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Polyamines in Foods and Human Milk

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Abstract

Background: Knowing the levels of polyamines, putrescine, spermidine and spermine in foods and human breast milk, and the contribution of daily food choice to polyamine intake and its effect on the levels in breast milk is of interest, due to the association of these bioactive amines to health and disease. There is a lack of relevant information on the content of polyamines in the Swedish Food Database. Polyamines in human milk vary between lactating mothers. In this thesis, a polyamine database was developed through literature review and laboratory analysis of polyamines in Swedish dairy products. We also aimed to estimate polyamine intake among adolescents and lactating mother in order to compare the intake with Swedish Nutrition Recommendations Objectified (SNO) and associate it with the levels in breast milk, respectively. The effect of a weight reduction intervention program on the levels of polyamines in milk from obese lactating mothers was also investigated.

Methods: Polyamine contents of foods were collected and polyamine data were inserted into the Swedish food database after an extensive literature search of databases and laboratory analysis of Swedish dairy products. Polyamine intake was calculated using Dietist XP after obtaining 7-day food records from 93 adolescents. Human milk samples were collected one week after delivery from mothers with normal BMI delivering prematurely after 24-36 wks of gestation (n=40) and after full term delivery (n=12). Milk was also collected after full term delivery at days 3 and 10 and at 1 and 2 months in normal weight (n=20), obese (n=20) and obese mothers who had participated in a weight reduction program during pregnancy (OI, n= 10). Food records for 3 days were obtained covering the sampling day. Polyamine levels in all samples were analyzed using high performance liquid chromatography (HPLC).

Results: Fruits and cheese were identified as the best sources of putrescine, while vegetables and meat products were found to be rich in spermidine and spermine, respectively. The adolescents' polyamine intake was 316 ± 170 $\mu\text{mol/day}$, while the calculated contribution from the ideal diet SNO was considerably higher with an average polyamine intake of 541 $\mu\text{mol/day}$. Polyamine concentrations were higher in preterm than in full term milk and higher in human milk than in the corresponding formulas. Dietary intake of polyamines was associated with their content in human milk (putrescine $r = 0.72$, ($p < 0.0001$); spermidine $r = 0.76$ ($p < 0.0001$); and spermine $r = 0.53$ ($p = 0.003$)). Total polyamine concentrations were higher in milk from obese mothers with intervention (703.9 ± 31 nmol/dl at 3 days, 767.5 ± 31 nmol/dl at 1 month and 727.2 ± 28.2 nmol/dl at 2 months) than the obese control mothers (571.2 ± 25.3 nmol/dl at 3 days, 603.2 ± 24.2 nmol/dl and 567.6 ± 22.3 nmol/dl at 1 month and 2 months, respectively), ($p < 0.01$).

Conclusions: The database provides information for other researchers in their quest for information regarding polyamine intake from foods. The average daily total polyamine intake was low in comparison with an intake estimated from healthy diet recommendations. None of the formulas reached the total concentration in corresponding breast milk. The strong correlation between breast milk content and mother's intake, and the higher concentrations in milk from obese women after general dietary intervention at all lactation times compared with that from both normal weight and obese women, suggest that dietary advice can improve the contents of breast milk.

Keywords: Putrescine; spermidine; spermine; foods; polyamine intake; breast milk, formulas.

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