Summary

Obesity prevalence has nearly doubled between 1980 and 2014, and obesity increases the risk of diseases, such as type II diabetes and cardiovascular diseases. Dietary modulation is the main strategy applied as a part of primary and secondary prevention of obesity and obesity-associated diseases, but an optimal diet to improve the success of weight loss maintenance has not reached consensus among worldwide experts. During the last decade, it has been observed that the gut microbiota composition is associated with obesity and obesity-associated diseases. However, a deeper understanding of how the host metabolism is affected by dietary modulation of the gut microbiota is necessarily before microbiota-based dietary recommendations can be applied as a strategy for prevention and treatment of obesity and obesity-associated diseases.

The objective for this PhD thesis was to investigate how nutrition affects the gut and the microbiome in relation to obesity and obesity-associated diseases. The objective was investigated by the conduct of three studies (KIFU, PROKA, MNG). In KIFU, the effect of habitual calcium intake on faecal fat and energy excretions was investigated by an observational study. The 189 participants collected faecal samples for five days and had a 1-day visit where metabolic markers and anthropometric data were collected. In PROKA, the effect of protein supplementation (whey with/without calcium and soy) on weight maintenance success was investigated by a randomised controlled trial. 220 overweight and obese subjects went through an 8-week weight loss period followed by a 24-week weight maintenance period. Measurements included anthropometry, metabolic markers, appetite sensation and energy expenditure. In MNG, the effect of arabinoxylan oligosaccharides (AXOS) and polyunsaturated fatty acid (PUFA) intakes on the gut microbiota composition was investigated by a randomised cross-over study with two 4-week diets periods and a 4-week washout period. Faecal samples and metabolic markers were collected from 30 subjects before and after each diet period.

Results showed that habitual dietary calcium intake was not associated with faecal excretions of fat and energy. However it was negatively associated with total and low density lipoprotein (LDL) cholesterol concentrations and systolic blood pressure (BP) (Paper I). Protein supplementation (whey with/without calcium or soy) did not improve success of weight maintenance or metabolic markers, compared to carbohydrate in individuals with a normal protein intake, despite sustained effects of appetite sensation and energy expenditure (Paper II). AXOS intake had bifidogenic effects on the gut microbiota composition, and butyrate-producing bacteria were the main contributors to the change of the bacterial community. Beneficial changes in metabolic markers were not observed. PUFA intake did not alter gut microbiota composition, but improved systolic and diastolic BP, and resulted in impaired glucose metabolism (Paper III).

In conclusion, the current evidence does not support that protein supplementation improves weight maintenance after a weight loss, compared to carbohydrate, in individuals with a normal protein intake. Convincing evidence supports that dietary calcium intake improves BP and lipid profile, while an effect on faecal fat and energy excretion in the free living population remains inconclusive. AXOS intake can increase abundance of Bifidobacteria and may stimulate the abundance of butyrate producers, whereas the effect of fat quality on gut microbiota modulation is inconclusive due to the limited literature.