Breastfeeding places a stress on maternal calcium homeostasis because of the increased calcium demands for milk production, leading to massive bone resorption and osteopenia. Ordinary calcium supplement is often not effective to prevent this maternal bone loss since fractional calcium absorption in the intestine is apparently low. Previous investigations showed that high plasma prolactin, especially the suckling-induced prolactin surge, enhanced intestinal calcium absorption; therefore, it was hypothesized that pre-suckling calcium supplementation is the potential regimen for preventing of lactation-induced bone loss. Day-7 lactating Sprague-Dawley rats were daily administered 4 times per day for 14 days with water (Vehicle) or various doses of CaCl\(_2\) solution (i.e., 1, 2 and 4 mg/kg/dose) at 90 min prior to suckling. Thereafter, maternal femora, tibiae and L5–6 lumbar vertebrae were collected for measurement of bone mineral density (BMD) and bone mineral content (BMC) by using dual energy X-ray absorptiometry (DXA). BMD and bone microarchitecture in the tibiae or femora of 5- and 7-week-old offspring were also investigated by DXA and computer-assisted bone histomorphometric analysis, respectively. The results showed 4 mg/kg/dose CaCl\(_2\)-treated lactating rats had higher femoral, tibial and vertebral BMD and BMC as compared to vehicle-treated rats. Male and female offspring breastfed by calcium-supplemented dams showed higher femoral BMD and trabecular bone volume than those breastfed by vehicle-treated dams. In conclusion, pre-suckling calcium supplement (4 mg/kg/dose, 4 times per day, administered 90 min prior to suckling) could effectively prevent bone microstructural defect in lactating rats and also increased bone density in their offspring.

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