

## Frequency of dairy products in preschool centers' meals with regard to seasons

Irena Colić Barić, Mirjana Brlečić

Original scientific paper-Izvorni znanstveni rad

UDC:637.144

### *Summary*

*It is well known that dairy products contain a great number of essential nutrients having positive influence on human health. The aim of this study was to determine the nutritive value of meals and frequency of dairy products in preschool centers' meals with regard to season. For assessment of energy and nutritive value as well ascertain food frequency in daily diet during four seasons the monthly reports menu were used.*

*According to the results the energy gained by the meals was adequate. Proteins were present in high amount (154.3 % RDA). The energy fraction of dairy products in average was 14.3 % what is for children age 4-6 less than recommended. Those products were served in average 6.5 times/5 days what represented 1.6 serving units per day. Milk was present in daily meals on regular basis, yogurt was present twice and cheese ones a week or even less. Milk and dairy products ensured of 362 mg (45.5 % DRI) of calcium, 272 mg (354.4 % DRI) of phosphorus, 36.3 mg (27.9 % DRI) of magnesium and 0.5 mg (83.3 % DRI) of vitamin B<sub>2</sub>.*

*Thus, dairy products should be included at least twice in daily preschool meals.*

*According to season significant difference was detected, mostly between spring and summer, with regard to milk and dairy products. With regard to energy and nutritive value difference between spring and autumn have been established.*

*Key words: milk and dairy products, preschool centers, meals, seasons*

### ***Introduction***

It is well known that healthful eating habits can best be achieved by consumption of a varied diet in moderation that includes foods from each of the major food groups as illustrated by the US Department of Agriculture Food Guide Pyramid (US Dept of Agriculture). Dairy products contain a great number of essential nutrients such as essential amino acids, fat acids, vitamins and minerals, especially calcium (Whitney et al., 1999; Tratnik, 1998). These products have also positive influence on human health especially because of fat content (Parodi, 1997), presence of alive microorganisms (Walker and Duffy, 1998) and so called active peptides (Tirrelli et al. 1997). But, it is also very difficult to meet calcium needs without a source of milk in the diet and it is advisable that 60 % of RDA for calcium is dairy calcium (Infante and Tormo, 2000.).

In childhood, dietary calcium is usually in deficit because consumption of milk and dairy products during the years decrease and consumption of soft drinks increase (Crawley and Summerbell, 1998). Nutrient intakes aggregate in families, with the strongest association found between mothers and their children but taste preferences, cultural norms, and food availability have influence on food choice too (Oliveira et al., 1992; Hornack, et al. 1997; Glanz, 1998). That means that preschool and school meals have also influence not only on nutritional status of children, but also in nutritional behavior of that young population.

Because of that the aim of this study was to determine the nutritive value of meals, especially frequency of milk and dairy products in preschool centers with regard to season.

### ***Materials and Methods***

Investigation was carried out from autumn 2000 to summer 2001 in area of Zagreb in ten preschool center chosen by random. For assessment of energy and nutritive value as well as food frequency in daily diet during four seasons the monthly reports menus were used (McDonald, 1991).

The portion sizes were expressed as weight (g). Nutritive value of thirty daily meals (breakfast, lunch and afternoon snack) was calculated using the food composition tables (Kulier, 1990.). Nutrient intakes were observed with regard to Recommended Dietary Allowances (RDA) (The National Academy

of Science 1989.; The Ministry of Health, 1994.) and Dietary Reference Intakes (DRI) (Food and Nutrition Board, 1997.).

Dairy products were expressed as weight, share of daily energy value of meals, frequency and serving units. The share of some minerals and vitamins from dairy origin, were also calculated.

Statistical analyses were performed by StatSoft, Inc. (Version 5,1, 1995) and included standard deviation (SD) and F-test.

### ***Results and discussion***

The American Dietetic Association (ADA) advocates the development of dietary guidelines specifically for children to ensure that school lunches will both provide adequate energy and nutrients and support health (Position of ADA, 1999.). The same results are expected from meals in our schools and preschool centers (Hiršl-Hećej, 1993.).

