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Relation between Epigenetics and Development of Life-Style Diseases by the Exposure of Low-Salt during Fatal Stage

Kazuki Mochizuki

University of Yamanashi

Summary

We previously performed experiments supported by the salt-science foundation at 2017 that pregnant mice were fed diets with different amounts of salt {control diet: 0.26% (w/w), high-salt diet: 0.8% (w/w), and low-salt diet: 0.1％ (w/w)} and mRNA levels of metabolic genes in the liver and adipose tissue of the offspring were measured. We found that mRNA levels of genes related to glucose incorporation into the cells, fatty acid synthesis and fatty acid oxidation in the adipose tissue were lower in the offspring at 22 days after birth born from the mother mice fed a high-salt diet than in those born from the mother mice fed a control diet. In addition, feeding pregnant mice a high-salt diet led to increase mRNA levels of genes related to fatty acid synthesis, fatty acid oxidation and a fatty liver-inducible transcriptional factor Pparg2 in the liver of the offspring. In addition, feeding pregnant mice a low-salt diet led to increase mRNA levels of genes related to fatty acid oxidation and an lipid droplet inducing factor Cidec in the offspring. These results indicate that increased glucose and lipids caused by reduction of metabolic activity in the adipose tissue of the offspring born from pregnant mice fed a high- or low-salt diet may be used as substrates of fat synthesis and may induce subsequent development of fatty liver development.

From the results of previous our study, we investigated in this study whether feeding pregnant mice a high- or low-salt diet alters mRNA levels of metabolic genes in the liver of the offspring at 72 days after birth. In addition, we investigated whether histone acetylation is involved in these expressional changes in the liver of the offspring, because recent studies suggest that acetyl-CoA in cytosol produced by metabolic enzymes is used as a substrate of the histone acetylation.

We found in this study that feeding pregnant mice a high- or low-salt diet reduced mRNA levels of genes related to glycolysis and fatty acid synthesis in the liver of the offspring at 72 days after birth. In addition, we revealed that histone acetylation in the gene body of Cidec, and in the gene body and promoter of a fatty acid synthesis-related gene Fasn tended to be lower in a low-salt diet-group than in control diet-group. Whereas, histone acetylation in the gene body of Cidec and Fasn and in the gene body and promoter of a triaclyglycerol synthesis-related gene Gpd1, was significantly higher or tended to be higher in a high-salt diet-group than in control diet-group.

Our results in current study suggest that feeding pregnant mice a high- or low-salt diet reduces expression of genes related to glycolysis and fatty acid synthesis in the liver of the offspring. Histone acetylation is presumably concerned with these expression changes in the liver of offspring born from the mother mice fed a low-salt diet.

However, the expression changes in the liver of offspring born from the mother mice fed a high-salt diet would be regulated by other mechanisms.