ABSTRACT BOOK

Oral Presentations

FRIDAY 9 SEPTEMBER

O01

A temporal examination of adult food insecurity amongst Canadian families managing food allergy

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Presenter: J. Protudjer

BACKGROUND. Since the start of the COVID-19 pandemic, food prices have increased substantially. Ongoing global concerns are further driving inflation, further reflected in food prices. It remains unknown how these increases are impacting the food allergy community, which already bears significant excess costs compared to families without food allergy. We aimed to understand the temporal pattern of food insecurity amongst Canadian families with food allergy from the year prior to the pandemic, through to present two years into the pandemic, and, to compare these findings with corresponding rates of food insecurity in the general Canadian population.
METHODS. Using data collected electronically from families reporting food allergy using a validated food security questionnaire, we estimated food insecurity, including categories of food insecurity (marginal, moderate, secure) in the year prior to the pandemic (2019; Wave 1), and the first (2020; Wave 2) and second years of the pandemic (2022; Wave 3). These results were compared with publically available rates of food insecurity among the general Canadian population.
RESULTS. Participants in all waves were commonly in 2+adult, 2 child households. Less than half of participants (e.g. Wave 1: 45.7%) reported household incomes below the median Canadian. Common allergies were milk, eggs, peanuts and tree nuts. In Wave 1, 22.9% of families reported food insecurity; corresponding numbers at Waves 2 and 3 were 30.6% and 74.4%, respectively, representing an overall increase of 225.6%, including notable increases in severe food insecurity. Food insecurity was more prevalent amongst those managing food allergy, compared to the general Canadian population.
CONCLUSION. Canadian families with pediatric food allergy report higher rates of food insecurity compared to families who do not manage food allergy, especially during the pandemic. Immediate and long-term interventions are essential to support families managing increased food costs for a condition that requires careful food choices to prevent a potentially severe allergic reaction.

O02

Diet diversity in pregnancy and risk of early allergic manifestation in the offspring; results from the Swedish NorthPop cohort

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Presenter: S. Bodén

BACKGROUND. Diet diversity, defined as the number of foods or food groups eaten over a given reference period may be linked to diversity of the gut microbiota, which based on dietary intake in infancy is associated with decreased allergy risk in childhood. Prenatal exposures like maternal diet in pregnancy may have both direct and indirect effect on infant gut microbiota composition, immune programming, and allergy risk in the offspring. We aim to investigate if increased diet diversity during pregnancy decreases the risk of early allergic manifestations in the offspring.
METHODS. A diet diversity score (DD-score) based on current dietary guidelines to pregnant women in Sweden was calculated from a food frequency questionnaire (FFQ) at pregnancy week 35 within the large population-based birth cohort NorthPop (www.northpop.se) (Table 1). Every pregnant woman that reported eating a certain food at least 1-3 times/week got 1 point. For consumption of milk, ≥2dl/day gave 1 point and fibre rich bread ranked as the number 1 or 2 most consumed bread was the chosen cutoff. If reported intake was less than this or none (for meat intake also more than 4-6 times/week), 0 point was applied. The main outcomes were parentally reported cumulative incidence of eczema, infant wheeze, and physician diagnosed asthma and food allergy by the age of 18 months. At that age, blood samples are analyzed for screening of IgE sensitization against food and inhalant allergens and Immunocap (data to be available in July 2022). We estimated multivariable odds ratios (ORs) and 95% CI between DD-score and early allergic manifestations, adjusted for maternal history of asthma and allergy, maternal education level, breast feeding duration, gestational omega-3 fatty acid and probiotic supplementation, infant vitamin D and probiotic supplementation, and solid food introduction at 9 months.
RESULTS. The DD-score included 40 foods (Table 1) and ranged from 1 to 35 in 5744 pregnant women. In relation to early allergic manifestations there were no statistically significant associations ($p \leq 0.05$) with diet diversity in pregnancy. There was indication of association between higher DD-score and decreased risk of wheeze (OR 0.98, 95% CI 0.96-0.99) and food allergy (OR 0.97, 98% CI 0.95-1.00) but after further adjustment the statistical significance was lost (Fig 1).
CONCLUSION. Maternal history of allergy was as expected shown to contribute most to the risk of early allergic manifestations in the multivariable models, while the association to diet diversity in pregnancy was weak.

O03

Concepts about nutrition and its role on allergic diseases vary among physicians, nutritionists and researchers in postgraduate students in Mexico

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Presenter: M. Rodríguez-González

BACKGROUND. As part of continuous medical education programs, a group of professionals who completed a 5-month postgraduate course on “Nutrition and its Interaction with the Immune System”, offered by the National Institute of Nutrition (INCMNSZ) and sponsored by the School of Chemistry at the National University (UNAM), were requested to answer an on-line survey containing clinical and conceptual questions about nutrition and its effect on allergic and inflammatory disease.
METHODS. The respondents (N=50) included physicians, nutritionists and researchers from different institutions, schools and specialties, who were asked about their knowledge and current concepts of nutrition and their effect upon allergic and inflammatory diseases.
RESULTS. We looked for answers to questions concerning several aspects by which nutrition and feeding may have an effect on allergy and inflammation, including the role of the exclusion diets on the pregnant/breastfeeding mothers, allergen-free diets for atopic children, the extent to which diet and nutrition actually impact on development and progression of allergic, inflammatory and infectious diseases, the immunomodulatory role of microbiome, and the impact of obesity and its role in allergic diseases among others. All questionnaires were grouped by specialty and analyzed with the Chi-square tests. Throughout this survey we detected knowledge-gaps especially in the field of the role of allergen free-diets as a preventive measure for the pregnant/breastfeeding mother (where 20-30% of the respondents were in favor) and allergen free-diets as a preventive measure among weaning recommendations for infants (where 25% of the respondents were in favor).
CONCLUSION. It has become clear that there is a window of opportunity to develop food tolerance instead of food allergy, once exposed to a certain food. As such, early introduction to causative food items seems an important preventive measure. There are still some disparities among physicians and nutritionists that impact the everyday clinical decisions and although there are high quality and evidence-based national and international guidelines on these subjects, real world data matters and should be taken into account for nation-wide surveys and to re-direct educational strategies.

