Health-promoting changes in plasma lipidome profiles after high-intensity exercise training in people with and without HIV

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Abstract: Both the human immunodeficiency virus (HIV) infection and its combination with antiretroviral therapy can contribute to dyslipidemia and abnormal distribution of body fat in people living with HIV (PLWH). These lipid-related metabolic alterations increase the risk of developing fatty liver and cardiovascular diseases. Physical activity and exercise training are effective interventions to protect against the development of these metabolic changes in PLWH. However, little is known about the mechanisms underlying the impact of exercise training on lipid metabolism and profiles. To better understand lipid alterations, this study aimed to evaluate the effect of 8-weeks of high-intensity-functional circuit training on the plasma lipidome comparing PLWH (n=13) and subjects without HIV (control group; n=14). The participants were submitted to exercise training three times per week at 80-85% intensity of maximum heart rate using a 2:1 (effort: pause) format. Anthropometric and biochemical parameters, together with plasma lipidomic analysis, were assessed at baseline and post-exercise. A total of 418 individual lipid species were described and monitored in both groups. The most significant distinction between PLWH and control subjects at baseline was the contrasting levels of adiponectin, fasting insulin, and values of HOMA-IR and Adipo-IR, which were all equalized after 8 weeks of training. Nonetheless, lower levels of leptin, HDL-C, body fat %, and BMI combined with elevated AST and HOMA-beta in PLWH relative to control subjects continued from baseline to post-exercise. The responses of PLWH to high-intensity training have likely revolved around the improvement in insulin sensitivity and hepatic steatosis after 8-weeks, playing a major role in distinguishing plasma lipidome signatures as compared to control subjects. In control subjects, the molecular signatures were linked to significant reductions in concentrations of almost all triglycerides (TG) alongside phosphatidylinositol and glycosylated ceramides. In contrast, PWLH displayed a significant decrease in concentrations of free fatty acids, cholesteryl esters, and glycosylated ceramides together with increased concentrations of diglycerides, acylcarnitines, and free cholesterol after exercise relative to baseline. While decreased fasting TG concentrations appear as one of the most often reported effects of chronic exercise on circulating lipids, our data showed no apparent evidence for significant TG pool alterations in PLWH despite improved insulin homeostasis. A reasonable explanation for the lack of TG pool alterations in PLWH could be related to tissue-specific improvement in insulin resistance. In addition to specific lipidome alterations of each group, this study revealed concomitant modulation in a dozen of lipids (including glycerophospholipids and sphingolipids) suggesting health-promoting effects of short-term high-intensity exercise training. Collectively, these commonly modulated lipid species represent interesting targets for future lipidomic-based studies evaluating not just the effects of exercise, but perhaps the molecular mechanisms ensuing a healthier plasma lipidome profile.

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