Average daily nutritive value of breakfasts, lunches and afternoon snacks with regard to seasons are presented in Table 1. Those three meals had to cover 70-75 % of RDA on daily intake of energy and all essential nutrients (proteins, vitamins and minerals). They have to be well balance with regard to energy share of macronutrients.

During the year investigated on average energy value of daily meals was 5701.7 kJ or 75.7 % of RDA with regard to age of the children, what was in correlation to recommendation (Table 1). Individual children's energy needs vary widely, depending on their growth and physical activity. In average, and with regard to season, energy value of daily meals was between 1265.5 and 1464.4 kJ (Table 1). Energy value was significantly different ( $p < 0.05$ ) only between spring and autumn.

Like energy needs, total protein needs increase slightly with age. Recommended dietary allowance in children age 4-6 years for proteins is 24 g/day. In average proteins were present in very high amount in daily meals (191.5 % of RDA) (Table 1.). Some studies have shown that calcium excretion rates increase with increasing protein intake and, generally result in negative calcium balance (Heaney, 1993; Linkswiler, 1981). Very high protein

tabli 1



intake was observed also among children who were not in day-care centers or schools too (Colić Barić et al., 2000., Colić Barić and Šatalić, 2002.).

With regard to seasons significant difference ( $p < 0.05$ ) in protein content was observed for summer and autumn (Table 1.)

In average energy share of proteins was 11.1 % and with regard to seasons was not significantly different (Table 1.). Energy share of proteins was lower than expected (15-20 % kJ/day) and lower than in the study with hospitalized children (Panjkota Krbavčić, et al., 1999.)

In average fat content was well balance in daily diet, and ranged from 22.7 to 37.9 % kJ/day respectively (Table 1.). Energy share of carbohydrates was generally less than 60 % but more than 55 %, what was in good agreement with dietary recommendation (Table 1.). With regard to seasons fat and carbohydrates were significantly different ( $p < 0.05$ ) between spring and autumn (Table 1.).

The share of milk and dairy products in preschool meals is presented in Table 2. From winter to autumn dairy products were present daily in children's meals from 85 to 590 g (mL). Generally during the summer the highest consumption of dairy products and the lowest during spring was notice ( $p < 0.05$ ). Energy share of dairy products in daily children's diet should be 20%. Generally this was lower than recommended during all four season investigated.

According to children's daily food patterns dairy products should be served 3 to 4 times per day and for children 4 to 6 years old  $\frac{3}{4}$  of cup is average size of serving (Whitney, 1999.). With regard to that during the year investigated dairy products were served from 0.4 to 3.1 with an average of 1-1.5 serving units per day (Table 2.). Similar intakes had adolescent girls (Colić, Barić et al., 2000.). Milk was the a major part of all dairy products presence in daily meals during the week (five working days) (Table 3.). It was present in every day meals during control period, while yogurt (0.5 time / 5 days) and especially cheese (0.3 time / 5 days) were children' daily diet in all four seasons (Table 3.). Pudding was often present as well (Table 3.). Similar very rare in situation was detected in children's hospital daily diet (Panjkota Krbavčić et al., 1999.). Pudding and ice cream were consumed 4.9 times/week, and as in daily diet of hospitalized children have the highest frequency consumption. According to research, which detect preferences









among children in Croatia, all types of cold milk and spread cheese were highly preferred in contrast to yogurt and hard cheese (Colić Barić, 2001.). According to that investigation children treat milks as food and not as drink.

It was expected that children will consume those products in similar amount at home and if not an adequate intake of calcium is hard to reach during the day. Calcium share in preschool meals from dairy products was present in amount lower than 75 % of RDA (Table 4). DRI for children's (4-8 years of age) calcium intake is the same to RDA or 800 mg per day. In average and according to season calcium from dairy products was present from 307.8 mg/day in spring to 415.4 mg/day in summer, what was 38.5 and 51.9 % of RDA and DRI respectively. DRI for phosphorus is 500 mg/day what is less than RDA (800 mg/day). According to recommendation phosphorus was well balanced by dairy as well as vitamin B<sub>2</sub> (Table 4.). Recommendation for magnesium was higher than 120 mg/day according to RDA. Still intake of magnesium was good especially when is known that magnesium is well spread in all, but specially in food of animal origin.