O04

Inhibition of stearoyl-CoA desaturase (SCD)-1 on blood monocytes as a proposed mechanism by which high doses of omega-3 fatty acids may be beneficial for allergic inflammation

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Presenter: M. Rodríguez-González

BACKGROUND. Although there is limited evidence and non-significant outcomes to support omega-3 polyunsaturated fatty acids (w-3 FA) during childhood as a preventive measure to reduce the risk of allergic disease, a positive trend for prevention of wheezing/asthma and allergic rhinitis has been observed. Their role for the treatment of allergic disease is still a matter of research as well as the proposed mechanisms to modulate the allergic inflammation. The study of stearoyl-CoA desaturase (SCD)-1 in either clinical and experimental models has demonstrated

that it is essential to overcome type 2 inflammation and its inhibition leads to airway hyper-responsiveness. A high SCD-1 activity has also been related to obesity, cancer and inflammation.
METHODS. In this study, we supplemented a group of obese women with a high dose of w-FA (4.8 g/day, consisting of 3.2 g of EPA and 1.6 g of DHA), for 3 months and determined its effect on SCD-1 activity and transcription and compared it to a supplemented control (healthy) group. The activity of SCD-1 was determined indirectly by the "desaturation index" which was calculated as the ratio of serum monounsaturated fatty acids to their saturated counterparts (16:1/16:0 and 18:1/18:0), whereas the level of transcription (mRNA) of SCD1 was determined by real-time PCR from total RNA obtained from blood monocytes.
RESULTS. At the time of recruitment, obese participants had higher serum triglycerides, as well as higher SCD-1 activity and mRNA expression compared to the control group. Supplementation with 4.8g/day of w-3 FA resulted in significant reduction in blood triglycerides in both groups, this reduction was more marked and have more clinical significance for the obese group. SCD1 activity (desaturation index) and transcription (mRNA levels) were also reduced after supplementation with w-3 FA. It is noteworthy that we were able to detect a reduction in SCD-1 transcription in blood monocytes, since the main organ for the inhibitory effect of w-3FA on SCD-1, is the liver.
CONCLUSION. Taken together these data show that w-3 FA supplementation had differential effects on SCD1 in obesity: first, the reduction in serum triglycerides and desaturation index indicate an inhibitory effect of w-3 FA on SCD-1 activity at the liver, and second, that w-3 FA suppress SCD1 transcription at one of the initiation points of the inflammatory response, the monocyte.

O05

Dietary oligosaccharide 2'FL increases SCFA levels and lowers mucosal mast cell activation in ovalbumin allergic mice

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Presenter: M. Zuurveld

BACKGROUND. Early life has been identified as a window of opportunity for interventions preventing the development of food allergic diseases. 0,5-2% of infants are allergic to hen's egg protein, of which ovalbumin (OVA) is a major allergen. Due to the known immunomodulatory effects of human milk oligosaccharides (HMOS), these prebiotic structures may potentially contribute to prevent allergic sensitization. In this study, we investigated two common fucosylated HMOS, 2'-fucosyllactose (2'FL) and 3-fucosyllactose (3FL), in a murine model for OVA induced hen's egg allergy.
METHODS. Female 3-4 weeks old C3H/HeOuJ mice were fed an AIN93G diet with or without 0,1% or 0,5% 2'FL or 3FL for two weeks prior to and during OVA sensitization and challenge. The ovalbumin induced acute allergic skin response and shock scores were determined as major allergic symptoms. After sacrifice, antibody and mucosal mast cell protease-1 (mMCP-1) levels were determined in serum. Mesenteric lymph nodes (MLN) were collected for flow cytometric analysis. Cecum content was stored to determine short chain fatty acid (SCFA) concentrations.
RESULTS. Mice receiving the 0,1% 2'FL diet had lower levels of OVA-IgG1 and -IgG2a in serum as compared to allergic control mice. Mice fed the 0,5% 2'FL diet had lower mMCP-1 serum levels, but systemic shock symptoms remained unaffected in the intervention groups compared to the allergic control mice. Total SCFA levels were significantly increased in the

allergic mice fed 0,5% 2'FL, and propionic acid was enhanced in mice fed 0,5% 2'FL or 0,5% 3FL diet compared to control diet. The 0,5% 3FL diet significantly lowered the %Th2 cells (T1ST2+ in CD4+) and activated Th2 cells (T1ST2 in CD69+CD4+), while enhancing the %Treg cells (Foxp3+CD25+ in CD4+) compared to control diet. However, mice receiving either 3FL diets had a higher frequency of CD40L+ Th2 cells, which is an indicator for allergen-specific Th2 cells and known to contribute to B cell activation. In addition, OVA-sensitized mice receiving 0,5% 2'FL or either 3FL diets had an enhanced proportion of CD40L+ Th cells compared to control diet fed allergic mice.
CONCLUSION. Dietary supplementation with 2'FL or 3FL did not alleviate clinical allergic symptoms. However, mice receiving the 0,1% 2'FL diet had lower OVA specific immunoglobulin levels. Furthermore, the 0,5% 2'FL diet prevented mucosal mast cell degranulation in association with increased intestinal SCFA levels suggesting local intestinal allergy protective effects.

