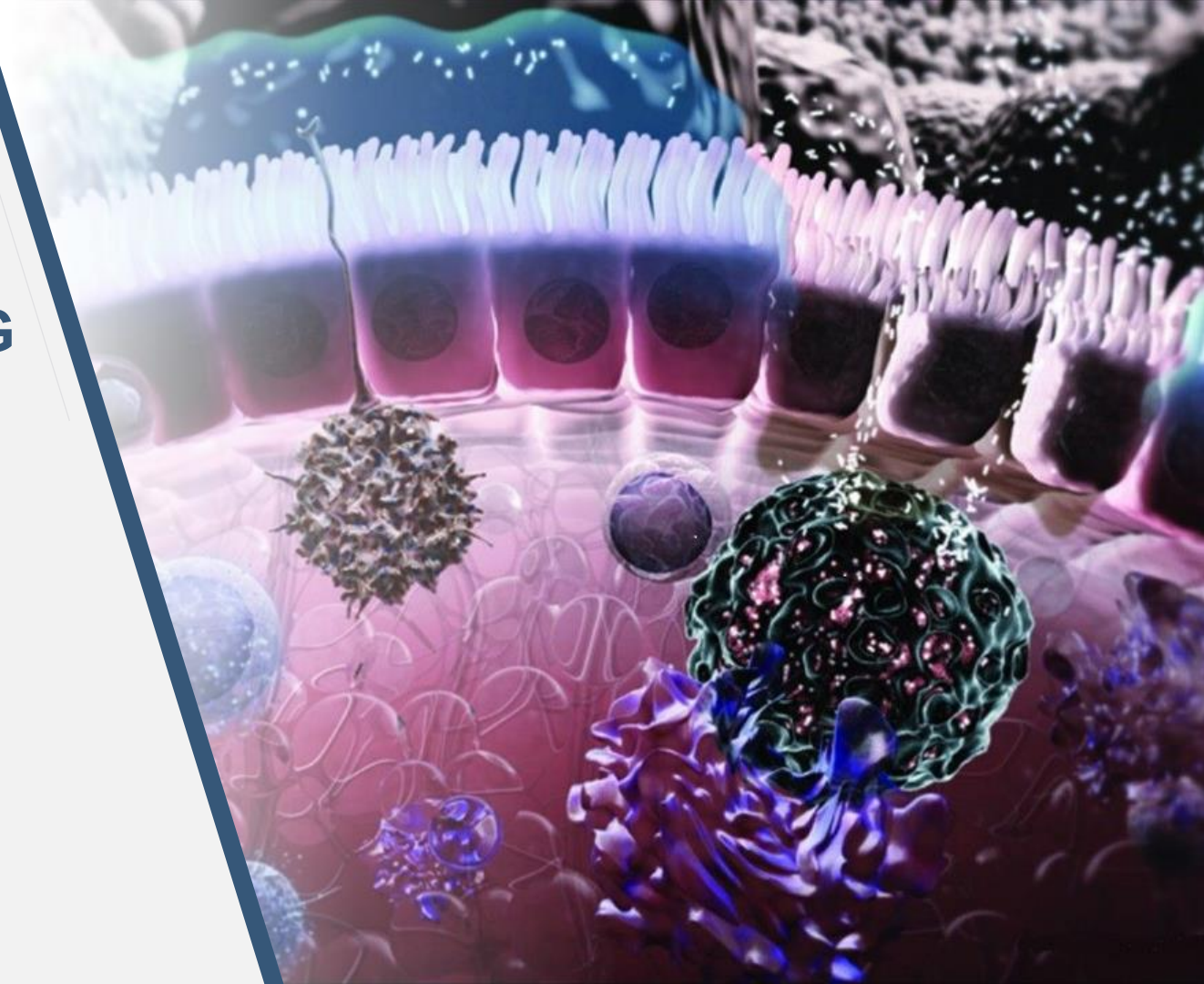


Food-Specific IgG Antibodies & Obesity

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Scientific Director, Omega Diagnostics



Introduction

- Adults with food allergies or sensitivities report a wide range of symptoms, including gastrointestinal distress, migraines, arthritis, rashes, and respiratory distress in addition to a reduced quality of life due to these symptoms.
- Approximately 15%–20% of adults report a food sensitivity or allergy, with increasing frequency over the past 15 years.
- Of these adults, only about 1 in 10 have an immunoglobulin E (IgE)-mediated allergic response.
- IgE-mediated responses are characteristic of atopic allergic reactions and include classic symptoms, such as hives, difficulty breathing, abdominal pain, and itchiness in and around the mouth.
- Because of the small percentage of IgE-mediated allergies, IgE testing has not proven useful for detecting the majority of food sensitivities¹.

1. Gaby AR. The role of hidden food allergy/intolerance in chronic disease. *Altern Med Rev* 1998;3:90–100



Introduction

- Immunoglobulin G (IgG) antibodies, on the other hand, have been hypothesised as a contributor to the symptoms associated with food sensitivities / IgG-mediated intolerances.
- In addition to clinical observations suggesting a role in food sensitivities, it has been hypothesised that high concentrations of IgG antibodies result from increased intestinal epithelial permeability to larger proteins, triggering an immunological reaction.



