Abstract

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Maternal zinc deficiency raises plasma prolactin levels in lactating rats.

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OBJECTIVE: There is an inverse relation between zinc (Zn) intake and plasma prolactin in men and nonpregnant women. Whether a relation exists in lactating women is unknown, despite the potential consequences of perturbations in prolactin regulation on lactation performance.

METHODS: We examined the effects of low Zn intake on prolactin concentration, the prolactin regulatory pathway in the pituitary gland, and lactation performance in lactating rats. Female rats were fed diets containing 7 (zinc deficient; ZD), 10 (marginally zinc deficient; MZD) or 25 mg Zn/kg (control) from 70 d preconception to lactation d 11. Rats were killed, pituitary glands dissected, and tissues and plasma collected and analyzed for prolactin concentration. Pituitary gland pituitary factor 1 (Pit-1), dopamine 2 receptor (D2R), and prolactin receptor mRNA expression were measured in the pituitary gland. Liver, mammary gland, plasma, and milk Zn were measured. Milk intake of the pups was also recorded.

RESULTS: Plasma prolactin concentration was higher in rats fed the ZD (125.9 microg/L) diet compared with control rats (21.7 microg/L). Pituitary gland prolactin concentration was higher in rats fed the ZD diet (69.8 mg/g total protein) compared with controls (29.0 mg/g). Plasma Zn concentration was lower in rats fed the MZD and ZD diets, and mammary gland and milk Zn concentrations were lower in rats fed the ZD diet compared with control rats. Rats fed the ZD diet had lower D2R, prolactin receptor, and Pit-1 mRNA levels, whereas rats fed the MZD diet had lower prolactin receptor and Pit-1 mRNA levels compared with control rats. Milk intake was lower in pups of rats fed the MZD and ZD diets.

CONCLUSION: Our results suggest that marginal Zn nutriture may compromise milk production despite increased prolactin levels. In addition, increased circulating prolactin concentration is not due to altered nursing behavior, but may be due to alterations in the prolactin regulatory pathway in the pituitary gland.

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