O06

Akkermansia muciniphila modulates food allergy sensitization in a diet-dependent manner

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Presenter: M. Boudaud

BACKGROUND. Alterations in the gut microbiome, including diet-driven changes, are commonly linked to the rising prevalence of food allergy, yet little is known about mechanisms of how gut bacteria are invovled in the breakdown of oral tolerance. Our previous work identified that depriving mice of dietary fiber leads to a microbiota-driven mucus barrier erosion. Here, we hypothesized that the mucus barrier disruption driven by microbiota metabolism contributes to the breakdown of oral tolerance, thereby leading to exacerbated allergic sensitization.
METHODS. Specific-pathogen-free (SPF) and gnotobiotic mice with functionally characterized synthetic human gut microbial communities were fed a fiber-deprived diet. Broad immunophenotyping was performed by using time-of-flight mass cytometry, alongside ELISA-based assays. IgE-coating of commensal bacteria was evaluated by flow cytometry.
RESULTS. Depriving mice of dietary fiber led to the microbiota-mediated colonic mucus barrier disruption, a surge in IgE-coated commensals and an increase in the colonic type 2 immune cells in non-sensitized mice. Consistently, fiber deprivation exacerbated anaphylaxis symptoms upon sensitization and challenge with ovalbumin or peanut in both SPF and gnotobiotic models. By removing Akkermansia muciniphila from the synthetic gut microbiota, fiber-deprived mice displayed decreased severity upon challenge, with reduced accumulation of TH2 cells, Gata3+ regulatory T cells, CD8+Gata3+ T cells, ILC2, M2 macrophages and eosinophils in the colon, as well as reduced IgE-coating of commensals.
CONCLUSION. These results support a role for a commensal mucin-degrading gut bacterium and the microbiota-mediated mucus barrier disruption in the sensitization to food allergens. Our study highlights a mechanistic link between diet and the gut microbiome in food allergy, which has important therapeutic implications.

O07

Key Themes and Communication Strategies for Closing Educational Gaps in Early Food Allergen Introduction

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Presenter: WS. Swanson

BACKGROUND. Food allergen (FA) introduction guidance has evolved substantially over the last two decades, reversing caution to supporting early introduction of multiple FAs. Education for parents and healthcare providers (HCPs) around evolving guidelines remains a challenge.
METHODS. We report on 5 years of learnings in identifying educational gaps, communication strategies, and themes that resonate around FA introduction and will share educational assets developed to help parents, pediatricians, and nutritionists advance their expertise in early allergy feeding science and strategies. Various communication strategies have been employed, including direct-to-HCP emails, continuing medical education (CME) presentations/webinars, an online allergen introduction quiz, and digital/print media circulating across the United States (US) with varying levels of success and resonance.
RESULTS. We've had the opportunity to educate 5000+ clinicians and pediatric clinic staff and 23,000+ parents over 5 years. For HCPs, highest engagement was seen when providing tools like dot phrases for early allergen introduction, a parent guide for introducing solids, a physician tool for implementing new guidelines, and highlights from recently published research. CMEs/webinars yield successful engagement with pediatricians/dieticians, reaching audiences in the thousands on topics such as key takeaways from USDA infant feeding, dietary guidelines and a how-to implementation in clinical practice. We inventoried the most common questions from parents including, "Do I need to introduce new foods one at a time?" and "What can I eat during pregnancy to reduce my baby's risk?" We saw successful engagement with an online allergen introduction quiz that provides a personalized feeding plan based on replies to their baby's FA risk factors and comfort level introducing single or multiple allergens. 1300+ parents have completed the quiz and responded with 44% reporting "cautious but confident" introduction, 34% "confident and free" and 22% reporting "very cautious."
CONCLUSION. With feeding guidelines evolving, parents and HCPs continue to require education with the unfolding recommendations. We find success and interest with tools and resources that support the application of guidelines for families in clinics and facilitate HCP/parent discussions. Learnings from our US educational experience can inform future communication and strategies for HCP, parent, and nutritionist education on early introduction of FA elsewhere in the world.

Lunch & Poster discussion Session - Poster Walk 1

SATURDAY 10 SEPTEMBER

P01

Translation and Adaptation of Food Allergy Quality of Life Questionnaire - Child Form into Czech Language

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Presenter: V. Spáčilová

BACKGROUND. The burden of food allergies (FA) is both physical and psychological, being a cause of higher anxiety and stress. These psychological issues together with lower quality of life (specifically health-related quality of life; HRQL) are not only described in allergic patients but also in their caregivers. As a part of a large, multicentric project Europrevall, there were several questionnaires focused on HRQL in FA developed and validated – child, teen, parent and adult form. The child form of the original questionnaire has already been translated into many languages and the aim of this work was to translate and adapt the questionnaire for Czech population.
METHODS. In this research, we used the disease-specific questionnaire originally created by Flokstra-De Blok et al. The WHO guideline for translation and validation of tools was used. This process consists of 5 steps: forward translation, expert panel, back-translation, pretesting and cognitive interviewing, and final version. The main researcher, dietitian with experience with research in FA, translated the original English questionnaire into Czech and the first version was discussed with the expert panel consisting of researchers with experience in FA research, questionnaires development and research in pediatric population. This process was followed by back-translation, comparing of the versions of questionnaire and implementation of comments and changes.
RESULTS. As a result of the process mentioned in methods the Czech version of Food Allergy Quality of Life Questionnaire – child form was created and is ready to be validated for usage in further research. During the expert panel meeting, the research team focused on cultural and geographical applicability of the questionnaire which the team found appropriate. The team also focused on specific requirements of the Czech language and reword some of the sentences and emphasized the importance of appropriate language for paediatric population.
CONCLUSION. There is a higher need of research focusing on FA and quality of life of allergic patients in the Czech Republic. This process of translation and validation of child form questionnaire is a first part of more complex research aiming to describe the well-being of allergic paediatric patients and their caregivers in the Czech Republic. Research relating to this abstract was funded by the Grant Agency of Masaryk University, grant No. MUNI/A/1402/2021.

