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COVER STORY

# Infants' Fluoride Ingestion from Water, Supplements and Dentifrice

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ABSTRACT

Concerns about dental fluorosis and the paucity of detailed fluoride intake data prompted this longitudinal study of fluoride intake in infants from birth to 9 months of age. On average, water fluoride intake greatly exceeded that from dietary fluoride supplements or fluoride dentifrice. However, fluoride supplements and dentifrice contributed substantial proportions of fluoride intake among children using them. Some children had estimated fluoride intake from water, supplements and dentifrice that exceeded the recommended "optimal" intake (a level that has yet to be determined scientifically). Practitioners should estimate fluoride ingestion from all these sources if considering systemic fluoride supplementation.

By the mid-1980s, the prevalence of dental caries in children had declined dramatically in the United States and other developed countries, mainly due to the widespread use of fluoride in many forms.[1,2] More recently, concerns have been raised about the increased prevalence and severity of dental fluorosis in the United States[3-5] due to the widespread ingestion of fluoride from a variety of sources. Local and regional studies in the United States and Canada have found the prevalence of mostly mild dental fluorosis to range from about 20 to 80 percent.[5-7] In an effort to help people achieve the "optimal" intake of ingested fluoride to balance dental caries prevention and dental fluorosis, the recommended dietary fluoride supplementation dosage recently has been reduced in both the United States[8-11] and Canada.[12] In addition, prudent use of small quantities of fluoride dentifrice by preschool-aged children has been widely recommended.[12-15] (Author's note: The optimal level of fluoride intake has never been determined scientifically and has been used only in general terms. Levy and Guha-Chowdhury[16] addressed the limitations of current knowledge of "optimal" fluoride intake levels.)

**TABLE 1**

**ESTIMATED TOTAL FLUORIDE INTAKE FROM WATER (mg).[17]**

| | AGE | | | |
|---|---|---|---|---|
| | 6 weeks (n=122) | 3 months (n=118) | 6 months (n=98) | 9 months (n=75) |
| **Percentile** | | | | |
| 0 (minimum) | 0 | 0 | 0 | 0 |
| 25 | 0.02 | 0.02 | 0.01 | 0.03 |
| 50 (median) | 0.14 | 0.14 | 0.24 | 0.14 |
| 75 | 0.46 | 0.56 | 0.62 | 0.49 |
| 90 | 0.83 | 1.06 | 0.93 | 0.80 |
| 100 (maximum) | 1.24 | 1.57 | 1.29 | 1.73 |
| **Overall mean (SD)** | 0.29 (0.32) | 0.35 (0.42) | 0.38 (0.40) | 0.33 (0.36) |
| **Means (SD) by water fluoride level (ppm)** | | | | |
| <0.3 | 0.03 (0.06) | 0.04 (0.06) | 0.03 (0.06) | 0.04 (0.07) |
| 0.3-0.6 | 0.20 (0.12) | 0.17 (0.08) | 0.17 (0.12) | 0.13 (0.08) |
| >0.6 | 0.46 (0.33) | 0.57 (0.44) | 0.64 (0.36) | 0.46 (0.39) |

Few studies have reported comprehensively on fluoride exposures or ingestion by children; most of these studies have used retrospective designs, which may limit their validity and utility,[17,18] especially in terms of the level of detailed response possible many years after the exposure. Little is known about the relative importance of different sources of ingested fluoride among preschool children whose permanent teeth are developing and who are at risk for dental fluorosis. Levy, Kohout, Guha-Chowdhury and colleagues recently reported on the frequency distribution of estimated intake of fluoride from water by itself, mixed with infant formula and mixed with other beverages among a group of infants from birth to 9 months of age.[18] The purpose of this article is to report on the relative contribution of fluoride ingested from water, supplements and dentifrices to overall fluoride intake among a group of infants studied longitudinally from birth until 9 months of age.

## METHODS

One hundred ninety-two women with newborns were recruited in 1990 from the postpartum wards of two Iowa City hospitals, after they had delivered but before they had left the hospital.[18] This constituted approximately 85 percent of all those invited to participate. Appropriate informed consent procedures were used. The mothers completed a recruitment questionnaire and subsequently completed structured mailed questionnaires concerning their infants at 6 weeks and 3, 6 and 9 months of age. The questionnaires focused primarily on the children's feeding habits, water sources and intake, as well as use of dietary fluoride supplements and fluoride dentifrice during the time since the previous questionnaire. Nonrespondents received a second mailing after three weeks and were contacted by telephone again three weeks later. Participants received toothbrushes as incentives. Fifty-six mothers did not return any questionnaire after recruitment, 21 returned one of the four, 24 returned two, 26 returned three and 65 returned all four.

