Microbiota is an ensemble of microorganisms that resides in a previously established environment, for example in the gastrointestinal tract. Human body (mainly large intestine) is home to vast quantity of microbial cells, they outnumber human cells 10 times. Because of multiple functions performed by gut microbiota and their big amount it is named „organ" of our body.

Bacteria, the same as human, produce various substances. A lot of reactions taking place in human body (either positive or negative regarding human health) wouldn't take place if it wasn't for the presence of bacteria. They produce various enzymes (that is substances enabling reactions to happen), which human organism does not produce. Different microbiota are able to generate diverse substances. Some bacteria can produce vitamin $B_9$, that is folic acid, others convert one of the vitamins – choline, into trimethylamine, that can be oxidized to the compound being risk factor for cardiovascular diseases. Other bacteria have the ability to decompose dietary fiber to simple sugars, that can be used by human as a source of energy. Moreover bacteria produce fatty acids in the gut. Those molecules nourish epithelial cells of the intestine. The presence or absence of certain bacteria may be related to the change of metabolic potential of microbiota, therefore it may influence the growth or decline of the risk of certain diseases (i.a. cardiovascular, obesity)

Thus, human health may be influenced by the composition of gut microbiota, but also by the quality of diet, meaning the appropriate intake of nutrients. Research shows that people eating healthy, that is who eat plenty of plant-based food (nuts, seeds, whole grains, legumes, fruits, vegetables), fish, seafood, and vegetable oils have lower risk of such diseases as cardiovascular, type 2 diabetes or colorectal cancer than people eating unhealthy (western diet), thus those whose diet is abundant in red and processed meats, refined carbohydrates such as sugars, sugar-sweetened beverages, desserts, sweets, refined cereals and solid fats.

The composition of the human diet influences the composition of gut matter, which can affect the development and metabolic activity of certain bacteria and consequently may result in the formation of various substances produced by them. Owing to those facts, diet can affect human's metabolism through the influence on gut microbiota.

The influence of the dietary pattern, that is a set of dietary habits and behaviors of a person, on the composition of gut microbiota, particularly on their metabolic potential related to metabolism of lipids and one-carbon pool (that is folates and choline) has not been thoroughly studied yet. This project will evaluate how the "western" and "healthy" dietary pattern influences: 1/composition of intestinal microflora; 2/ potential of gut microbiota to metabolize cholesterol and dietary fiber, and to synthesize folic acid, trimethylamine and fatty acids; 3/the lipid profile and serum concentrations of folic acid, homocysteine, choline and their metabolites (trimethylamine and its oxide) and other parameters in serum; 4/ and also consequently the relationship between the dietary patterns, composition of intestinal microflora, their metabolic potential and the lipid profile, serum concentrations of folic acid, homocysteine, choline and their metabolites (trimethylamine and its oxide) and other parameters in serum.

The proposed project can answer the question whether there is a difference in composition and metabolic potential of gut microbiota between people of different dietary patterns and can explain the contribution of "western" and "healthy" gut microbiota in the human metabolism. Elevated concentrations of metabolites which we plan to focus on are well known risk factors for cardiovascular diseases (homocysteine, trimethylamine oxide, cholesterol). For that reason, it is of great importance to fully understand those diet-metabolism relations, that can be modified by microbiota. The obtained results can be used to modify the dietary guidelines and indicate if there is rationale to include the pro and/or prebiotic supplementation in individuals having "western" dietary pattern in order to "restore healthy microbiota" to improve metabolic health. It has remarkable significance because of worldwide growing popularity of "western" dietary pattern.