P02

Kiss- induced anaphylaxis by amoxicillin

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Presenter: I. Vázquez Barrera

BACKGROUND. Oral, intramuscular or intravenous are the principal routes for drug allergens to trigger allergic reactions. In some patients, severe symptoms may develop upon skin contact or inhalation.
METHODS. A 54-year-old man immediately after having fried eggs and melon for dinner developed facial erythema and palmo-plantar pruritus, facial edema, dyspnea, desaturation, dizziness and hypotension (90/74mmHg). He was attended in Emergency Room (ER) and treated with methylprednisolone, epinephrine and dexclorfeniramine. One week later, five minutes after taking amoxicillin, he presented palms pruritus, generalized erythema, dizziness and syncope with anal sphincter relaxation. He was treated in ER with epinephrine, methylprednisolone and dexclorfeniramine. Serum tryptase was 32.3 mcg/L and 19.5 mcg/L at 2 hours after symptoms

onset in the first and second episodes respectively. He was diagnosed of two episodes of anaphylactic shock. An allergological study was carried out to determine the culprit allergen.
RESULTS. Basal Tryptase: 5.77 mcg/L, total IgE: 64.0 KU/L, specific IgE to penicilloyl G, penicilloyl V, ampicillin: negative. Specific IgE to amoxicillin: 3.92 KU/L (>0,35 KU/l). Intradermal skin test was positive to penicillin G. Allergy to food was ruled out. Specific IgE, skin prick test and oral provocation test to melon, egg yolk and white were negative. To clarify the culprit allergen of the first episode, a new anamnesis was made. He reported that his wife was taking amoxicillin at that moment. He manipulated the tablet for her, ate the melon and kissed his wife, right after he developed the anaphylactic shock.
CONCLUSION. The final diagnosis was amoxicillin-induced anaphylactic shock. The presence of tiny particles of amoxicillin on the kisser's lips was sufficient to trigger an anaphylactic reaction. Indirect contacts might go unnoticed, but must be taken into account because they could trigger a systemic reaction in patients previously sensitized to drugs or food.

P03

Synbio-Breast study protocol

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Presenter: S. Simons

BACKGROUND. Human milk oligosaccharides (HMOs) (prebiotics) and microbiota (potential probiotics) in breast milk are of particular interest for allergy prevention, based on their influence on the gut microbiome and immunomodulatory properties. Although it is known that maternal diet influences the composition of breast milk, little is known how diet modulates the amount and types of HMOs or microbiota in breast milk. We hypothesized that the synbiotic composition of the maternal diet is reflected in the synbiotic composition of breast milk. The aims of this study are to study the relationship between the maternal diet and: the amount and types of HMOs and the microbial content in breast milk; the microbiota composition of stool and saliva of mother and infant. The primary outcome is the amount of lactobacillae in breast milk
METHODS. A study protocol for was developed. The Synbio-breast study (figure 1) is a cross-sectional study in which 65 atopic and 10 non-atopic (controls) pregnant mothers are included as determined by power analysis. The women are included under strict inclusion criteria (e.g. vaginal birth, no use of probiotics or antibiotics and no formula milk fed). Three days and four weeks post partum breast milk samples as well as stool and saliva samples of mother and infant are collected. A three-day food diary from the women is collected at four weeks post partum, to estimate the food-derived microbial content. Also 15 mothers collect duplicate food 2x 24 hours, to validate the estimation of food-derived microbial content. Statistics Multivariate regression analysis will be used to search for relationships between synbiotic components in the maternal diet and synbiotic components in the breast milk.
RESULTS. So far 50/75 women have been included since January 2020. 66% of the women who gave informed consent dropped out of the study due to our strict in- and exclusion criteria. Data analysis has not yet been performed.
CONCLUSION. Although results are still lacking, the study design is promising to generate insight into the relationship between the synbiotic composition of the maternal diet and the synbiotic composition of breast milk.

P04

Food for thought: Proposed food choices to support immune health in allergic disease

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Presenter: O. Benjamin

BACKGROUND. The role of a healthy diet to support immune function as adjuvant therapy in the treatment of allergic disease, alongside elimination of foods, has not been adequately explored. Aim: To develop proposal for an “immune supportive diet” as adjuvant treatment of allergic diseases.
METHODS. According to available literature on nutrition related to immune function and allergic disease dietary patterns and foods were selected as beneficial for the immune function based on the following set of criteria: 1. Dietary patterns consisting of fresh, whole and minimally processed foods, in age appropriate amounts; 2. Dietary patters with ample plant-based foods rich in dietary fiber and anti-inflammatory properties such as flavonoids; 3. Dietary patterns with a high food diversity between and within all food groups; 4. Fermented foods and foods naturally rich in food microbes; 5. Foods rich in omega 3 fatty acids and limited use of omega 6 rich foods; 6. Foods which are beneficial for the gut microbiome and the gut barrier function such as foods rich in vitamin A, zinc and iron; Subsequently foods were allocated into 3 food groups: a. Recommended in large amounts: with an acknowledged beneficial role in immune health; b. Recommended in limited amounts: with an acknowledged beneficial role in immune health when used in limited amounts. c. Not recommended: with an acknowledged unfavorable role in immune health
RESULTS. Foods were selected and allocated into 3 food groups as follows: Recommended in large amounts: fruits, raw and cooked vegetables, whole grains, legumes, fatty fish, omega-3 rich oil, olive oil, fermented vegetables, herbs and spices, tea: all fresh or home cooked; Recommended in limited amounts: dairy preferably fermented such as yoghurt, cheese, hard cheese from raw (unpasteurized) milk, butter: preferably from grass-fed animals; eggs, poultry and lean meat: preferably free range; nuts and seeds, coffee, ready-meals and foods based on natural ingredients; Not recommended: fatty meat (products), margarine, refined grains, added sugar, ultra-processed foods, such as sweets, biscuits, savoury snacks, fast food, candy, soda’s, ready-meals.
CONCLUSION. The efficacy of the application of this dietary advice in the treatment of allergic disease remains to be established. This proposed “immune-supportive diet” will be applied in the DIAMETER study. (Abstract M. Yang)

