10. Summary

Endothelial dysfunction is considered to be either the primary cause or a consequence of many diseases, such as atherosclerosis or non-alcoholic fatty liver disease (NAFLD). This pathology usually develops in response to environmental factors and unhealthy lifestyle including inappropriate diet. Altered macronutrient proportions, among others protein overconsumption, is considered to be a potential risk factor of non-communicable diseases like CVD. On the other hand, food is a natural source of bioactive compounds with positive effect on the human body. Coffee is one of those products containing many bioactive substances like dimethylpyridines, which are potentially vasoprotective.

In this context, the aim of the study was to characterize the low carbohydrate high protein diet (LCHP) and its impact on lipid metabolism, atherosclerosis and progression of NAFLD in murine experimental models (C57BL/6 and apoE/LDLR$^{-/-}$). Moreover, the potential vaso- and hepatoprotective properties of coffee brew and 1,4-dimethylpyridine were evaluated. In detail three hypotheses were set: (1) LCHP diet causes disorders in lipid metabolism, progression of atherosclerosis and nonalcoholic fatty liver disease; (2) coffee brew, as the source of numerous bioactive substances, as well as (3) 1,4-dimethylpyridine have hypocholesterolemic, antiatherogenic and hepatoprotective potential *in vivo*.

The study have demonstrated that LCHP diet affects lipid profile, increases atherosclerotic lesions and may contribute to excessive fat accumulation in hepatocytes. This pathology may be related to limited availability of nitric oxide precursors, what can intensify endothelial dysfunction. Those observations have confirmed the first hypothesis of this dissertation. Intake of coffee brew has improved the availability of NO precursors and slightly reduced the atherosclerotic plaques and the amount of lipids in the hepatocytes. Whereas, 1,4-dimethylpyridine has shown a significant therapeutic effect at both, morphological and biochemical levels on non-alcoholic fatty liver disease. It has confirmed the hepatoprotective properties of 1,4-DMP.

In summary, the low carbohydrate high protein diet negatively affects lipid metabolism and may contribute to progression and intensification of atherosclerosis and fatty liver disease. The intake of coffee brew does not counteract negative changes caused by LCHP diet, but supplementation with 1,4-dimethylpyridine shows hepatoprotective effect in murine experimental models.