

Abstract

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Vitamin D is positively associated with sperm motility and increases intracellular calcium in human spermatozoa.

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BACKGROUND: The vitamin D receptor (VDR) is expressed in human spermatozoa, and VDR-knockout mice and vitamin D (VD) deficiency in rodents results in impaired fertility, low sperm counts and a low number of motile spermatozoa. We investigated the role of activated VD (1,25(OH)(2)D(3)) in human spermatozoa and whether VD serum levels are associated with semen quality.

METHODS: Cross-sectional association study of semen quality and VD serum level in 300 men from the general population, and in vitro studies on spermatozoa from 40 men to investigate the effects of VD on intracellular calcium, sperm motility and acrosome reaction. All men delivered samples for routine semen analysis and blood for measurements of follicle stimulating hormone, Inhibin B, 25-hydroxy-VD, albumin, alkaline phosphatase, calcium and parathyroid hormone (PTH).

RESULTS: In the association study, 44% were VD insufficient (<50 nM), and VD was inversely correlated with PTH ($P < 0.0005$). VD serum levels correlated positively with sperm motility and progressive motility ($P < 0.05$), and men with VD deficiency (<25 nM) had a lower proportion of motile ($P = 0.027$), progressive motile ($P = 0.035$) and morphologically normal spermatozoa ($P = 0.044$) compared with men with high VD levels (>75 nM). 1,25(OH)(2)D(3) increased intracellular calcium concentration in human spermatozoa through VDR-mediated calcium release from an intracellular calcium storage, increased sperm motility and induced the acrosome reaction in vitro.

CONCLUSIONS: 1,25(OH)(2)D(3) increased intracellular calcium concentration, sperm motility and induced the acrosome reaction in mature spermatozoa, and VD serum levels were positively associated with sperm motility, suggesting a role for VD in human sperm function.

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