1. Gocki J, Bartuzi Z. Role of immunoglobulin G antibodies in diagnosis of food allergy. *Postepy Dermatol Alergol* 2016;33:253–256

Intestinal Permeability

- The intestinal mucosa's paradoxical role:
- Absorbing nutrients
- Excluding toxins and larger molecules

- Any breach of the mucosa can lead to:
- Malabsorption
- Increased exposure to toxins & antigens



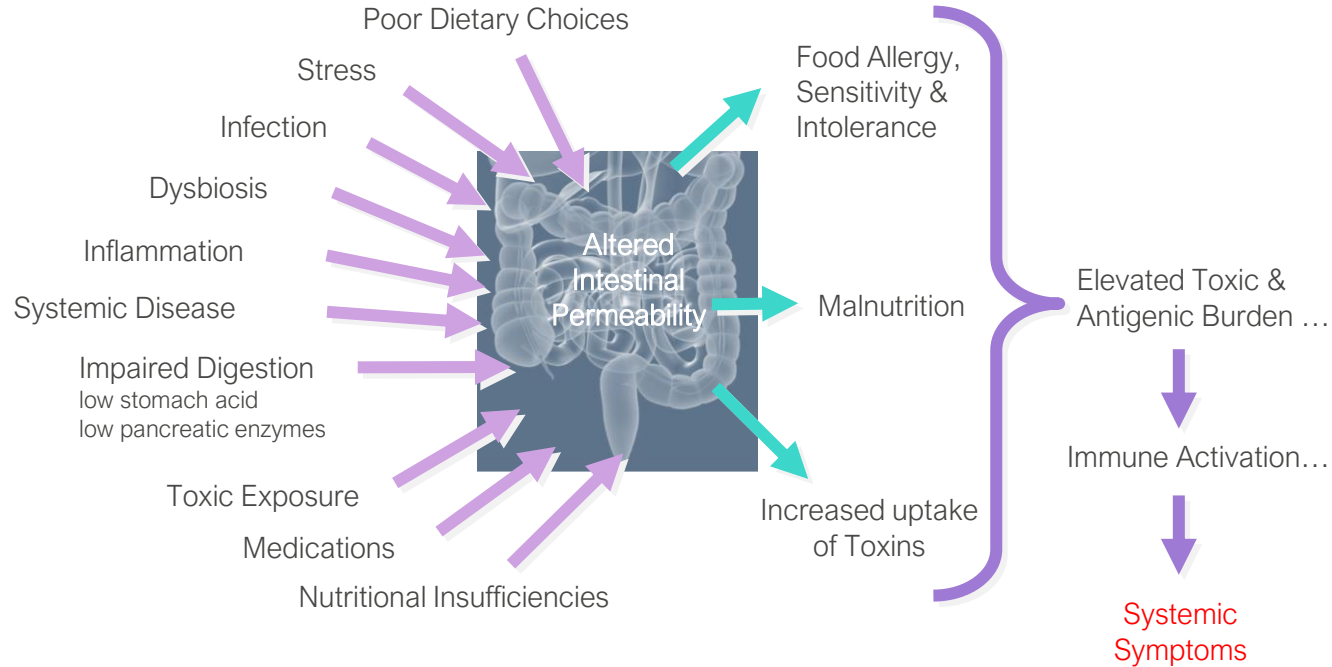
Intestinal Permeability

In intestinal diseases, increased permeability to large molecules mostly (food antigens, microbial fragments) can have a role in exacerbating inappropriate immune responses

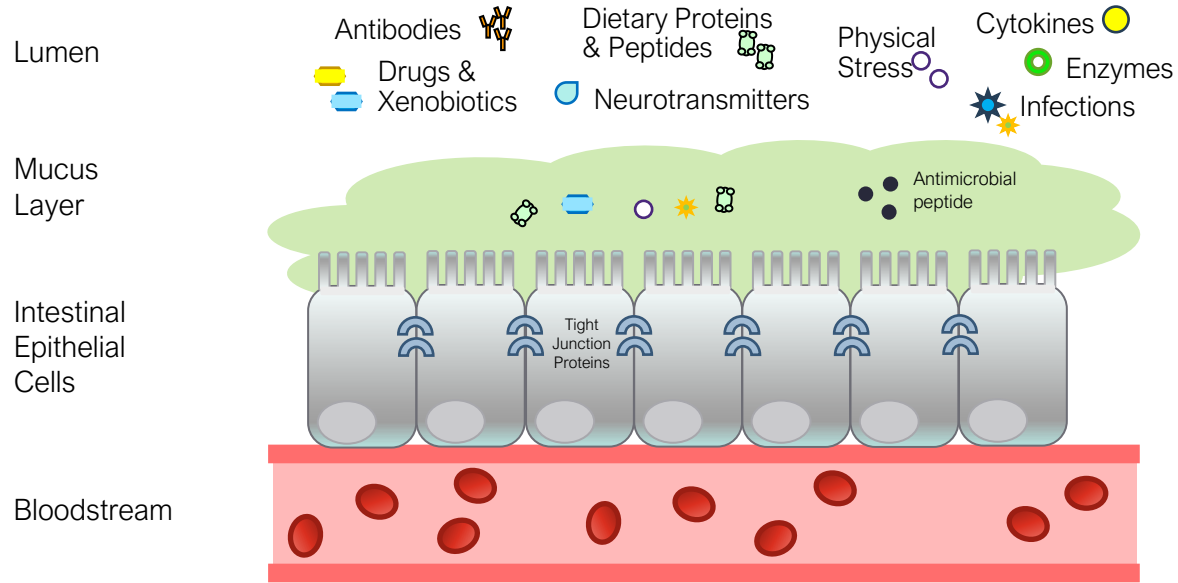
1. Ménard S, Cerf-Bensussan N, Heyman M. Multiple facets of intestinal permeability and epithelial handling of dietary antigens. *Mucosal Immunol.* 2010 May;3(3):247-59. doi: 10.1038/mi.2010.5. Epub 2010 Mar 10. PMID: 20404811.