Low consumption of milk in adolescent age is very common, although according to one study in Croatia school children were well educated about role of milk in human nutrition as well as recommended intake of milk. Still, school and preschool centers should be including in education process, especially when they designed the meals. Dairy products should be more frequently included in preschool meals. The recommendation is at least twice per day.

With regard to seasons significant difference was detected mostly for spring and summer. Milk was only served twice a day in some cases.

### ***Conclusions***

According to results obtained the energy was well balanced in meals. Proteins were present in high amount (154.3 % RDA). Energy share of dairy products was in average 14.3 % what is for children age 4-6 less than recommended. Those products were served in average 6.5 times/5 days what represented 1.6 serving units per day. Milk was the mostly present dairy product in daily meals, while yogurt and cheese were present ones a week or even less. Milk and dairy products ensured of 362 mg (45.5 %RDA) of

calcium, 272 mg (354.4 %DRI) of phosphorus, 36.3 mg (27.9 % DRI) of magnesium and 0.5 mg (83.3 % DRI) of vitamin B<sub>2</sub> in daily diet.

Dairy products should be more frequently included in preschool meals.

With regard to seasons significant difference was detected mostly between spring and summer in presence of milk and dairy products and with regard to energy and nutritive value mostly between spring and autumn.

### **ZASTUPLJENOST MLIJEKA I MLIJEČNIH PROIZVODA U OBROCIMA PREDŠKOLSKIH USTANOVA S OBZIROM NA GODIŠNJA DOBA**

#### **Sažetak**

*Mlijeko i mliječni proizvodi izvor su velikog broja esencijalnih nutrijenata za ljudski organizam, ali i komponente koje imaju pozitivan utjecaj na ljudsko zdravlje. Cilj ovog istraživanja bio je utvrditi prehrambenu vrijednost i učestalost mlijeka i mliječnih proizvoda u obrocima koji se nude u predškolskim ustanovama s obzirom na godišnje doba. Da bi se utvrdila energijska i nutritivna vrijednost, kao i učestalost određenih namirnica u obroku, korišteni su mjesečni jelovnici za četiri godišnja doba.*

*Prema dobivenim rezultatima obroci energijski odgovaraju, dok proteina ima više nego li se preporuča (154, 3 %). Energijski udjel mlijeka i mliječnih proizvoda u prosjeku iznosi 14,3 %, što je s obzirom na potrebe djece u dobi 4-6 godina, manje od preporučenog. Ti proizvodi bili su u prosjeku 6,5 puta/5 dana, što znači 1,6 servirnih jedinica po danu. Mlijeko je najzastupljenije u dnevnim jelovnicima, dok je jogurt zastupljen jednom do dva puta, a sir jednom na tjedan, a čak i rjeđe. Mlijeko i mliječni proizvodi bili su izvor 362 mg (45,5 % DRI) kalcija, 272 mg (354,4 % DRI) fosfora, 36,3 mg (27,9 % DRI) magnezija i 0,5 mg (83,3 % DRI) vitamina B<sub>2</sub>.*

*Mlijeko i mliječni proizvodi u dnevnom jelovniku predškolskih ustanova trebali bi biti češće zastupljeni. S obzirom na godišnje doba, statistički značajna razlika utvrđena je uglavnom između proljeća i ljeta, s obzirom na zastupljenost mlijeka i mliječnih proizvoda, a s obzirom na energijsku i nutritivnu vrijednost uglavnom između ponuđenih obroka u proljeće i jesen.*

*Ključne riječi: mlijeko i mliječni proizvodi, predškolske ustanove, obroci, godišnja doba*

