALYSIS

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Introduction. The colour of vegetable oils is formed due to the synthesis in plants of chlorophylls, xanthophyll, carotenes and other chemical coloured substances. One of the most important indicators of quality of vegetable oils is colour, which can be detected with colorimetric measurements.

Objective. The aim of the research was to detect colour of vegetable oils with smartphone-based image analysis.

Methods and materials. Traditionally, colorimeters, spectrometers, tintometers and other analytical equipment's is used to determine colour. As an alternative for the replacing classical analytical methods smartphone-based colorimetry can be used, employing a digital image analysis. For colorimetric detection of colour in vegetable oils Huawei P30 lite smartphone and android application "Color Picker", with image matching algorithm RGB model (R-red, G-green and B-blue), was used. The image of sample and standard solutions was captured in the polyvinyl chloride box with light-emitting diode (LED) lamps. The detected colour of eleven vegetable oils (sea buckthorn, sunflower, rice, macadamia nut, hemp, corn, grape, linseed, rapeseed, olive and milk thistle oils) was compared with the standard solutions of iodine with concentration range from 0 to 100 mg 100 mL^{-1}. RGB model captured with smartphone is in the value range from 0 to 255.

Results and conclusions. Results show that smartphone-based colorimetry can be used for detection of the colour of vegetable oils and it is possible to compare it with standard solutions of iodine. The colour of vegetable oils was expressed as the number or concentrations in milligrams of free I_2 in 100 mL standard solution prepared in deionized water.

Keywords: colour, digital image colorimetry, Android, smartphone, vegetable oil.

P40 IDENTIFICATION OF THE PRESENCE OF PATHOGENIC AND POTENTIALLY PATHOGENIC BACTERIA IN WHEAT, SEEDS AND SPROUTED SEEDS

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Introduction. For a long time, sprouted seeds have been used in food as a healthy product with high nutritional value and also as a decor for exquisite dishes today. However, there have been many serious outbreaks of diseases in Europe, the United States and other parts of the world associated with pathogenic microbial contamination of sprouts. These outbreaks pose a constant challenge to the entire industry of sprouts.

Objective. The aim of this study was to determine the presence of pathogenic microorganisms Shiga toxin-producing *Escherichia coli* (STEC) and *Salmonella spp*. in wheat, seeds, sprouted wheat and sprouted seeds intended for industrial food production and ready for use without further processing.

Methods and materials. A total of one grain type and two types of seeds and sprouts were evaluated: broccoli *(Brassica oleracea)*, hemp *(Cannabis sativa)* seeds and wheat *(Triticum aestivum)* grains. Microbiologically, the presence of *E. coli* was evaluated by enrichment broth inoculation on TBX and EMB agars, and colony characterization with MALDI-TOF. *E. coli* enumeration was done according to the LVS ISO 16649-2:2007. The presence of STEC was determined in accordance with ISO/TS 13136:2012. *Salmonella spp*. detection was done by real-time PCR.

Results. *E. coli, Salmonella* spp. and STEC were not found in any of the samples. Environmental bacteria were detected on TBX in dry seeds and 12 h-soaked seeds. The presence of environmental bacteria was found in all the samples by colony characterization on EMB by MALDI-TOF.

Conclusions. The results show that the sprouts and edible seeds available in Latvia could be considered a healthy and relatively safe food.

Keywords: grain, germination, seeds, pathogenic bacteria, STEC.

P41 MICROBIOLOGICAL RISK ASSESSMENT OF FRESHLY SQUEEZED ORANGE JUICE

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Introduction. The changing consumer preference towards healthier lifestyle and tendency towards convenience and spending less time on preparing food stimulates the demand for fresh and minimally processed food in supermarkets. Consumption of freshly squeezed fruit juice has been associated with better diet quality and higher intakes of key nutrients, like vitamins A and C and B-6, folate, thiamine, magnesium, potassium and dietary fibre [1, 2].

Offering self-squeezed orange juice for daily consumption in the supermarkets is convenient to consumer, but poses a risk for hygienic conditions. By violating good hygiene practice, the freshly squeezed orange juice may be contaminated with microorganisms and pathogens that can cause the consumer to contract food-related illnesses.

Objective. The aim of the study is to evaluate the factors influencing the microbiological risk of freshly squeezed orange juice in food supermarkets.

Results. The risk factors influencing the safety of freshly squeezed orange juice are microbiological parameters of air, equipment and containers, as well as microbiological parameters of self-squeezed orange juice. The results of the study were compared to the Regulation of the Cabinet of Ministers No. 461/2014.

According to results of the present study, microbiological contamination with mesophilic aerobic and facultative anaerobic bacteria, yeasts and lactic acid bacteria was found at all stages of squeezed orange juice production.