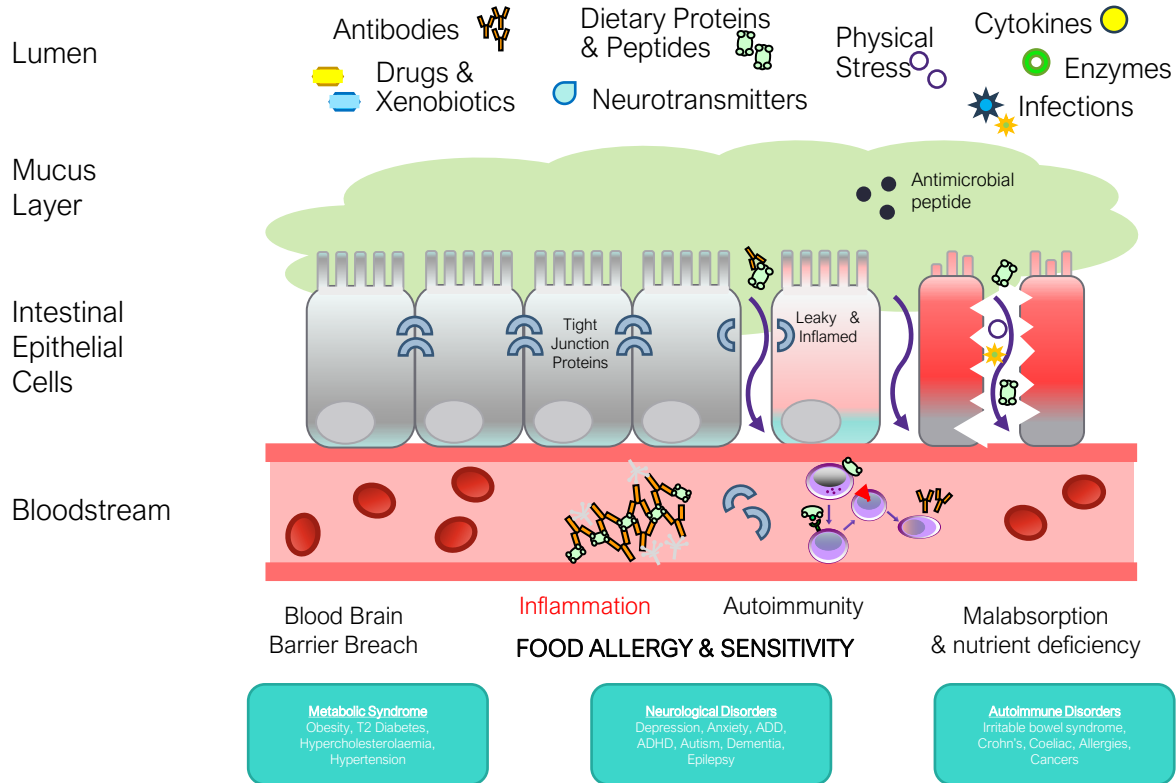
Influences on intestinal permeability



Leaky Gut' Syndrome - Optimal



Leaky Gut' Syndrome - Optimal



IgG, Inflammation and Obesity

- The prevalence of obesity in the United States has more than doubled since the 1960s; currently, over two-thirds of adults are considered overweight or obese.
- Several factors affect this growing health crisis, including individual genetics, food availability, dietary choices, stress, physical activity, income, and mental health.
- Overweight and obese adults are at greater risk for certain health problems, such as diabetes, hypertension, heart disease, fatty liver disease, osteoarthritis, mental health disorders, and some cancers.



IgG, Inflammation and Obesity

- Increased inflammation has been theorised as a mediator of many of the health effects of obesity, including hypertension, cardiovascular disease, and diabetes.
- Inflammation is also considered an important causative factor in the dysregulation of the mucosal barrier in the gastrointestinal tract.
- The resulting conceptual framework includes inflammation as a cause and effect of overweight/obesity, in turn contributing to increased intestinal epithelial dysfunction, potentially increasing measurable IgG antibodies to food.
- This conceptual model is supported by the work of Lewis et al. who conducted an IgG antibody-based elimination diet for 120 participants with a body-mass index (BMI) >20 kg/m² demonstrating reduced BMI and waist circumference.



IgG Weight & Quality of life

- 120 subjects with a mean age of 45.5 and BMI of >20 avoided positive foods for 90 days
- Body composition, blood pressure & quality of life measured at baseline 30, 60 & 90 day follow up.
- On average participants lost 1lb a week and 3 inches from the waist.
- Reduction in weight, BMI, waist and hip circumferences, blood pressure
- Improvements in all indicators of quality of life including mental quality.



