

**20 Publications** with description of the importance of the publications (a.), impact factors (b.) and number of citations (c.) of each publication

Impact factors: Journal Citation Reports, 2020 Journal Impact Factor

Numbers of citations: Web of Science, Times Cited in All Data Bases or Scopus (\*)

1. Pellonperä O, Mokkala K, Houttu N, Vahlberg T, Koivuniemi E, Tertti K, Rönnemaa T, Laitinen K. Efficacy of fish oil and/or probiotic intervention on the incidence of gestational diabetes in an at-risk group of overweight and obese women – a randomized, placebo-controlled, double-blind clinical trial. *Diabetes Care* 2019;42:1009-1017.
  - a. Description of importance: In this article the efficacy of fish oil and/or probiotic consumption during pregnancy on the incidence of gestational diabetes and glucose metabolism are reported. No impact by the intervention was detected, but the importance lies in the concept of considering the impacts of each food supplement on their own or in combination in a double-blind randomized manner. This study is the first of its' kind in combining fish oils and probiotics in 4-group study design. The study has involved a detailed collection of dietary and clinical data as well as biological sampling allowing inspection of multiple factors related to the nutrition during and after pregnancy in both mothers and their infants.
  - b. Impact factor: 19.112
  - c. Number of citations: 50
2. Mokkala K, Paulin N, Houttu N, Koivuniemi E, Pellonperä O, Khan S, Pietilä S, Tertti K, Elo LL, Laitinen K. Metagenomics analysis of gut microbiota in response to diet intervention and gestational diabetes in overweight and obese women: a randomized, double-blind, placebo-controlled clinical trial. *Gut* 2021;70:309-318.
  - a. Description of importance: This study has increased understanding the role of gut microbiota in the risk of metabolic disease during pregnancy and the potential of diet in modifying the gut microbiota. Using deep metagenomics sequencing, we showed that gut microbiota is not involved in the onset of gestational diabetes, the relation that has recently been debated. However, we showed that dietary modification with fish oil and probiotics has a potential to modify gut microbiota. The study fills a gap in current knowledge in gut microbiota composition and function during pregnancy and clears the controversy among previous studies. This study is the first of its' kind due to large study population and modern approaches used: data from carefully conducted clinical trial together with comprehensive metagenomics analysis of fecal DNA and bioinformatics tools.
  - b. Impact factor: 23.059
  - c. Number of citations: 11
3. Koren O, Goodrich JK, Cullender TC, Spor A, Laitinen K, Backhed H, Gonzalez A, Werner JJ, Angenent LT, Knight R, Backhed F, Isolauri E, Salminen S and Ley RE. Host remodeling of the gut microbiome and metabolic changes during pregnancy. *Cell*. 2012;150:470-480.
  - a. Description of importance: This is a ground-breaking article in the field of microbiota in pregnancy demonstrating that microbiota changes as pregnancy proceeds. Faecal samples collected in the well-conducted clinical trial were analyzed for microbiota utilizing state of the art analytics at the time. The detailed and many-sided data collection allowed exploration of various aspects in the human study and further an experimental germ-free mice study was carried out: late pregnancy microbiota transferred to mice induced greater adiposity and insulin insensitivity compared to early pregnancy samples.
  - b. Impact factor: 41.584
  - c. Number of citations: 1061

