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1,25-Dihydroxyvitamin D3 has a direct effect on steroid production from human theca cells

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There is evidence from animal studies that 1,25-dihydroxyvitamin D3 (1,25(OH)₂D3) is essential for normal reproductive function. Vitamin deficient rats have reduced fertility and VDR null mutant mice demonstrate impaired folliculogenesis. One small uncontrolled study in humans has demonstrated that vitamin D replacement improves menstrual frequency and acne in women with polycystic ovary syndrome (PCOS). We have previously demonstrated that 1,25(OH)₂D3 inhibits the production of oestradiol independently of progesterone in luteinised but not in non-luteinised granulosa cells. We have also demonstrated the presence of vitamin D receptors on luteinised granulosa cells and cells of the corpus luteum¹.

The aim of this study was to investigate the effect of a range of concentrations of 1,25(OH)₂D3 (200picomolar-20nanomolar) on human theca cells dissected from whole ovaries from women with natural cycles undergoing TAH/BSO. Theca was dispersed enzymatically into single cells. Cells were plated at a concentration of 0.5x10⁶ per well in 24 well plates and cultured in McCoys 5A modified medium. Steroid levels were measured in the medium using radioimmunoassay. 1,25(OH)₂D3 decreased androstenedione (A) production, p=0.0320 (multiple regression analysis). 1,25(OH)₂D3 also decreased A production in the presence of LH (10nanograms per millilitre). 17-hydroxyprogesterone (17OHP) production was unchanged and progesterone (P) production was variable. Where suppression of A production was most significant (p=0.0038), P production was significantly increased in the same wells (p=0.0187). In summary, 1,25(OH)₂D3 inhibited A production from human theca cells, both basally and in the presence of LH. The production of 17OHP was unchanged and of P was variable. This may explain the beneficial action of vitamin D in women with PCOS.

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