The microbiological parameters of freshly squeezed juice were, respectively: the total plate count 3.88 log $CFUg^{-1}$, yeasts 3.86 log $CFUg^{-1}$ and lactic acid bacteria count 4.07 log $CFUg^{-1}$. Microbiological parameters in the testing samples were not within the legal limits.

Conclusions. The results of the study showed that freshly squeezed orange juice was contaminated and not safe for consumption. To prevent the risk to the consumer, the microbial contamination should be reduced at all stages of production.

Keywords: freshly squeezed orange juice, food safety, microbiological contamination.

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P42 EFFECT OF DIFFERENT *S. CEREVISIAE* YEAST STRAINS ON STRAWBERRY WINES POMACE PHYSIOCHEMICAL PARAMETERS AND BIOACTIVE COMPOUNDS

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Introduction. One of the wine production by-products is fruit pomace. Pomace consists of seeds, skin and stalks. Wine production results in about 10–20% of pomace. The chemical composition of pomace is the reason why the residue can be an environmental pollutant [1]. About 70% of bioactive compounds remain in pomace, hence, it can be used as a good material to produce other high-value products [2], [3].

Objective. The aim of this work is to study the content of bioactive compounds in strawberry wine marc.

Methods and materials. Pomace were obtained from three strawberry wines. Three different *S. cerevisiae* yeast strains (71B-1122, EC 1118, RC 212) and one strawberry variety ('Flair') were used to make these wines. Several tests of pomaces were made to determine the physicochemical parameters, total phenolic content [4] and antiradical activity [5].

Results. *S. cerevisiae* yeast strains had a significant effect ($p<0.05$) on basic physicochemical values. The average total phenolic content in the residue from the wine with 71B-1122 yeast strain was 789.08±91.85 mg GAE L^{-1}, in the residue from the wine with EC 1118 the yeast strain was 559.84±42.37 mg GAE L^{-1}, and in the residue from the wine with RC 212 the yeast strain was 504.65±25.66 mg GAE L^{-1}. The pomaces of the strawberries still retained about 51% of the original amount of phenolic content from the fresh strawberries. The content of phenolic compounds in the residue depends on several factors: berry variety, growing conditions, methods of processing berries in wine production, etc. [6].

Conclusions. The choice of yeast strain affects not only the chemical composition of wine, but also the chemical composition of the waste products.

Keywords: strawberry pomace, total phenolic content, wine, *S. cerevisiae* yeast strains.

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P43 CHANGES IN PHENOLIC CONTENT OF HONEY DURING SPRAY-DRYING PROCESS

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Introduction. Honey contains several phenolic compounds and can be used as a natural source of antioxidants [1]. Due to its high viscosity and tendency to crystallize, the usage of honey in the food industry is limited. The powdered honey could be an alternative and would allow to expand applications of honey in the industry [2].

Objective. The aim of the research was to determine the changes of individual phenolic compounds in fresh and spray-dried honey samples.

Methods. The above task was achieved by using the HPLC method. The individual phenolic compounds in both samples were detected by Shimadzu LC-20 Prominence liquid chromatograph using DAD detector.

Results and conclusions. 10 different phenolic compounds were detected and identified in the fresh honey sample. The concentration of identified phenolic compounds ranged from 0.9 to 190 μg 100 g^{-1} dry matter. The obtained results of the spray-dried honey sample showed a decrease in the concentration of phenolic content. Phenolic compounds, such as syringic acid and ferulic acid were not detected in the spray-dried honey sample. The results showed that the obtained spray-dried honey also contains phenolic compounds, however, in a lower concentration than fresh honey.

Keywords: honey powder, spray drying, phenolic compounds, HPLC.

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P44 ASSESSMENT OF CONSUMER AWARENESS OF FOOD LABELS

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Introduction. The nutrition label is an important tool that food manufacturers can use to communicate with consumers. Nevertheless, there is a lack of evidence on the extent to which consumers are able to understand nutrition and health claims (NHC) [1]. To date, no representative study has been conducted in Latvia to explore consumer knowledge of labelling. Retail store survey results are published periodically, however, the results do not provide sufficient clarity regarding consumer knowledge. Information shown on the label can be obtained in various ways – in Latvia, the most common sources are laboratory analyses, literature data and publicly available information from databases.

Objective. The aim of this study was to determine Latvian consumers' comprehension of food and nutrition labels.

Methods. An online survey of 103 participants was conducted. Participants from Institute's representative database were invited to participate in the survey. The overall response rate was 29%.

Results. More than a third of participants (39.4%) of which 65% are women, trust the information on food labels. 20% of the respondents do not trust the information provided on labelling, while 16.5% trust only the information provided by Latvian food producers.