4. Mokkala K, Vahlberg T, Houttu N, Koivuniemi E, Lahti L, Laitinen K. Impact of combined consumption of fish oil and probiotics on the serum metabolome in pregnant women with overweight or obesity. *EBioMedicine* 2021;73, 103655.
  - a. Description of importance: Here we demonstrated that fish oil and particularly the combination of fish oil and probiotics modified serum metabolites, particularly lipids in pregnant women with overweight or obesity, while no such effects were seen with probiotics alone. The changes in metabolites were also dependent on whether the women developed gestational diabetes. These findings are novel regarding combined efficacy of fish oil and probiotics as well as the modifying role of the metabolites by maternal gestational diabetes.
  - b. Impact factor: 8.143
  - c. Number of citations: 2\*
5. Lotankar M, Mokkala K, Houttu N, Koivuniemi E, Sørensen N, Bjørn Nielsen H, Munukka E, Lahti L, Laitinen K. Distinct diet-microbiota-metabolism interactions in overweight and obese pregnant women: a metagenomics approach. *Microbiology Spectrum* DOI: <https://doi.org/10.1128/spectrum.00893-21> (published online March 28, 2022)
  - a. Description of importance: Here we inspected whether diet-gut microbiota-metabolism and inflammation responses are influenced by the maternal overweight or obesity status. Indeed, partially distinct responses were observed. The study infers the importance of considering nutritional status whilst inspecting the role diet has on gut microbiota and eventually on metabolism and inflammation responses.
  - b. Impact factor: 7.171
  - c. Number of citations: 0
6. Yamamoto JM, Kellett JE, Balsells M, García-Patterson A, Hadar A, Sola I, Gich I, van der Beek EM, Castañeda-Gutiérrez E, Heinonen S, Hod M, Laitinen K, Olsen SF, Poston L, Rueda R, Rust P, van Lieshout L, Schelkle B, Murphy HR, Corcoy R. Gestational diabetes mellitus and diet: A systematic review and meta-analysis of randomized controlled trials examining the impact of modified dietary interventions on maternal glucose control and neonatal birth weight. *Diabetes Care* 2018;41:1346-1361.
  - a. Description of importance: In this systematic review and meta-analysis the associations of dietary interventions with glycemia and infant birth weight outcomes in gestational diabetes patients were investigated. The study revealed that dietary interventions, when compared to the controls, resulted in larger decrease in fasting and postprandial glucose and lower need for medication treatment. Further, interventions were associated with lower infant birth weight. The study encourages the search for new dietary means to improve the management of the most common medical condition pregnant women encounter. Also, I value the international and multidisciplinary collaboration.
  - b. Impact factor: 19.112
  - c. Number of citations: 90
7. Mokkala K, Pellonperä O, Röytiö H, Pussinen P, Rönnemaa T, Laitinen K. Increased intestinal permeability, measured by serum zonulin, is associated with metabolic risk markers in overweight pregnant women. *Metabolism – Clinical and Experimental* 2017 Apr;69:43-50.
  - a. Description of importance: The role of intestinal permeability, as measured by new serum marker zonulin, in relation to metabolic endotoxemia, i.e. elevated circulating levels of bacterial lipopolysaccharide and metabolic risk markers (low-grade inflammation, glucose and lipid metabolism) in overweight pregnant women was studied. These findings highlight the importance of the gut as a gatekeeper of metabolic health during pregnancy.
  - b. Impact factor: 8.697
  - c. Number of citations: 40
8. Mokkala K, Röytiö H, Munukka E, Pietilä S, Ekblad U, Rönnemaa T, Eerola E, Laiho A, Laitinen K. Gut microbiota richness and composition and dietary intake of overweight pregnant women are related to serum zonulin concentration, a marker for intestinal permeability. *J Nutr* 2016;146:1694-700.
  - a. Description of importance: The extent to which the gut microbiota and diet contribute to intestinal permeability, measured by serum zonulin, during pregnancy were explored. Gut microbiota richness and abundances of particular bacteria as well as diet composition, primarily

intakes of polyunsaturated fatty acids differed according to high and low zonulin concentration groups. The study proposes that intestinal permeability may be regulated by diet and microbiota in pregnancy.

- b. Impact factor: 4.798
- c. Number of citations: 66

9. Pellonperä O, Koivuniemi E, Vahlberg T, Mokkala K, Tertti K, Rönnemaa T, Laitinen K. Dietary quality influences body composition in overweight and obese pregnant women. *Clinical Nutrition* 2019;38:1613-1619.

- a. Description of importance: Here we applied modern methods (air displacement plethysmography) for analysis of body composition in pregnant women, the population that has been underrepresented in research with regard to body composition. We found that dietary protein intake and dietary quality score correlated with maternal fat free mass, whilst physical activity (MET index) level did not relate to body composition. Higher gestational weight gain was related to higher gain in fat mass. Identification of these determinants of body composition and weight during pregnancy may be used in dietary counselling with potential benefit particularly in overweight and obese women at risk for metabolic complications.
- b. Impact factor: 7.325
- c. Number of citations: 2

10. Mokkala K, Houttu N, Cansev T, Laitinen K. Interactions of dietary fat with the intestinal microbiota: evaluation of mechanisms and metabolic consequences. *Clinical Nutrition* 2020;9:994-1018. pii: S0261-5614(19)30214-6. doi: 10.1016/j.clnu.2019.05.003.

- a. Description of importance: The interest in research with regard to diet-gut microbiota relations has mostly focused on carbohydrates and fibre. Here we comprehensively reviewed scientific literature on the role of the amount and type of dietary fat in modulating the gut microbiota. Most of the evidence arises from animal studies, but there is also evidence emerging from human studies. The results indeed indicate dietary fat-gut microbiota crosstalk that deserves further research due to plausible health implications.
- b. Impact factor: 7.325
- c. Number of citations: 38

11. Mokkala K, Gustafsson J, Vahlberg T, Vreugdenhil ACE, Ding L, Shiri-Sverdlov R, Plat J, Laitinen K, Serum CathepsinD in pregnancy: relation with metabolic and inflammatory markers and effects of fish oils and probiotics. *Nutrition, Metabolism and Cardiovascular Diseases*.  
<https://doi.org/10.1016/j.numecd.2022.02.011> (published online February 23, 2022).