1. Lewis, John E. et al. "Eliminating Immunologically-Reactive Foods from the Diet and its Effect on Body Composition and Quality of Life in Overweight Persons." Journal of obesity and weight loss therapy 2012 (2011)

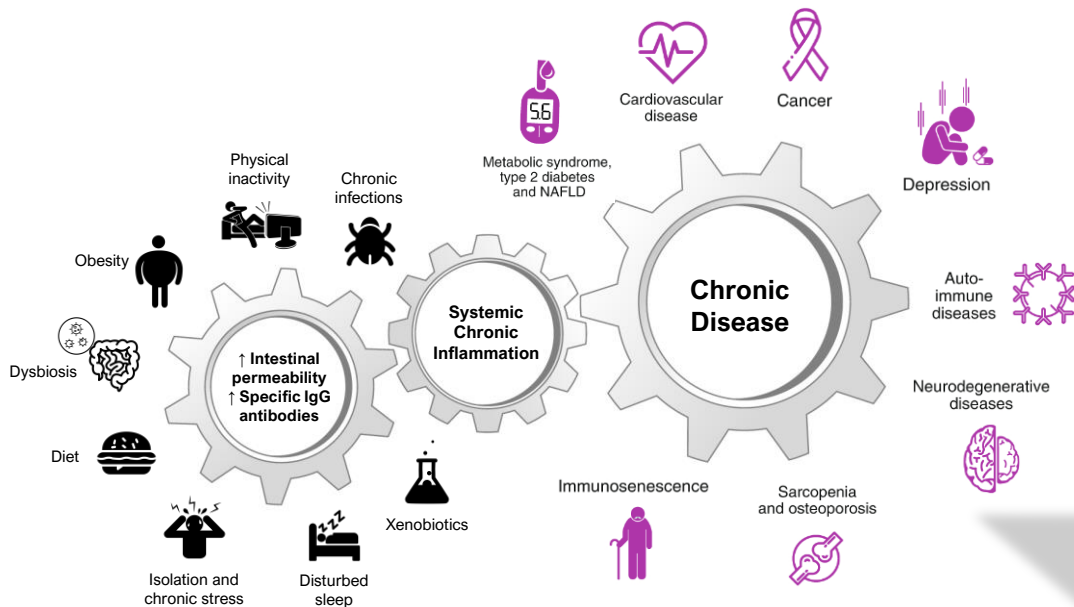
IgG Weight & Quality of life

- **Objective:** This study assessed the effect of an IgG-mediated food sensitivity test in combination with a food elimination diet on body composition and secondary outcomes in people who wanted to lose weight and/or were overweight.
- **Conclusions and Context:** Subjects were able to improve their body composition and quality of life in response to eliminating IgG reactive foods from the diet.
- This test may represent a strategy to counteract the severe U.S. obesity epidemic.



1. Lewis, John E. et al. "Eliminating Immunologically-Reactive Foods from the Diet and its Effect on Body Composition and Quality of Life in Overweight Persons." Journal of obesity and weight loss therapy 2012 (2011)

Inflammation & Disease



1. Furman D, Campisi J, Verdin E, Carrera-Bastos P, Targ S, Franceschi C, Ferrucci L, Gilroy DW, Fasano A, Miller GW, Miller AH, Mantovani A, Weyand CM, Barzilai N, Goronzy JJ, Rando TA, Effros RB, Lucia A, Kleinstreuer N, Slavich GM. Chronic inflammation in the etiology of disease across the life span. *Nat Med.* 2019 Dec;25(12):1822-1832. doi: 10.1038/s41591-019-0675-0. Epub 2019 Dec 5. PMID: 31806905; PMCID: PMC7147972.

PERSPECTIVE
<https://doi.org/10.1038/s41591-019-0675-0>

nature medicine

Chronic inflammation in the etiology of disease across the life span

David Furman^{1,2,3,4*}, Judith Campisi⁵, Eric Verdin⁶, Pedro Carrera-Bastos⁷, Sasha Targ^{1,7}, Claudio Franceschi⁸, Luigi Ferrucci⁹, Derek W. Gilroy¹⁰, Alessio Fasano¹¹, Gary W. Miller¹², Andrew H. Miller¹³, Alberto Mantovani^{14,15,16,17}, Cornelia M. Weyand¹⁸, Nir Barzilai¹⁹, Jorg J. Goronzy²⁰, Thomas A. Rando^{21,22}, Rita B. Effros²³, Alejandro Lucia²⁴, Nicole Kleinstrreuer^{25,27} and George M. Slavich²⁶

Abstract Although intermittent increases in inflammation are critical for survival during physical injury and infection, recent research has revealed that certain social, environmental and lifestyle factors can promote systemic chronic inflammation (SCI) that can, in turn, lead to several diseases that collectively represent the leading causes of disability and mortality worldwide, such as cardiovascular disease, cancer, diabetes mellitus, chronic kidney disease, non-alcoholic fatty liver disease and autoimmune and neurodegenerative disorders. In the present Perspective we describe the multi-level mechanisms underlying SCI and several risk factors that promote this health-damaging phenotype, including infections, physical inactivity, poor diet, environmental and industrial toxicants and psychological stress. Furthermore, we suggest potential strategies for advancing the early diagnosis, prevention and treatment of SCI.