#### **References**

- COLIĆ BARIĆ, I., (2001): A comparison of nutrition knowledge, attitudes and dairy consumption of school children according to age and gender. *Mljekarstvo*, 51, 3-14.
- COLIĆ BARIĆ, I., KENĐEL, G., ŠPANJUR, L., ŠATALIĆ, Z (2000): Milk and dairy products in daily diet of children and adolescents according to age and sex. *Mljekarstvo*, 50, 99-112.
- COLIĆ BARIĆ, I., ŠATALIĆ, Z (2002): Breakfast quality differences among children and adolescents in Croatia. *Int. J. Food Sci. Nutr.*, 53, 79-87.
- CRAWLEY, H.F., SUMMERBELL, C.D. (1998): The nutrient and food intakes of British male dieters aged 16-17 years. *J.Human Nutr. & Diet.*, 11, 33-40.
- FISHER, J.O., BIRCH, L.L. (1995): Fat preferences and fat consumption of 3 to 5 years old children are related to parental adiposity. *J.Am.Diet.Assoc.*, 95, 759-764.
- FOOD AND NUTRITION BOARD (1997): *Dietary reference intake for calcium, phosphorus, magnesium, vitamin D, and fluoride*. Washington, DC: National Academy Press.
- GLANZ, K., BASIL, M., MAIBACH, E., GOLDBERG, J., SNYDER, D., (1998): Why American eat what do: taste, nutrition, cost, convenience and weight control concerns as influence on food consumption. *J.Am.Diet.Assoc.*, 98, 118-1126.
- HEANEY, R.P.(1993): Protein intake and the calcium economy. *J.Am.Diet.Assoc.*, 93,1259-1260.
- HIRŠL-HEČEJ, V. (1993): *Prehrana djece predškolske dobi*. Institut za zaštitu majki i djece. Zagreb.
- HORNACK, L., BLOCK, G., LANE, S. (1997): Influence of selected environmental and personal factors on dietary behavior for chronic prevention; a review of the literature. *J. Nutr. Educ.*, 29, 306-312.
- INFANTE D., TORMO R. (2000): Risk of inadequate bone mineralization in diseases involving long-term suppression of dairy products. *Journal of Pediatric Gastroenterology and Nutrition*. 30, 310-313.
- KULIER I. (1990): Prehrambene tablice (Food composition data). Diana, Zagreb.
- MCDONALD, I. (1991): *Monitoring Dietary Intakes*. Springer-Verlag. Berlin, p. 4-34.
- NATIONAL ACADEMY OF SCIENCE (1989): *Recommended dietary allowances*. Washington, DC: National academy of science.
- OLIVEIRA S., ELLISON, R., MOORE, L., GILLMAN, M. (1992) - Parent-child relationship in nutrient intake: The Framingham Children's Study. *Am.J.Clin.Nutr.* 56, 594-598.
- PANJKOTA KRBAVČIĆ, I., COLIĆ BARIĆ, I., JURKOVIĆ, N. (1999): Milk and dairy products in hospital daily diet. *Mljekarstvo*, 49, 75-82.
- PARODI, P.W. (1997): Cows' milk fat components as potential anticarcinogenic agents. *J.Nutr.*, 127,1055-1060.
- POSITION OF THE AMERICAN DIETETIC ASSOCIATION (1999): Dietary guidance for healthy children aged 2 to 11 years. *J.Am.Diet.Assoc.*, 99, 93-101.
- THE MINISTRY OF HEALTH (1994): Regulation of the health accuracy of food *Narodne novine*, 46, 1587-1597.
- STATSOFT, Inc. (1995) Version 5,1.
- TRATNIK LJ. (1998): *Mljekarstvo: tehnologija, biokemija i mikrobiologija*. Hrvatska mljekarska udruga. Zagreb.

TIRELLI, A., DE NONI, I., RESMINI, P. (1997): Bioactive peptides in milk products. *Ital.J.Food Sci.*, 2, 91-98.

US DEPT OF AGRICULTURE, HUMAN NUTRITION INFORMATION SERVICE (1992): Food Guide Pyramid: A Guide to Daily Food Choice. Home and Garden Bulletin No. 252. Washington D.C.

WALKER, W.A., DUFFY, L.C. (1998): Diet and bacterial colonization: role of probiotics and prebiotics. *J.Nutr.Biochem*, 9, 668-675.

WHITNEY, E.N., HAMILTON, E.M.N., ROFLES, S.R. (1999): Understanding Nutrition, 5 ed., West Publishing Co. Edinburgh.

**Author's addresses – Adrese autora:**

Dr. sc. Irena Colić Barić

Dipl. ing. Mirjana Brlečić

Faculty of food technology and Biotechnology, University of Zagreb

**Received – Prispjelo:**

January, 9, 2002

**Accepted – Prihvaćeno:**

February, 18, 2002