P06

Dietary variety and parental self-efficacy in food allergic children

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Presenter: I. Adomaite

BACKGROUND. Dietary variety is considered a marker of dietary quality, which is especially important in children with food restrictions such as food allergies. Parental confidence in managing their children's food allergies is related to a better quality of life for the parent. It is currently unknown how parental self-efficacy can affect dietary variety in food allergic children. Therefore, this study aimed to analyse the relationship between the dietary variety of food allergic children and the parental self-efficacy in managing their child's food allergy.
METHODS. Parents of children with milk and egg allergies were asked to fill out a 3-day estimated food record. The 22 food subgroup measure was used to examine the dietary variety of the children. A single point was given for an intake of at least a half serving of each food subgroup over the three days. Language validated Food Allergy Self-Efficacy Scale for Parents (FASE-P) was used to assess parental confidence in managing their child's food allergy. The food variety sum and mean parental confidence scores, as well as the number of food allergies, were compared using Spearman's correlation test.
RESULTS. The data of thirty-three food allergic children aged 1 to 11 years (median 1 year) were analysed. The mean FASE-P score was 78.0 (standard deviation (SD) = 10.6), the mean food variety sum was 9.1 (SD = 1.7), and the mean count of food allergies was 2.4 (SD = 1.8) in the analysed children. A statistically significant correlation was found between parental confidence and the dietary variety of food allergic children ($\rho = 0.488$, $p < 0.01$); however, interestingly, no correlation between parental confidence and the number of food allergens the child was allergic to was found ($\rho = -0.325$, $p > 0.05$).
CONCLUSION. Parental self-efficacy and dietary variety of food allergic children seem to be related; further studies are needed to examine whether there is a causality between these two elements.

P07

Identikit of FDEIA patients: a single-center experience in Northern Italy

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Presenter: E. Saracco

BACKGROUND. Food- depended exercise-induced anaphylaxis (FDEIA) is a particular and potentially life-threatening type of food allergy in which anaphylaxis occurs exclusively in association with physical exercise. Management of FDEIA includes the avoidance of any identifiable culprit foods at least 4 hours before and 1 hour after exercise, and the removal of the cofactors.
METHODS. This retrospective study was performed collecting data of FDEIA patients followed up at the Allergy and Clinical Immunology University Clinic in Turin between 2016 and 2019. Patients included in the study were adult subjects (> 18 years old) with a diagnosis of Food-

dependent exercise-induced anaphylaxis. Exclusion criteria were gastrointestinal comorbidities (e.g IBD or celiac disease) and the systemic use of corticosteroids. We collected data about age, sex and body mass index (BMI). Patients were also classified as vegan (not consuming any animal derived products), vegetarian (not consuming any meat or fish) and omnivorous (eating all kind of foods). Furthermore, we took into account how many different types of food the patients avoided.
RESULTS. We included in the study twenty-two FDEIA patients: 8 males and 14 females. Mean age was 37.9 years (range 19-62). According to BMI classification, 1 (4.5%) patient was underweight (BMI <18.5), 19 (86.3%) patients were in the normal BMI range and 2 (9%) patients were overweight (> or =25). All 22 (100%) subjects were omnivores. The mean number of foods excluded from the diet was 6 (range 0-16). The foods more frequently avoided were nuts, excluded by 18 (81.8%), fruits by 17 (77.2%) and vegetables by 14 (63.6%) patients. On the flip side we found avoidance of cereals (e.g wheats) and legumes in only 4 (18.1%) subjects respectively, and shellfish in 2 (9%).
CONCLUSION. Food allergy may be a slippery slope that can lead to eating misbehavior resulting in malnutrition, obesity or excessive food avoidance with macro e micro nutrient deficiency. This preliminary retrospective study aimed to portray our cohort of FDEIA patients, to underline some possible issues in their dietary management. Although we did not find any significant alteration in BMI value nor any rigid dietary restraint, it must be considered that this study has some limitations: the limited number of patients, the lack of medical attention in the complex field of nutrition, and thus the limited access to anamnestic and clinical data. Moreover we did not search for any nutritional status deficiency, which could be expected in those type of patients. In summary more effort in the anamnesis should be done, to having a better understanding of the complex balance between food allergy and nutrition, with the purpose of tailoring a correct individual dietary plan for each patient.

Lunch & Poster discussion Session - Poster Walk 2

SATURDAY 10 SEPTEMBER

P08

Significant changes in microbiome composition relate to the clinical phenotype in peanut allergic children

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Presenter: R. Czolk

BACKGROUND. The increasing prevalence of food allergy has been linked to alterations in the human gut microbiome. So far, no specific microbiome signature has been associated with clinical food allergy. One of the reasons for this could be that the microbial shifts correlate with clinical subtypes and individual food allergens. In order to understand better patterns of bacterial dysbiosis for this clinical entity, we assessed the role of the gut microbiome in peanut allergy.

METHODS. Genomic DNA from snap-frozen stool samples collected from peanut-allergic children (n=16, mean age 6.3 years) and healthy children (n=10, mean age 5 years) was extracted, purified and subsequently used for metagenomic library preparation. The libraries were subjected to 2 x 150 bp read Illumina shotgun sequencing. Raw data were assembled using the Integrated Meta-omics Pipeline (IMP) and microbiome composition was subsequently analysed using the vegan, DESeq2 and Maaslin2 packages in R. Allergic participants filled a food diary 24hrs before stool sampling.
RESULTS. The peanut-allergic children had a clinical history of peanut-induced symptoms, positive skin tests (mean wheal diameter 15.6 mm) and specific IgE to peanut (mean sIgE 68.1 kUA/L). Age-matched controls had no history of any allergic disease. Food diaries showed high sugar (mean 102.8g, 47.7-212g) and low fiber (mean 10.1g, 4.5-14.6g) consumption. The alpha diversity (Shannon and Chao1), was significantly reduced in peanut-allergic children as compared to healthy controls (P=0.009 and P = 2.35e-07 respectively). On a phylum level, allergic childrens' microbiomes contained significantly more bacteria of the phylum Firmicutes and less of Bacteriodetes. Relative abundance analysis revealed multiple strains to be over- or underrepresented in allergic children. Notably, A. baldanorium and B. spizizenii were completely absent in all allergic participants but found in controls. Reversely, Actinomyces oris, which is associated with opportunistic infections mainly in the oral cavity, was significantly different (P=0.002), and found to be higher in the allergic group.
CONCLUSION. Our study revealed that the alpha diversity and composition of the gut microbiome differed between peanut-allergic children and healthy controls, illustrating hitherto unknown patterns of dysbiosis. These peanut-specific alterations may be new targets for modulation of type-2 immunity via the human gut microbiome, as a newly emerging area of intervention.