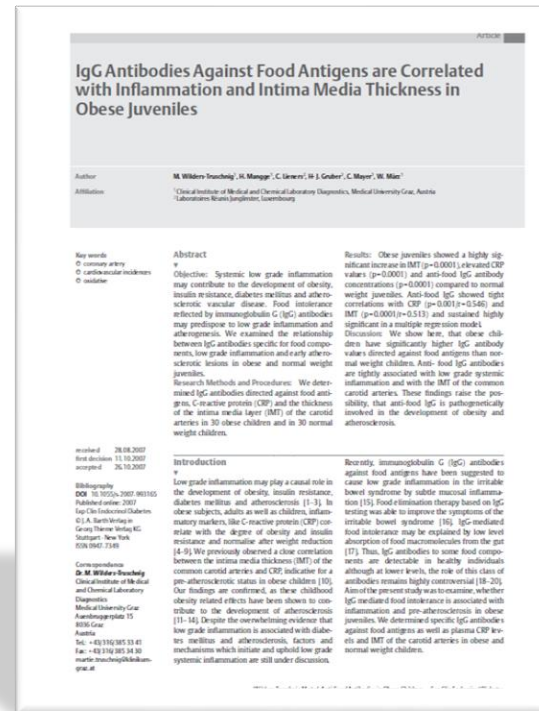
Key points One of the most important medical discoveries of the past two decades has been that the immune system and inflammatory processes are involved in not just a few select disorders, but a wide variety of mental and physical health problems that dominate present-day morbidity and mortality worldwide^{1–3}. Indeed, chronic inflammatory diseases have been recognized as the most significant cause of death in the world today, with more than 50% of all deaths being attributable to inflammation-related diseases such as ischemic heart disease, stroke, cancer, diabetes mellitus, chronic kidney disease, non-alcoholic fatty liver disease (NAFLD) and autoimmune and neurodegenerative conditions^{4–6}. Evidence is emerging that the risk of developing chronic inflammation can be traced back to early development, and its effects are now known to persist throughout the life span to affect adulthood health and risk of mortality^{7–9}. In this Perspective, we describe these effects and outline some promising avenues for future research and intervention.

Inflammation Inflammation is an evolutionarily conserved process characterized by the activation of immune and non-immune cells that protect the host from bacteria, viruses, toxins and infections by eliminating pathogens and promoting tissue repair and recovery¹⁰. Depending on the degree and extent of the inflammatory response, including whether it is systemic or local, metabolic and neuroendocrine changes can occur to conserve metabolic energy and allocate more nutrients to the activated immune system¹¹. Specific bio-behavioral inflammation that include a constellation of energy-sparing behaviors commonly known as “sickness behaviors,” such as

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Inflammation & Food IgG

- Obese children have significantly higher IgG antibody values directed against food antigens than normal weight children.
- Anti-food IgG antibodies are tightly associated with low grade systemic inflammation, measured by high sensitivity C-reactive protein.



1. Wilders-Truschig M, Mangge H, Lieners C, Gruber H, Mayer C, März W. IgG antibodies against food antigens are correlated with inflammation and intima media thickness in obese juveniles. *Exp Clin Endocrinol Diabetes*. 2008 Apr;116(4):241-5. doi: 10.1055/s-2007-993165. Epub 2007 Dec 10. PMID: 18072008.

Inflammation & Food IgG

- hs-CRP plasma concentrations were 3-fold higher in obese than in normal weight children.
- Anti-food IgG concentrations were found about 2.5-fold higher in obese than in normal weight children.

IgG Antibodies Against Food Antigens are Correlated with Inflammation and Intima Media Thickness in Obese Juveniles

Table 1 Clinical and biochemical characteristics, anti-food IgG and IMT in normal weight and obese children

	Normal weight (n= 30)	Obese (n= 30)	p
age (years)	14.4 ± 2.6	12.8 ± 2.9	0.024*
body mass index (kg/m ²)	20.5 ± 1.7	30.1 ± 4.6	<0.001*
BMI-SDS	0.71 ± 1.02	5.75 ± 1.55	<0.001*
systolic blood pressure (mmHg)	125 ± 8	128 ± 16	n.s.
diastolic blood pressure (mmHg)	67 ± 7	68 ± 14	n.s.
intima media thickness (mm)	0.49 ± 0.08	0.61 ± 0.09	<0.001*
triglycerides (mg/l)	0.84 ± 0.38	1.20 ± 0.58	0.014*
cholesterol (mg/l)	1.62 ± 0.27	1.66 ± 0.27	n.s.
LDL Cholesterol (mg/l)	1.00 ± 0.23	1.02 ± 0.19	n.s.
HDL Cholesterol (mg/l)	0.46 ± 0.09	0.43 ± 0.11	n.s.
plasma glucose (g/l)	0.82 ± 0.24	0.89 ± 0.10	n.s.
insulin (mU/l)	13.1 ± 10.7	30.2 ± 27.2	0.033*
CRP (mg/l)	1.2 ± 1.7	3.6 ± 3.0	<0.001*
anti-food IgG (mg/l)	600 ± 327	1451 ± 972	<0.001*

Results are expressed as mean ± SD

* two tailed Student's t-test for independent samples

*Mann-Whitney-U test; n.s. not significant

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between the intima media thickness (IMT) of the common carotid arteries and CRP indicator for a pro-atherosclerotic status in obese children [15]. Our findings are confirmed, as their childhood obesity related effects have been shown to contribute to the development of atherosclerosis [11-14]. Despite the overwhelming evidence that low grade inflammation is associated with diabetes mellitus and atherosclerosis, factors and mechanisms which initiate and upregulate low grade systemic inflammation are still under discussion. Inflammation is detectable in healthy individuals although at lower levels, the role of this class of antibodies remains highly controversial [16-20]. Aim of the present study was to examine, whether IgG mediated food intolerance is associated with inflammation and pre-atherosclerosis in obese juveniles. We determined specific IgG antibodies against food antigens as well as plasma CRP levels and IMT of the carotid arteries in obese and normal weight children.

