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# Zinc

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## Drug Levels and Effects

### Summary of Use during Lactation

Zinc is a normal component in human milk. Typical daily doses of 15 mg or less of oral zinc from prenatal vitamins or other multimineral supplements do not alter milk zinc levels in lactating women. Mothers may therefore take zinc supplementation during lactation to achieve the recommended daily intake of 12 to 13 mg.[1] Daily oral doses between 15 and 25 mg have negligible effects on milk zinc levels. Treatment of patients with Wilson's disease with zinc acetate up to 100 mg daily may increase zinc levels in milk, but not above the normal range.

Sublingual zinc lozenges and nasal sprays used to prevent or treat adult viral upper respiratory tract infections have not been studied during lactation. Maternal use of these remedies several times daily for short time periods, as they are typically intended to be used, would not be expected to cause harm to the breastfed infant.

Zinc deficiency in exclusively breastfed infants, whether due to inadequate maternal zinc status or to infant premature birth or other causes, should be treated with direct zinc supplementation of the infant.

### Drug Levels

Zinc is normally present in human breastmilk, mostly bound to milk proteins.[2] Reported average milk zinc levels in colostrum range from 4 to 9 mg/L, decreasing to 2 to 4 mg/L by 1 to 2 weeks postpartum, then stabilizing at 1 to 2 mg/L beyond two weeks, eventually falling below 1 mg/L by 9 months.[2-10] Levels are similar between fore- and hindmilk.[3] Mothers with less than adequate zinc intake may have slightly lower milk zinc levels compared to mothers with adequate intake, although the reported differences are of marginal clinical relevance.[9] In a U.S. study of sixty-three postpartum, lactating, mostly white, women taking a daily prenatal or multi-vitamin, those on a vegan or vegetarian diet had similar milk zinc levels compared to those on an omnivore diet.[11]

Zinc levels may be higher in preterm milk, although only limited data are available. In a study from Rio de Janeiro, Brazil, three mothers who gave birth between 28 and 36 weeks gestation had a median milk zinc level of 2.9 mg/L after 2 weeks postpartum compared to 1.2 mg/L in four mothers who gave birth at term.[2]

*Maternal Levels.* Forty mothers in Maryland were randomly given a once daily 25 mg elemental oral zinc supplement as zinc oxide or placebo beginning the day after delivery and continuing for 9 months. Prenatal vitamins without zinc were used during pregnancy, and the estimated average dietary zinc intake was similar between the two groups at around 11 to 12 mg daily throughout the study period. Milk was collected at 1 and 2 weeks, and at 1, 3, 6, and 9 months after delivery. Levels were approximately 4, 3.5, 2.7, 1.3, 1, and 0.65 mg/L, respectively, in both groups.[12]

In Colorado, 19 pregnant and 52 postpartum women within two weeks of delivery were randomized to receive a once daily 15 mg elemental zinc oral supplement as zinc sulfate or placebo for nine months. Milk samples were collected at baseline and then monthly. The postpartum estimated average daily dietary zinc intake was similar between the two groups at around 12 to 13 mg throughout the study period. Average milk zinc levels were not different at any time between the two groups. At baseline, 2, 4, 6, and 9 months postpartum, levels in were approximately 4, 2, 1.5, 1, and 0.8 mg/L, respectively, in both groups.[13] The same research group had previously conducted a smaller, nonrandomized study comparing 14 lactating women given a daily 15 mg zinc supplement as zinc sulfate to 25 lactating women not given a supplement. The nonsupplemented group had a slightly lower average dietary zinc intake of 10.7 mg daily during the study compared to 12.2 mg daily in the supplemented group. Average milk levels were similar between the two groups until 8 to 12 months postpartum when levels in the supplemented group were 0.8 to 1 mg/L compared to 0.5 to 0.8 mg/L in the nonsupplemented group.[14] However, participant attrition by this late stage of the study was 50 to 80%, which, along with the other study design limitations, and the lack of confirmation by the authors' larger study, suggests that the milk zinc level differences were not necessarily attributable to supplementation.