- a. Description of importance: In this international collaboration study we inspected a range of factors that relate to serum CathepsinD, a novel marker of liver inflammation. We found that proportion of body fat as well as low-grade inflammation marker GlycA were related to CathepsinD, and different responses were seen in women with or without gestational diabetes. Only modest impacts of fish oil or probiotics intervention were detected. These results are of interest considering the long-term impacts to the maternal health, particularly as women with gestational diabetes are at a heightened risk for type 2 diabetes and nonalcoholic fatty liver disease.
- b. Impact factor: 4.222
- c. Number of citations: 0\*

12. Hulkkonen P, Kataja E-L, Vahlberg T, Koivuniemi E, Houttu N, Pellonperä O, Mokkala K, Karlsson H, Laitinen K. The efficacy of probiotics and/or n-3 long-chain polyunsaturated fatty acids intervention on maternal prenatal and postnatal depressive and anxiety symptoms among overweight and obese women. *Journal of Affective Disorders* 2021;289:21-30.

- a. Description of importance: Maternal depression and anxiety symptoms influence not only the well-being of the mother but also that of the child. Here we reported the impact of fish oil and/or probiotics in modifying pre- and postnatal depressive and anxiety symptoms and found only modest, but clinically not significant impacts. Interestingly, we demonstrated the beneficial impact of good dietary quality in terms of modifying the symptoms.
- b. Impact factor: 4.839

- c. Number of citations: 2
13. Laitinen K, Poussa T, Isolauri E. Probiotics and dietary counselling contribute to glucose regulation during and after pregnancy: a randomised controlled trial. *Brit J Nutr* 2009;101:1679-1687. doi: 10.1017/S0007114508111461. (published online: November 19, 2008).
- Description of importance: This is a ground-breaking study in indicating the role of probiotics, and thus gut microbiota in metabolism. The improved blood glucose control during pregnancy was achieved by consumption of probiotics. When this study was initiated, the research in probiotics was focused on gut health, and the metabolic outcomes designed in this study were novel. This study and that of Luoto et al (*Brit J Nutr* 2010) boosted several studies that investigated the impact of probiotic administration on glucose metabolism in pregnancy.
  - Impact factor: 3.718
  - Number of citations: 238
14. Røytiö H, Morkkala K, Vahlberg T, Laitinen K. Dietary intake of fat and fibre according to reference values relates to higher gut microbiota richness in overweight pregnant women. *Brit J Nutr* 2017;118:343-352.
- Description of importance: Here we demonstrated that adherence to the dietary reference intake of fat and fibre was associated with beneficial gut microbiota composition, which again contributed to serum lipidomic profile. Also links by diet and microbiota to new low-grade inflammation marker GlycA were demonstrated. The importance of the study lies in providing novel insights for the significance of adherence to dietary recommendations as a potential means in mediating health effects through gut microbiota.
  - Impact factor: 3.718
  - Number of citations: 56
15. Miles EA, Vahlberg T, Calder PC, Houttu N, Pajunen L, Koivuniemi E, Morkkala K, Laitinen K. Iodine status in pregnant women and infants in Finland. *Eur J Nutr* 2022. <https://doi.org/10.1007/s00394-022-02852-9> <https://rdcu.be/cJnjF> (published online March 19, 2022)
- Description of importance: Iodine status of the mother during pregnancy is of vast importance for the developing foetus. The iodine intake of the Finnish adult population has been inadequate, but the situation has been improved by use of iodized salt. However, there have been no studies in pregnant or breastfeeding women or infants. This is the first study to investigate the matter in Finland. The results demonstrate that the majority of the pregnant and breastfeeding women and their infants were iodine insufficient, and thus further actions, e.g. use of iodine food supplements, need to be considered.
  - Impact factor: 5.619
  - Number of citations: 0\*
16. Pajunen L, Korkalo L, Koivuniemi E, Houttu N, Pellonperä O, Morkkala K, Shivappa N, Hébert JR, Vahlberg T, Terti K, Laitinen K. A healthy dietary pattern with a low inflammatory potential reduces the risk of gestational diabetes mellitus. *Eur J Nutr* 2022;61:1477-1490.
- Description of importance: Here we evaluated comprehensively maternal diet in early pregnancy with purpose to establish the key factors influencing the onset of gestational diabetes. The results emphasize the importance of an overall healthy diet and limitation of foods with saturated fatty acids, and other nutrients with a high inflammatory potential in reducing the risk of gestational diabetes. These results support the implementation of dietary recommendations as a health-promoting approach in the care of pregnant women.
  - Impact factor: 5.619
  - Number of citations: 0\*
17. Muhli E, Koivuniemi E, Laitinen K. Living with Overweight, rather than a history of gestational diabetes, influences dietary quality and physical activity during pregnancy. *Nutrients* 2022, 14(3), 651; <https://doi.org/10.3390/nu14030651> (published online February 3, 2022).
- Description of importance: in this nationwide study, we demonstrated that in about half of the pregnant women, and particularly in those with overweight, the diet quality was poor. We assumed that those women who had had gestational diabetes in their previous pregnancy would