1. Wilders-Truschig M, Mangge H, Lieners C, Gruber H, Mayer C, März W. IgG antibodies against food antigens are correlated with inflammation and intima media thickness in obese juveniles. *Exp Clin Endocrinol Diabetes*. 2008 Apr;116(4):241-5. doi: 10.1055/s-2007-993165. Epub 2007 Dec 10. PMID: 18072008.

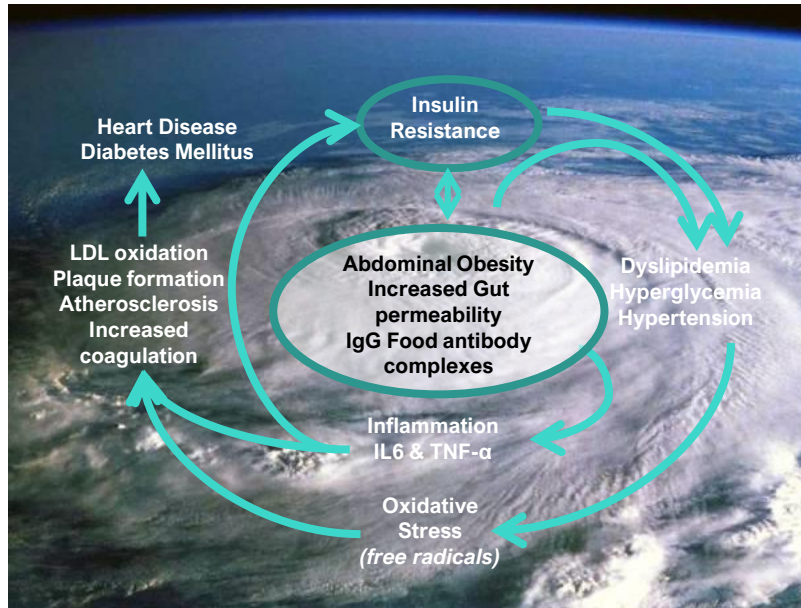
Inflammation & Food IgG

- Dietary elimination therapy based on the presence of IgG antibodies to food components may be indicated.
- Such dietary therapy may be effective in reducing low grade inflammation and thereby preventing clinical consequences like type 2 diabetes and atherogenesis.



1. Wilders-Truschig M, Mangge H, Lieners C, Gruber H, Mayer C, März W. IgG antibodies against food antigens are correlated with inflammation and intima media thickness in obese juveniles. *Exp Clin Endocrinol Diabetes*. 2008 Apr;116(4):241-5. doi: 10.1055/s-2007-993165. Epub 2007 Dec 10. PMID: 18072008.

Inflammation & Food IgG



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IgG and Increased BMI

- The results obtained demonstrated a food sensitivity for a number of food antigens in individuals with high body mass index.
- There was a correlation between concentrations of IgG to food antigens, imbalance of pro-inflammatory cytokines, rheological and metabolic parameters.
- This data may be used as biomarkers suggesting higher risk of evolving metabolic syndrome.

ЭФФЕКТЫ ДИЕТЫ НА РЕОЛОГИЧЕСКИЕ ПОКАЗАТЕЛИ, КОНЦЕНТРАЦИИ ЦИТОКИНОВ, ПЕРМЕАБИЛЬНОСТЬ КРАСНОЙ КРОВЯНИЦЫ И ЭМЕРГЕНЦИЮ МЕТАБОЛИЧЕСКИХ ПОРЯДКОВ У ЛИЦ С ПОВЫШЕННЫМ ИНДЕКСОМ МАССЫ ТЕЛА

EFFECTS OF DIET ON BLOOD RHEOLOGICAL INDICES, CYTOKINE CONCENTRATIONS, AND EMERGENCE OF METABOLIC DISORDERS IN THE PERSONS WITH INCREASED BODY MASS INDEX

Novikov P.S.^a, Cherevko N.A.^a, Klimov V.V.^a, Kondakov S.E.^b, Rozenshteyn M.Yu.^c, Rozenshteyn A.Z.^c, Motlokhova E.A.^a, Zagreshenko D.S.^d

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Abstract. Metabolic syndrome (MS) is a serious medical and social problem due to its high prevalence, lack of common approaches to diagnosis and treatment. Prevention of food dysadaptation reactions and the studies of control mechanisms of immune tolerance to food antigens is of special scientific interest, thus providing available anti-inflammatory tools for correcting increased permeability of the intestinal epithelium and vascular endothelium associated with development of MS. Nutritional dysadaptation occurs due to inappropriate diet being mediated by the geno-phenotypic characteristics of digestive enzymes and immune system which control the efficiency of food digestion.