P09

Effect of an immune-supportive diet on gut permeability and allergic symptoms in children with peanut and/or nut allergy: a study protocol

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Presenter: M. Yang

BACKGROUND. A selection of patients with peanut and/or nut allergy have very low threshold levels for peanuts and/or nuts, while others only react to higher doses. The reasons for these differences in threshold are not well understood. A disturbed gut microbiota composition and an increased gut permeability has been proposed as possible explanation. We hypothesized that increased gut permeability is related to low threshold levels for peanuts or nuts. In addition, as it is known that nutrition can influence gut permeability, we also hypothesized that a healthful “immune-supportive diet” restores gut permeability and alleviates symptoms. To test this hypothesis, we developed a study protocol to analyze: 1. The effect of an immune-supportive diet on gut permeability (primary outcome), microbiota composition, coexisting allergic symptoms and quality of life. 2. The relationship between gut permeability, microbiota composition and threshold levels for peanut or nuts.

METHODS. We developed a study protocol for a multi-center randomized controlled intervention trial (RCT) with an immune-supportive diet (figure 1). In addition, we developed an "immune supportive diet". For the "immune-supportive diet" foods were selected with an acknowledged beneficial effect on immune function, as further elucidated in the abstract by O. Benjamin et al.
RESULTS. Based on a power analysis one hundred ten children between 4 and 12 years with proven peanut or nut allergy, established by a routine oral peanut or nut challenge, and 22 healthy controls will be included in the RCT. The intervention group will receive standard care and, in addition instructions on the maintenance of a healthy and individually tailored "immune-supportive diet" during 4 months. This "diet" is supported by sample menus meeting age appropriate recommended daily allowances, recipes and product information by an allergy-specialist dietician. At baseline and after 4 months, gut permeability will be measured by sugar absorption test (Raffinose/Mannitol ratio), allergic symptom severity and quality of life will be scored. Nutrition intake will be recorded by the patients using online 24-hour recalls. Stool samples will be collected for gut microbiota analyses by 16S sequencing.
CONCLUSION. The efficacy of an "immune-supportive diet" on gut permeability, gut microbiome, allergic symptoms and QOl in allergic disease is promising, but has not yet been established, awaiting the results of this RCT.

P10

Immunomodulatory effects of microbial metabolites on G protein-coupled receptors in immune cells in allergy and asthma

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Presenter: B. Forde

BACKGROUND. It is now appreciated that microbiota composition and metabolism associate with risk of a wide variety of immune-mediated disorders, including allergy and asthma. However, the mechanisms by which these microbes interact with the human immune system are still poorly understood.
METHODS. We've developed a database of microbial enzymes that generate GPCR agonists or antagonists. This collection of genes was used to query publicly available metagenomic libraries from the human gut, lungs and skin. Metabolites of interest were tested for effects on NF-kB and the interferon regulatory factor (IRF) pathway using THP-1 cells.
RESULTS. Of the 50 GPCR ligands examined, genes encoding the microbial enzymes required to generate these metabolites was found for 30 GPCR ligands in gut (n=1,377 people), lung (n=122 people) and skin (n=283 people) metagenomic libraries. Genes encoding 19 of the remaining 20 GPCR ligands was expressed at one body site only but not globally. A subset of these genes was differentially expressed in BALs from patients with asthma, or within the skin microbes associated with atopic dermatitis. Many of these metabolites impacted NF-kB and IRF pathway signalling following stimulation with LPS or cGAMP respectively.
CONCLUSION. Approximately 60% of the microbial GPCR-binding metabolites examined in this study can be expressed at all mucosal sites, suggesting non-redundant effects on the immune system. These metabolites are immunomodulatory and they change in association with inflammatory disorders. We will further examine the therapeutic potential for these metabolites in murine allergy models.

P11

Immunoregulatory Effects of Tryptophan Metabolites Generated by Microbial Metabolism in Allergy and Asthma

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Presenter: L. Yao

BACKGROUND. Microbial metabolism of dietary tryptophan generates a wide range of metabolites that could potentially impact host mucosal immune responses, in particular via the aryl hydrocarbon receptor (AHR). While AhR has been shown to be important for Th17 and epithelial barrier responses, it's importance for allergy and asthma has been poorly studied so far.
METHODS. Following CD4+ T cell sorting from peripheral blood mononuclear cells (PBMC) and cord blood cells (CBC), we incubated lymphocytes with the corresponding cytokines and antibodies to promote differentiation into Th1, Th2, Th17 or Treg cells. Tryptophan metabolites were included at the beginning or the end of the incubation. Cell polarization was examined by flow cytometry and ELISAs.
RESULTS. We have firstly determined the impact on Th17-polarizing conditions (stimulated with CD3/CD28, TGFβ, IL-23, IL-1β, IL-6, anti-IFNγ and anti-IL4 antibodies for 6 days). Many of microbial-derived tryptophan metabolites tested, including indole-3-propionic acid (IPA, 1mM) and indole-3-acetic acid (IAA, 1mM) significantly inhibited IL-17A and IL-22 secretion and Th17 differentiation.
CONCLUSION. These initial experiments demonstrate that microbial metabolism of tryptophan can influence immune polarization. Further experiments will identify those metabolites that are critically involved in mucosal responses in those with allergy and asthma.

