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Elevated level of oxidized low-density lipoprotein is associated with hyperandrogenism in Polycystic ovary syndrome

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Objective: To investigate oxidized LDL (ox-LDL) levels in the four PCOS phenotypes based on the Rotterdam criteria and the effects of LDL/ox-LDL on the proliferation and testosterone synthesis in the rat ovarian theca-interstitial (T-I) cells.

Methods: Serum ox-LDL concentrations were measured in patients with PCOS (n=526) and the control women (n=279). Plasma LDL was separated and mild ox-LDL was prepared. The rat ovarian T-I cells for primary culture were obtained from immature estrogen-treated SD rats. The T-I cell proliferation, the total testosterone (TT) levels in culture supernatant, the mRNA levels of cholesterol side-chain cleavage enzyme (CYP11A1), 17α-hydroxylase (CYP17A1), 3β-hydroxysteroid dehydrogenase (3β-HSD) and steroidogenic acute regulatory protein (StAR), and the protein levels of CYP17A1 were determined in the control and LDL/ox-LDL treated cells.

Results: (1) Serum ox-LDL levels were significantly higher in the HA+OA+PCO phenotype than in the controls (n=256, P=0.001). Multivariate regression analysis demonstrated that apoB, 2–h glucose and LDL-C levels, the Ferriman–Gallwey score, the average ovarian volume, triglyceride, total antioxidant capacity, and FSH level were significant predictors of ox-LDL. (2) T-I cell numbers were significantly higher in LDL/ox-LDL treated cells than in the control cells and higher in LDL treated cells than in ox-LDL treated cells (P<0.001). LDL/ox-LDL treatment had also increased TT levels in the culture supernatant, the mRNA levels of key enzymes of testosterone synthesis (CYP11A1, CYP17A1, 3β-HSD) and StAR, and the protein expression of CYP17A1 when compared with the control cells (P<0.05). In addition, the mRNA levels of CYP17A1 and 3β-HSD were significantly higher in ox-LDL treated cells than in LDL treated cells (P<0.05).

Conclusions: PCOS patients with HA+OA+PCO have higher circulating ox-LDL levels. Increasing ox-LDL and/or LDL levels promote the proliferation of ovarian T-I cells, increase the synthesis and secretion of testosterone by increasing the expression of key enzymes.

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