Immunological control of digestion, including dynamic maintenance of tolerance to food antigens, is carried out at two levels of immune system: innate response with functional involvement of microbiota, and adaptive response, represented by cellular and humoral mechanisms associated with molecular epitopes and critical mass of persistent food antigens which are present in immunologically competent areas of small intestine, due to changing permeability of intestinal barrier and transcytosis processes. Patients and methods: aiming for assessment of the diet contribution to the immuno-biochemical and rheological imbalance in people with increased body weight, 170 volunteers of both sexes aged 20-55 years were examined, depending on the body mass index: > 27.0 kg/m² (clinical group, n = 120), and those with BMI of < 25.0 kg/m² (control group, n = 50). We have revealed statistically significant increase of multiple parameters in the clinical group, i.e., concentration of IL-6, IL-17, cholesterol, glucose, glycosylated hemoglobin, insulin, indices of insulin resistance and atherogenicity. Increased levels of specific IgG antibodies to a number of food antigens were found in the subjects in the clinical group. In the course of our study, a statistically significant relationships was found between total numbers of platelets (p < 0.05; r = 0.213), erythrocytes (p < 0.05; r = -0.211), mean erythrocyte volume (MCV) (p < 0.05; r = 0.339), and the concentration of IgG to casein in the blood, as well as a correlation between the levels of IgG to soybeans and the number of platelets (p < 0.05; r = 0.231). At the same time, some associations were found between the established values of IgG to casein pAG, and the risk of developing atherogenic changes (atherogenicity index > 3) being significant at OR = 2.68 (1.33-5.42), as well as between IgG values to casein pAG (OR = 8.9 (2.6-30.5)), to soybean pAG (OR = 5.6 (1.8-16.7)), to gluten pAG (F = 0.0039, p < 0.05), and increased body mass index.

The results obtained were interpreted as a possible impairment of food tolerance for a number of food antigens in individuals with high body mass index, due to the revealed correlations between concentrations of IgG to food antigens, imbalance of pro-inflammatory cytokines, rheological and metabolic parameters. These data may be used as biomarkers suggesting higher risk of evolving metabolic syndrome.

Keywords: food antigens, food tolerance, metabolic syndrome, inflammation, blood rheology, hyperreactivity

822

1. Novikov P.S., Cherevko N.A., Klimov V.V., Kondakov S.E., Rozenshteyn M.Yu., Rozenshteyn A.Z., Motlokhova E.A., Zagreshenko D.S. Effects of diet on blood rheological indices, cytokine concentrations, and emergence of metabolic disorders in the persons with increased body mass index. *Medical Immunology (Russia)*. 2022;24(4):821-830. (In Russ.) <https://doi.org/10.15789/1563-0625-EOD-2474>

Weight & Metabolic Parameters

- Obesity is caused by the chronic low-level inflammation of white adipose tissue associated with the activation of the immune system.
- Food intolerance (IgG) is one of the probable causes of this low-level inflammation.



1. Meltem Yaman Onmus, Elif Cakirca Avcu, Ali Saklamaz. The Effect of Elimination Diet on Weight and Metabolic Parameters of Overweight or Obese Patients Who Have Food Intolerance. Journal of Food and Nutrition Research. Vol. 4, No. 1, 2016, pp 1-5. <http://pubs.sciepub.com/jfnr/4/1/1>

Weight & Metabolic Parameters

- The obese patients, who were given a diet according to the food sensitivity test:
 - lost weight.
 - Reduced body fat mass, decreased BMI & waist/hip ratio.
 - Lowered triglycerides levels significantly.
- Elimination diet has also been shown to reduce:
 - reflux disease
 - chronic fatigue syndrome
 - headaches.
 - decreasing the inflammation markers.

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The Effect of Elimination Diet on Weight and Metabolic Parameters of Overweight or Obese Patients Who Have Food Intolerance

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Abstract Obesity is caused by the chronic low-level inflammation of white adipose tissue associated with the activation of the immune system. Food intolerance (FI) is one of the probable causes of this low-level inflammation. Food intolerance test had been done to the patients who were refractory to lose weight. In this study, we used to prove that the elimination diet, based on test results, can help with weight loss in patients. 51 patients were enrolled in the study. Their ages were between 18-65 years and had BMI ≥ 25 kg/m². The FI test was done to all of them. The patients randomized to control or FI group. The FI group was given food intolerance elimination diet (FIED) while the patients in the control group underwent a weight loss program by supervision of a dietitian. The patient's body weight, fat weight, lean body mass, body mass index, waist/hip ratio were measured before and after the diet program of the two groups. At the same time, fasting blood sugar, lipid and A1c levels were tested. In the FI group, patients significantly lost weight (86.66±20.93 kg (BMI=31.40±6.68 kg/m²) to 77.99±14.23 kg (BMI=28.95±4.23 kg/m²) (p<0.05). In the control group the body weight also decreased from 89.60±17.69 kg (BMI=33.09±4.70 kg/m²) to 88.09±14.44 kg (BMI=32.44±5.09 kg/m²) (p<0.05). Body fat weight decreased from 32.2±6.18 kg to 27.00±6.27 kg in the FI group while in the control group it was decreased from 36.18±10.50 kg to 36.17±12.76 kg (p<0.05). Triglyceride levels of the FI group decreased significantly than the control group (p<0.05). There was no significant change in fasting blood glucose, A1c and cholesterol levels of two groups at the end of study (p<0.05). In this study, people who cannot lose weight by low-calorie diet can lose weight and do with elimination diet according to the results of FI test. FIED is also significantly effective in triglyceride levels.

Keywords: Food intolerance, obesity, elimination diet

Cite This Article: Meltem Yaman Onmus, Elif Cakirca Avcu, and Ali Saklamaz, "The Effect of Elimination Diet on Weight and Metabolic Parameters of Overweight or Obese Patients Who Have Food Intolerance." *Journal of Food and Nutrition Research*, vol. 4, no. 1, (2016), 1-5. doi: 10.12691/jfnr-4-1-1.