27% of the respondents do not believe that the manufacturer indicates all the substances added to the product. More than a fifth of participants (21.2%) cannot read the list of ingredients due to small font size and 16.1% reported lack of understanding of terms, statements and values.

The most important food label components that consumers paid attention to while purchasing food were expiration date, ingredient list and manufacturer, while eco label and NHCs were ranked low.

40.3% of the participants reported that NHCs might be an efficient tool that helps to choose healthier products. However, 17.8% of the respondents revealed that NHCs do not influence their food choices.

Only 10.7% of the participants are aware that statements on the labels are defined by the regulation.

More than a half of the respondents believe that nutrition claims indicate that a product is more valuable than other equivalent products.

Conclusions. Food labels might be an efficient nutrition education tool. However, the study results showed that Latvian consumers have a limited knowledge about food labels and NHCs.

Keywords: nutrition labelling, food labelling, nutritional and health claims, consumer perception.

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P45 EVALUATION OF AMARANTH AS POTENTIAL RAW MATERIAL FOR VEGAN PRODUCTS

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Introduction. An increasing part of the contemporary society adheres to vegan lifestyle. In response to growing demand, the number of vegan products on the market is also increasing. A previous study of the supply of vegan products in Latvia showed that one of the main raw material used in the production of vegan products is soya (Glycine) [1]. It is necessary to look for other alternatives, products that would be nutrient-dense enough to expand the vegan product offer.

Objective. The aim of the study was to evaluate the composition of amaranth seeds cultivated in Latvia as a potential raw material for the development of new vegan products.

Methods. The composition of amaranth seeds was determined according to standard methods by analysing the content of protein, carbohydrates, saturated and unsaturated fatty acids, and squalene.

Results. Amaranth seeds cultivated in Latvia in the 2018 have carbohydrate content of 61.2%, where fructose is <1%, glucose – 1.5%, and sucrose – 1.1%, protein content of 15.8% and oil content of 7.7%. The composition of amaranth seeds obtained in the study is close to that indicated in the literature [2], despite different origins. By analysing the composition of unsaturated fatty acids, linoleic acid (41.8% of fat) and oleic acid (27.1% of fat) have the highest concentrations, while palmitic acid (20.1% of fat) has the highest concentration among saturated fatty acids. The fatty acid composition confirms the usefulness of amaranth seeds for oil production. It has also been proven that amaranth positively affects plasma lipids and its oil is a source of squalene [3], which was confirmed by the results of the study. The squalene value for 1 kg of amaranth grains grown in Latvia is 12961.00 mg.

Conclusions. Due to the nutrient composition, which is confirmed by the data of this study and literature analysis, amaranth seeds could be a good potential raw material for the development of new vegan products.

Keywords: amaranth seeds, nutritional value, raw material, vegan products.

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P46 BIOLOGICALLY ACTIVE COMPOUNDS OF BEE POLLEN FROM DIFFERENT REGIONS OF LATVIA

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Introduction. Bee pollen is rich in biologically active substances but its composition differs by plant origin and region of collection.

Objective. The aim of current research was to evaluate quality of bee pollen from different regions of Latvia.

Methods and materials. In total, 20 samples were obtained from four regions: Vidzeme (45%), Zemgale (35%), Kurzeme (10%), Latgale (10%) in the summer of 2019. Packaging materials of selected pollen samples were zip bags (50% of samples), polypropylene (PP) jars with lids (30%), glass jars with metallic lids (20%). The physicochemical parameters (moisture, water activity, pH) were determined and for evaluation of biological activity – total phenolic compounds (TPC) and antioxidant activity was tested. The moisture content of analysed pollen was from 3.81 to 12.14 %.

Results and conclusions. The guidelines for the primary production of beekeeping products in the Republic of Latvia state that the moisture content of dried pollen must be in the range from 7.00 to 8.00% and 47.5% meet the requirements, whereas 38.0% are drier, but 10% – wetter. For all the pollen samples analySed, the pH and water activity did not exceed the permitted limits – pH=4.0–7.0 and aw<0.400, thus reducing the risk of microbial contamination. TPC differed between samples ($p \leq 0.05$) and the highest TPC (743.36 mg GAE 100 g^{-1}) was found in sample collected in Zemgale (Vircava, Jelgava county), and also the sample with the lowest TPC was detected in Zemgale (Tērvete county). The results of cluster analysis show that all pollen samples can be divided into four clusters. Sample ZP14 (collected in Jelgava region, PP box) with a high TPC and antioxidant activity was isolated separately. Each of the other three clusters combines the samples from different regions and packaging materials, therefore no trend could be observed.

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