P12

Maternal gut microbiome composition and diet modulate early life immune responses

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Presenter: E. Grant

BACKGROUND. In early life, the neonatal intestine becomes colonized with microbes alongside the maturation of the gut mucosal barrier and immune system. This critical period can have important consequences for immune priming and long-term health outcomes.
METHODS. We sought to understand the influence of dietary fiber intake on this dynamic process using a gnotobiotic mouse model colonized with a synthetic human microbiome (SM). Since dietary fiber is known to exert a powerful impact on the microbiome and immune function, we bred mice with the full SM community (14SM) on a fiber-rich (FR) or fiber-free (FF) diet. To assess the role of discrete changes in the microbiome on immune development, we additionally colonized and bred mice without A. muciniphila (13SM) on the FR diet.
RESULTS. Pups of FR-fed dams exhibited an initial expansion of Akkermansia muciniphila, a health-associated commensal with both milk oligosaccharide and mucin-degrading capacities.

Unexpectedly, A. muciniphila did not proliferate in the colons of mice born to FF-fed dams until after weaning, when the pups switch from maternal milk to the solid food diet, at which point mucin-degrading bacteria rapidly expanded to comprise the majority of the community. Prior to weaning, FF-fed mice exhibited enrichment of transcripts corresponding to pathways for defense response against external antigens as well as altered profiles for cytokines involved in barrier-maintenance. Using flow cytometry, we found that pups of FF-fed dams also exhibited elevated levels of CD8+ T cells and group 3 innate lymphoid cells. The presence or absence of A. muciniphila did not affect the colonic transcriptome on a pathway level, however its absence was inversely related to the proportions of RORgt+ T cells.
CONCLUSION. These results underscore the powerful influence of maternal dietary fiber intake in the postnatal establishment of mucolytic communities and the maturation of the intestinal mucosal barrier.

P13

Improvement of allergic symptoms by targeted micronutrition with holoBLG in cat allergic patients - a pilot study in the allergen exposure chamber

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Presenter: J. Raab

BACKGROUND. Immune cells of atopic patients can be affected by nutritional deficiencies. Clinical studies have shown that targeted micronutrition using the bovine whey protein beta-lactoglobulin (BLG) loaded with micronutrients (holoBLG) and provided as a food for special medical purpose (FSMP) in the form of a lozenge significantly improves the symptoms of pollen and house dust mite (HDM) allergic patients. BLG transports its ligands (e.g. iron) specifically to immune cells and nourishes them with micronutrients which leads to immune resilience. To investigate the allergen-nonspecific effect, cat allergic patients were supplemented with holoBLG for 3 months and allergic symptoms were evaluated in a controlled setting using an allergen exposure chamber (AEC).
METHODS. Before (baseline) and after (final) a 3-month intervention phase (2x holoBLG/d), patients with clinically relevant cat allergy were exposed to cat allergen for 120 min in an AEC under standardised conditions. The nasal, conjunctival, bronchial and pruritus symptoms triggered in the AEC were assessed by the patients every 10 min and added up to the total symptom score (TSS). Peak Nasal Inspiratory Flow (PNIF) was measured every 30 min. The primary endpoint was the individual change in TSS at the end of the final exposure compared to baseline. Secondary endpoints included the development of PNIF and the occurrence of late reactions as a result of AEC up to 24 h after exposure.
RESULTS. 35 patients (mean age: 40 years) completed the study. Compared to baseline, holoBLG supplementation showed a significant improvement in median TSS of -50% ($p<0.001$), and median PNIF of 17% ($p=0.0016$) at 120 min. While 20% of the patients reported a late

reaction after baseline exposure in the AEC, this was described by 0% of the patients after the final exposure.
CONCLUSION. Besides pollen and HDM allergic patients, also patients with cat allergy benefit from targeted micronutrition with holoBLG. This supports the allergen-independent effect of the underlying mode of action. The establishment of immune resilience in atopic immune cells through the targeted compensation of a nutritional deficiency could be an important element in the fight against atopy.

Lunch & Poster discussion Session - Poster Walk 3

SATURDAY 10 SEPTEMBER

P15

Role of atopy patch test, skin prick test and sIgE in diagnosing food allergy in toddlers

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Presenter: S. Abraityte

BACKGROUND. Food allergy can be either immunoglobulin E (IgE) or non-IgE mediated. Food allergy is more common in pediatric patients and varies in different age categories. Food could be the first allergen that a child have huge probability to be sensitised to. Atopy patch test (APT), skin prick test (SPT) and specific imunoglobulin E (sIgE) are routine tests performed in our outpatient clinic to diagnose most of food allergens in toddlers. Aim: To identify any food allergen with the help of various allergy tests.
METHODS. Our study included 163 4 months - 4 years old toddlers, who had in suspicion clinical symptoms of food allergy. Retrospective analysis of outpatient personal disease records from 2017 to 2021 was performed.
RESULTS. In our study: 74 (45,4%) boys and 89 (54,6%) girls were enrolled. APT was performed for all the toddlers and it was positive for 78,6%. SPT was performed for 24% of toddlers and was positive for 10%. SIgE was performed for 77% of toddlers and was positive 23% (table 1). Though, APT was negative for 35(21,4%) toddlers, three of them had positive SPT, other three had positive sIgE and one patient had positive SPT and IgE. According to our study data, the most common food allergens found in APT were grains (wheat, buckwheat, barely, rye, oats), peanuts, carrot, chicken, egg yolk and cacao (table 2). But strong reactions to food allergens diagnosed with APT were seen with peanuts, hazelnuts and wheat. We analised patients allergy history: 23% patients were breastfead (Figure 1), only a few of them had pets at home (cats, and dogs) (table 3), positive family history was for almost half of toddlers (table 4).
CONCLUSION. Our study showed that APT, SPT ir sIgE are reliable diagnostic tests for food allergies. Combination of case history, clinical examination, sIgE, SPT and APT helps to understand and diagnose food allergies more precisely.