Forty-nine mothers from Indiana who were intending to fully breastfeed took a prenatal vitamin containing either 25 mg zinc or no zinc daily beginning 1 to 2 days after delivery. Supplementation was not randomly assigned or blinded. Milk samples were collected monthly beginning at 1 month postpartum through 6 months. Estimated average daily dietary zinc intakes were about 11 to 12 mg in both groups over the study period and participant attrition was about 10% in both groups. Average milk levels were higher in the supplemented group at each time point, beginning with 2.8 and 2.3 mg/L at 1 month, to 1.1 and 0.8 mg/L after 6 months, and ranging from 0.2 to 0.5 mg/L higher throughout the study period.[15] Since there was no baseline measurement, and supplementation was not randomly assigned, the differences reported may not have been due to supplementation. Assuming the two groups were similar at baseline, based on the 0.2 to 0.5 mg/L higher milk levels in the supplemented group, an exclusively breastfed infant would be exposed to an additional zinc exposure from breastfeeding of 0.03 to 0.075 mg daily, which is not a health concern. Using the highest reported value of 2.8 mg/L at 1 month postpartum, when a fully breastfed infant would consume around 0.5 to 0.6 L of milk daily, the daily zinc exposure from milk would only be around 1.5 mg, which is not above the recommended 2 mg daily intake for young infants.[1]

One hundred and thirty-five mothers in Yazd, Iran were randomized to receive 50 mg elemental zinc twice a week or placebo beginning the first postpartum week and continued until 5 months postpartum. Estimated average daily dietary zinc intakes were 10 to 11 mg in both groups over the study period. Milk was collected at baseline and monthly. Average milk zinc levels were approximately 3.2 mg/L in both groups at baseline, then 2.2 mg/L at 1 month. At 2 and 3 months, levels were significantly different between the two groups with 1.8 mg/L and 1.6 mg/L in the supplemented and nonsupplemented groups, respectively, and 1.5 mg/L and 1.3 mg/L in the placebo group. At 4 and 5 months, milk levels were similar between the groups at approximately 1.1 mg/L at both times. Participant attrition from the study was around 25% in both groups.[16] Based on the reported 0.3 mg/L increase in milk zinc from maternal supplementation at 2 and 3 months, an exclusively breastfed infant

would consume an additional 0.05 mg/kg of zinc daily from the maternal supplementation strategy used in this study. This amount is very low considering the recommended infant intake is around 0.5 mg/kg daily.[1]

One nursing mother in Japan with Wilson's disease was taking 75 mg of zinc acetate daily. Zinc concentrations in her colostrum at 4 days postpartum and mature milk at 32 days postpartum were within the normal range of zinc in breastmilk in Japanese women.[17]

Another small study found that zinc concentrations in the mature milk of 6 women receiving oral zinc for Wilson's disease were somewhat elevated, but within the range of control mothers not receiving zinc.[18]

*Infant Levels.* Relevant published information was not found as of the revision date.

## Effects in Breastfed Infants

Zinc deficiency in exclusively breastfed infants can occur. Clinical features include facial and groin rash, diarrhea, hair loss, disinterest in feeding, and failure to thrive. One known cause is below-normal milk zinc levels due to maternal genetic mutations affecting mammary zinc transport proteins.[19] Zinc deficiency may also occur in infants born very preterm who are not supplemented with special human milk fortifiers designed for premature babies.[20] With both causes, direct administration of zinc drops to the infant quickly corrects the deficiency and alleviate the infant's symptoms.

Acrodermatitis enteropathica is a congenital zinc deficiency disorder caused by genetic mutations affecting the infant's intestinal zinc transporter proteins. Breastmilk is protective against this disorder, and symptoms typically develop after weaning from breastmilk feeding.[19,21] Resuming breastmilk feeding, if possible, and direct infant supplementation with zinc drops are the recommended treatments.

## Effects on Lactation and Breastmilk

Certain variations in genes encoding mammary epithelial cell zinc transporter proteins are associated with reduced milk volume and altered milk content beyond zinc. This is not thought to be triggered by maternal zinc intake or zinc status and is not correctable with maternal zinc supplementation.[22]

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# Substance Identification

## Substance Name

Zinc

## CAS Registry Number

7440-66-6

## Drug Class

Breast Feeding

Lactation

Milk, Human

Minerals

Elements