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Milk selenium concentration varies with time of year and feeding practices in grazing cows

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Background – Selenium (Se) deficiency is implicated in disease processes such as cardiovascular disease, muscular dystrophies, cancers and neurological conditions (moods, anxiety states).[1] Milk-derived Se appears to have a higher bioavailability and bioactivity compared with inorganic Se.[2] Understanding the factors Se concentration influence in milk and dairy products will help to determine their potential as a important source of dietary Se.
Objective – To determine the effect of season and farm management practices on milk Se concentrations.
Design – Milk samples representative of both autumn and spring-calved dairy herds located in the northern irrigation region of Victoria were collected at 6–7 wk intervals between April 2001 and March 2002. Farms were selected to reflect a range in input of concentrates (<15-50% of energy to support lactation), with most of the remaining energy coming from pasture. Samples were digested in a mixture of nitric acid and hydrogen peroxide and the Se concentration was determined using Inductively Coupled Plasma Mass Spectrometry/Vapour Generation.
Outcomes – The mean (± SE) and range in milk selenium concentrations for 166 observations were 12.7 (0.56) and <3 – 37.1 μg/kg milk, respectively. Milk collected in spring had a lower concentration of selenium compared with milk collected in autumn (9.8 vs 16.2 μg/kg milk; $P<0.05$). The average concentration of selenium in milk was higher (16.3 vs 8.7 μg/kg milk; $P<0.01$) in cows fed mineral supplements, and increased by 0.7 (0.15) μg/kg milk for every kg of cereal grain-based concentrate fed. There was no effect of time of calving on milk Se concentraions.
Conclusions – Season and mineral supplements were important in determining the concentration of Se in milk. These data suggest that targeted feeding strategies will be effective in enhancing the Se concentration in milk.

1. Rayman MP. The argument for increasing selenium intake. Proc. Nut. Soc., 2002; 61:203-215.
2. McIntosh GH and Royle PJ. Final report to the DRDC on project CSHN 04, 2003.

Folic acid fortified milk increases red blood cell folate concentration in women of childbearing age

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Background – Folic acid (~400 μg/day) taken around the time of conception significantly reduces the risk of bearing a child with a neural tube defect (NTD). Strategies to reduce NTDs with folic acid include supplement use and fortified foods. One fortification option is to add folic acid to milk powder formulated for use by women prior to and during pregnancy. It is uncertain whether folic acid fortified milk reduces NTD-risk. However, NTD risk has been inversely associated with red cell folate (RCF) concentrations.
Objective - To determine whether consuming folic acid (375 μg/day) fortified milk increases RCF and plasma folate concentrations in women of childbearing age compared to an equivalent amount of unfortified milk, over 12 weeks. A second aim was to determine the effect of fortified milk on plasma homocysteine concentration, a functional indicator of folate status
Design - Seventy-three women (aged 18-47 years) were randomized for 12 weeks to receive either a fortified milk powder (ANMUM™, NZNew Zealand Milk Ltd) or unfortified (control) milk powder. Participants were instructed to consume 75 g of milk powder as two servings per day. Both milks provided 38 μg of naturally occurring folate per day. The fortified milk provided an additional 375 μg of folic acid per day. The control milk powder was a blend of whole milk and a skim milk powder that was blended to match the fat level of the fortified milk. Blood samples were collected at baseline, 6 and 12 weeks.
Results – Sixty-six women completed the trial. Consuming the fortified milk caused RCF concentrations to rise markedly so that by week 12 the mean (95% CI) concentration was 539 nmol/L (436, 641) higher in those consuming the fortified milk than those consuming the control milk ($P <0.01$). The mean plasma folate concentration in participants consuming the fortified milk was 35 nmol/L (30, 41) higher at week 12 than in those taking the placebo ($P<0.01$). Women consuming the fortified milk had a 14% lower mean homocysteine concentration at week 12 than women consuming the control milk ($P<0.01$).
Conclusion - Milk fortified with folic acid (375 μg/day) substantially increases RCF and plasma folate and lowers plasma homocysteine concentration over 12 weeks in women of childbearing age. Milk powder fortified with folic acid can increase women's RCF concentrations and would be expected to reduce the risk of bearing a child with a NTD.

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