P17

Prevalence of major food allergens in sunscreen products

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Presenter: K. Ryczaj

BACKGROUND. Sunscreens are important in protecting against the harmful effects of skin exposure to ultraviolet radiation. Since the application of cosmetic products containing food allergens can cause percutaneous sensitization, our work presents an analysis of the prevalence of major food allergens in sun protection products.
METHODS. Three major online cosmetic retailers in Poland were screened for sunscreens products. The included products were divided into products which manufacturers state they can be used for infants and for individuals with eczema. Major food allergens, which according to the European legislation are required to be indicated in food ingredients labels, were searched in INCI nomenclature in cosmetic ingredient labels. Ingredients derived from the non-dietary aerial parts (such as grain leaf/steam) were excluded.
RESULTS. 159 sun protection products were included in the analysis. 27.7% products containing at least one major food allergen derivative. Derivatives from four major food allergens groups were identified. The most common were soybean derivatives, found in 15.7% of cosmetics, followed by tree nuts (almond 8.2% and macadamia nut 1.3%), cereals (wheat 8.8% and oats 0.6%) and peanuts (1.9%). The predominant formulation of food derivatives were oils (70.3%), then hydrolyzed proteins (25%), extracts (3.1%) and others (1.6%). Food allergen derivatives were present in cosmetics intended to use by infants and by individuals with eczema in 23.3% and 11.5% respectively.
CONCLUSION. Our analysis showed that the major food allergens are prevalent in sunscreen products. Considering the increased risk of transdermal sensitization when skin barrier is immature, inflamed and/or damaged, choosing the appropriate sun protection products should be crucial especially in infants and patients with eczema.

P18

Parent-Reported Outcomes Design and Digitization of Feeding Frequency Survey for a Novel Digital Health Trial Evaluating A Multi-food Allergen Product as a Complementary Feeding Strategy

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Presenter: WS. Swanson

BACKGROUND. Early and consistent feeding of multiple food allergens may reduce the risk of food allergy. We report on a parent-reported, outcomes-focused, digital study evaluating a complementary feeding strategy using a multi-allergen product.
METHODS. The INTENT study (NCT04803981) is a large, direct-to-parent digital feeding study that recruited infants between 4-6 months of age and randomized them 1:1 to a daily, early introduction multi-allergen food product containing 30mg each of 16 common food allergens or

non-intervention control. Participation occurs entirely through a mobile app and parents report regularly on comfort level on introducing foods to their babies' diets, age of introduction, diet diversity, and compliance and convenience using a multi-food allergen product.
RESULTS. As a digital trial, the INTENT study employed novel online recruitment strategies to enroll over 1700 infants during a narrow window of eligibility during the COVID-19 pandemic, including outreach via an online baby community forum. The mean age of enrollment is 4.7 (range: 4-6) months, 45% are female, and 496 report eczema at baseline. As part of this study protocol, we digitized a nutritionist-developed feeding frequency survey. Parents are asked monthly about common food proteins introduced into their baby's diet in the last month, including which specific foods and frequency of feeding. As part of the digitization, we translated serving sizes into helpful examples (e.g. 1 serving of cod = 1 fish stick, 1 serving of shellfish = 1 medium-sized shrimp). In conjunction, we evaluate parents' comfort with feeding common food allergens every 3 months and we will be able to compare reported baseline comfort, comfort over time, and actual feeding habits. Additionally, in the active arm, we will evaluate the impact of feeding a multi-allergen food product on parent-reported allergen introduction comfort levels.
CONCLUSION. The INTENT study results based on parent-reported outcomes will provide valuable insight into how families introduce food allergens and evaluate multi-food allergen products as a convenient and practical early complementary feeding strategy for families to introduce and include food allergens into their babies' diets.

P20

Protein concentration and protein content of homemade food allergen extracts used in skin prick tests in the diagnosis of an IgE-mediated food allergy

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Presenter: S. Terlouw

BACKGROUND. Skin prick tests (SPTs) are the first step in the diagnosis of an immunoglobulin E (IgE)-mediated food allergy. In the absence of standardized commercial food allergen (FA) extracts homemade FA extracts might be a good alternative. In our recently published study we compared SPT results of homemade FA extracts with commercial FA extracts. Secondary objective was to measure protein content and perform SDS-PAGE to identify presence of major allergens in the homemade FA extracts.
METHODS. Adult patients with a suspected food allergy were included. FA-specific symptoms were scored using a questionnaire. SPTs were performed with homemade and commercially available extracts from almond, apple, hazelnut, peach, peanut, and walnut. Serum-specific IgE was measured with ISAC or ImmunoCAPTM. The proportion of agreement with FA-specific symptoms was analyzed. SDS-PAGE was performed with both extraction methods for almond, hazelnut, peanut, and walnut extract.
RESULTS. Fifty-four patients (mean age 36; range 19–69 years; female/male: 42/12) were included. The intra-class correlation coefficient (ICC) between SPT results of both extract methods was strong for hazelnut 0.79 (n = 44) and walnut 0.78 (n = 31), moderate for apple 0.74 (n = 21) and peanut 0.66 (n = 28), and weak for almond 0.36 (n = 27) and peach 0.17 (n = 23). Protein concentration in extracts from both methods was comparable. The proportion of agreement between SPT results and FA-specific symptoms was comparable for both extract

methods for all examined food allergens, except for peach, which showed a very low proportion of agreement for the commercially available extract: 0.36 versus 0.77 for the homemade extract. SDS-PAGE showed that all major allergens for almond, hazelnut, peanut and walnut were present in the homemade extracts.
CONCLUSION. Homemade extracts appear to be a good alternative in the diagnosis of an IgE-mediated food allergy, in the absence of commercially available food allergen extracts. SDS-PAGE indicated that homemade extracts of almond, hazelnut, peanut, and walnut contained all major allergens.