1. Introduction

Obesity is a serious public health problem in the last decades. Its prevalence is increasing, especially in rapidly developing countries. Obesity brings a huge burden of health spending to the society. The World Health Organization (WHO) defined obesity as "abnormal and excessive growth of the amount of fat in adipose tissue to significantly disrupt the health." Obesity is a major risk factor for many chronic diseases. It affects cardiovascular, digestive, respiratory and hormonal systems and causes hypertension, type II diabetes mellitus, coronary artery disease, osteoarthritis, gall bladder disorders, reflux, cancer/breast, prostate, colon, endometrium, etc. [1-6]. According to the new researches, chronic activation of the hereditary immune system may contribute to obesity by causing low-level inflammation in white adipose tissue. Systemic low-grade inflammation may contribute to the development of insulin resistance, diabetic mellitus and atherosclerotic vascular disease with obesity. Food

intolerance caused by IgG antibodies may create a low-grade inflammation and atherosclerosis in obese people [7,8,9,10,11,12]. Studies support that the obese patients had increased levels of IgG [9]. According to the World Health Organization (WHO), approximately half of the world population has food intolerance (FI). FI is food reactions that caused by immunological mechanisms and is quite different from a food allergy which is the immune system reaction against a food [13,14,15,16]. Food allergies are triggered by immunological mechanisms. In the pathogenesis, an abnormal response develops by the defense system to food or food additives by immunoglobulin E (IgE) which is an important part of reaction. FI is an answer of the defense system is formed depending on the increase of IgG antibodies resulting in not fully digested specific nutrients. Discomfort associated with FI, are sometimes similar to the symptoms of allergies. But unlike allergies, symptoms and complaints of FI are seen in longer duration time than allergies. The negative effects of the food that are eaten in FI begin to emerge between 1-24 hours; food allergy symptoms in consumed food are emerging immediately after the formation of the response of the immune system.

1. Meltem Yaman Onmus, Elif Cakirca Avcu, Ali Saklamaz. The Effect of Elimination Diet on Weight and Metabolic Parameters of Overweight or Obese Patients Who Have Food Intolerance. *Journal of Food and Nutrition Research*. Vol. 4, No. 1, 2016, pp 1-5. <http://pubs.sciepub.com/jfnr/4/1/1>

Weight & Metabolic Parameters

- In this study, people who cannot lose weight by low-calorie diet can lose weight and fat with elimination diet according to the results of food sensitivity test.
- Food elimination diet is also significantly effective in lowering triglyceride levels.
- Elimination diet according to the food sensitivity test results may be useful in personalised slimming diets.
- This method may be alternatively used in medical nutritional treatment of obesity.

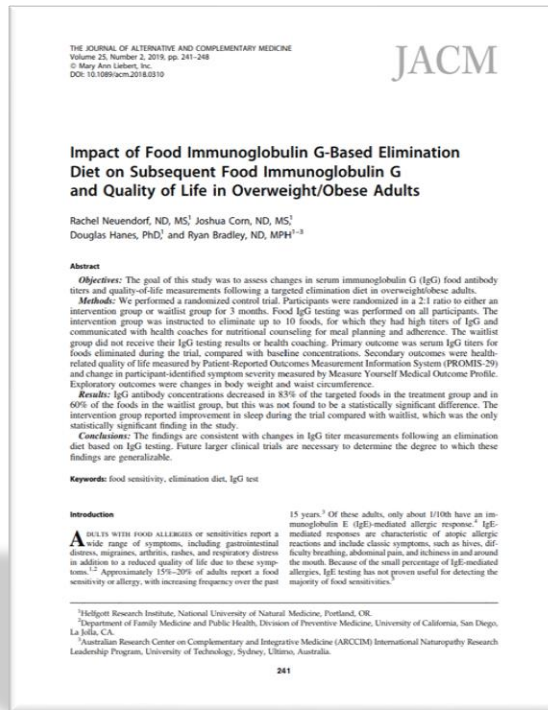


1. Meltem Yaman Onmus, Elif Cakirca Avcu, Ali Saklamaz. The Effect of Elimination Diet on Weight and Metabolic Parameters of Overweight or Obese Patients Who Have Food Intolerance. *Journal of Food and Nutrition Research*. Vol. 4, No. 1, 2016, pp 1-5. <http://pubs.sciepub.com/jfnr/4/1/1>

IgG-based Elimination Diet

- On average, IgG antibody concentrations were reduced in 83% of the targeted foods in the intervention group.
- These results support the conceptual framework that reduction or elimination of a food can lead to a decreased IgG concentration over time.
- The intervention group also reported improvement in sleep during the trial.

1. Neuendorf R, Corn J, Hanes D, Bradley R. Impact of Food Immunoglobulin G-Based Elimination Diet on Subsequent Food Immunoglobulin G and Quality of Life in Overweight/Obese Adults. *J Altern Complement Med.* 2019 Feb;25(2):241-248. doi: 10.1089/acm.2018.0310. Epub 2018 Sep 28. PMID: 30265560.



Finally

- Obesity is a major public health problem and is associated with many health risks and affects quality of life.
- The most effective treatment method of obesity is giving individuals a proper diet and monitor regularly.
- Individuals should be aware of diet mistakes in weight control and should use new scientific methods for the treatment of obesity.
- One of the methods is to identify and remove the foods from the diet that are reactive in the food sensitivity test.





Informing decisions
Improving health

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