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Lipidomic analysis of blood serum from prepubertal boys with different BMI

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Objective Childhood obesity is a worldwide health problem which may causes metabolic diseases such as hyperglycemia, hyperlipidemia, hypertension and hyperuricemia. It is well know that lipid metabolites regulate fatty acid and glucose homeostasis. Lipidomics is the comprehensive analysis of lipid metabolites which include their quantitation and metabolic pathways. The intention of this study is to identify the circulating lipid species which are altered in obese prepubertal boys.
Methods A total number of 72 boys aged 10.28 ±0.69 years old were included into this study, and divided into normal(NC), overweight(OW) and obese group(OB). The degree of maturation of all boys were measured by bone age and sex hormones. Then we measured the form indexes, blood lipids, blood glucose level to identify the current state of all boys. Serum indexes were detected by CLIA and ELISA methods. A lipidomic method was established by using a Waters Acquity UPLCI-Class liquid system combined with Waters Xevo G2-SQ-TOF mass spectrometry system. The identification and analysis of lipid metabolites were complished by using MassLynx 4.1, Progenesis QI software and LipidMaps database. Statistical analyzes were performed using SPSS22.0 software.
Results (1)The waist-to-hip ratio, bone age and HDL-c levels ware significant lower in OW and OB groups. The TG level was significant higner in OB group. The DHEA and SHBG levels was significant higner in OW and OB groups and the other sex hormones are not .
(2) In this study, 153 most significant different lipid metabolites were founded, incluing 3 diacylglycerol, 32 triglyceride, 1 Phosphatidyl cholines, 1 Phosphatidylinositol, 3 Sphingomyelin, 1 Ceramide which significant higher in OW&OB group; 4 diacylglycerol, 17 Phosphatidic acid, 32 Phosphatidyl cholines, 4 Phosphatidylinositol, 13 Phosphatidylserine, 18 Phosphatidyl ethanolamine, 3 Phosphoglycerides, 13 Sphingomyelin and 6 Ceramide which significant lower in OW&OB group. Among all this metabolites, 8 lipids (fold change ≥5) were founded as the significant biomarkers related prepubertal obesity , including 1 Phosphatidyl cholines, 1 phosphatidylserine, 2 sphingomyelin and 4 Triglyceride. What's more, the level of SM(d16:1/24:0) and TG(15:0/17:1/20:3) which measured by UPLC-QTOF/MS are highly positive correlated with the level of serum SHBG; PC(18:0/0:0) and TG(16:1/18:0/20:3) are highly negtive correlated with serum SHBG.
Conclusions Overweight and obese prepubertal boys showed disorder in lipid metabolism and bone growth. The lipidomic results showed lower SHBG level is related with the disorder of lipid metabolism. We suggest that further studies on these metabolites could help us gain a better understanding of the relationship between obesity and growth disorder.