have a better diet quality in the current pregnancy. This would be amenable, as these women receive dietary counselling for their conditions as outlined in the current care guidelines. However, the history of gestational diabetes was not reflected in the diet quality. The study highlights the importance of continuous dietary counselling of pregnant women and suggests that new means are needed to improve lifestyle habits of pregnant women.

- b. Impact factor: 5.719
- c. Number of citations: 0\*

18. Koivuniemi E, Nuutinen O, Riskumäki M, Vahlberg T, Laitinen K. Development of a stand-alone index for the assessment of diet quality in elementary school-aged children. *Publ Health Nutr* 2021;24:5629-5640.

- a. Description of importance: Our research group has been active in developing methods for diet evaluation. We have developed methods for assessment of diet quality in adults (Leppälä et al. 2010) and in pre-school aged children (Röytiö et al. 2015). Here, we report the development of a diet quality index for primary school aged children. The index may be utilized in health care (e.g. school nurses), and in research to evaluate diet quality. We have utilized the adult index e.g. in demonstrating the relation between an overall diet quality and gut microbiota diversity (Laitinen & Mokkala 2019).
- b. Impact factor: 4.022
- c. Number of citations: 0\*

19. Laurila S, Sun L, Lahesmaa M, Schnabl K, Laitinen K, Klén R, Li Y, Balaz M, Wolfrum C, Steiger K, Niemi T, Taittonen M, U-Din M, Välikangas T, Elo L, Eskola O, Kirjavainen A, Nummenmaa L, Virtanen K, Klingenspor M and Nuutila P. Secretin Activates Brown Fat and Induces Satiation. *Nature Metabolism* 2021;3:798-809 <https://doi.org/10.1038/s42255-021-00409-4> (published June 21, 2021) <https://rdcu.be/cm0t4>. <https://www.sciencedirect.com/science/article/pii/S016503272100330X>

- a. Description of importance: In this placebo-controlled, randomized crossover study directed by Turku PET (positron emission tomography) Centre, it was shown that secretin activates brown adipose tissue, reduces central responses to appetizing food and delays the motivation to refeed after a meal. Thus, meal-induced, secretin-mediated brown adipose tissue activation appears to be relevant in the control of food intake in humans. The study may offer new possibilities for clinical research in treating obesity. Our research group was privileged to participate in this trial in providing expertise in dietary intake assessment and measurements of satiety and body composition.
- b. Impact factor: 13.511
- c. Number of citations: 7

20. Picaud JC, Pajek B, Arciszewska M, Tarczon I, Escribano J, Porcel R, Adelt T, Hassink E, Rijnierse A, Abrahamse-Berkeveld M, Korczowski B, TENUITO Study group: Mazela J, Schlembach D, Oudshoorn JH, Kalach N, Pastor Rosado J, Closa R, Nermes M, Laitinen K. An infant formula with partially hydrolysed whey protein supports adequate growth and is safe and well-tolerated in healthy, term infants: A randomized, double-blind equivalence trial. *Nutrients* 2020;12:E2072. (published online: July 13, 2020) doi: 10.3390/nu12072072

- a. Description of importance: Infancy is a critical phase of life when nutrition defines growth and development as well as health in long-term. In this multinational and multidisciplinary research project, supported by industry, we demonstrated that the partially hydrolyzed whey protein-based infant formula supported adequate infant growth, with a daily weight gain equivalent to a standard intact protein-based formula, and was safe for use and well-tolerated in healthy term infants. This study was also essential in fulfilment the changes in legislation related to the requirements set for the infant formulas.
- b. Impact factor: 5.719
- c. Number of citations: 4