Mothers reported whether their infants had ingested any of these 13 categories of beverages and food during the previous week, and if so, the average daily amount ingested:

- water by itself;
- powdered concentrate formula reconstituted with water;
- liquid concentrate formula reconstituted with water;
- ready-to-feed formula;
- cow's milk;
- breastmilk;
- ready-to-drink juices;
- beverages reconstituted with water;
- other ready-to-drink beverages;
- ready-to-feed baby food;
- powdered infant cereal reconstituted with water;
- other food made with water;
- table food.

Total daily water intake was estimated from the reported intake of water by itself; powdered and liquid concentrated formulas reconstituted with water; beverages reconstituted with water; powdered infant cereals reconstituted with water; and other food made with water (such as gelatin, pudding, soup).

**TABLE 2**

## DIETARY FLUORIDE SUPPLEMENT USE.

| VARIABLE | AGE | | | |
|---|---|---|---|---|
| | 6 weeks | 3 months | 6 months | 9 months |
| **Percentage receiving supplements** | 25 | 19 | 23 | 23 |
| **Supplement use (among users only)** | | | | |
| Number of subjects | 31 | 22 | 22 | 17 |
| Mean percentage (SD) of weeks in period | 63 (29) | 84 (26) | 82 (30) | 72 (35) |
| Mean percentage (SD) of days per week* | 83 (28) | 86 (22) | 91 (19) | 86 (26) |
| Mean daily intake (SD) from supplements† | 0.13 (0.08) | 0.18 (0.08) | 0.19 (0.08) | 0.14 (0.09) |

* In weeks when supplements were received.
† Mean daily intake from supplements=(supplement dosage prescribed)•(proportion of weeks that supplements were received)•(proportion of days that supplements were received).

In addition to completing a questionnaire at each time point, mothers also completed three-day intake diaries of all beverages and foods that we used to confirm the mothers' answers concerning these categories of ingestion. We contacted the mothers by telephone or mail to clarify important discrepancies between questionnaire and diary responses. No assessment of reliability of subject responses was conducted.

Fluoride levels of well water, bottled water and filtered water supplies in homes and child care settings were assayed with a fluoride-specific electrode. Available information obtained from the State of Iowa Health Department reporting monthly fluoride values was used to determine fluoride levels in those homes and child care settings using public water supplies. We estimated the amounts of fluoride ingested from water at each age by multiplying the amounts of water ingested times the fluoride levels of the water used.

At each time point, mothers reported whether their infants received dietary fluoride supplements. If so, then they reported the number of weeks that supplements were given, the average number of days per week given and the brand and dosage used. From these responses, we calculated an average daily fluoride supplement dosage. If dosage data were not available, we assumed that the then-recommended dosage of 0.25 milligrams of fluoride was used.

Mothers also reported whether their infants had any teeth yet, whether the teeth were brushed, the daily frequency of brushing, whether fluoride dentifrice was used, the quantity of dentifrice used (by choosing from among pictures of toothbrushes with varying quantities of dentifrice)[17,19] and an estimate of the proportion of dentifrice usually ingested. From these responses, we estimated the infants' average daily fluoride dentifrice use and ingestion.

We analyzed the data using SPSS-PC Plus (SPSS Incorporated) with descriptive statistics generated at each time point for each variable for the whole sample. Here we present selected results according to composite water fluoride levels (individually weighted averages of home, bottled water and child care setting sources) categorized as <0.3 parts per million, 0.3 to 0.6 ppm or >0.6 ppm, according to the dietary fluoride supplement categories for water fluoride levels recently adopted by the American Dental Association, the American Academy of Pediatrics and the American Academy of Pediatric Dentistry.[8-11]

The results presented here are for the 122 respondents at 6 weeks of age, 118 at 3 months, 98 at 6 months and 75 at 9 months. This is the same group of children followed longitudinally, not different groups at each time period.

### RESULTS

We compared the baseline responses at recruitment of respondents with those of non-respondents at the different time points to assess possible non-response bias.[18] No significant differences arose between respondents and non-respondents in source of water, child care plan, number of adults or children in the family or family income. Only on parent education did respondents differ significantly; the mothers and fathers of infants remaining in the study at 6 months and 9 months of age had significantly higher levels of education than did the parents of non-respondents.[18] We also compared 3-month and 6-month fluoride in-

**TABLE 3**

## TOTAL FLUORIDE INTAKE FROM WATER, SUPPLEMENTS AND DENTIFRICE (mg).

| | AGE | | | |
|---|---|---|---|---|
| | 6 weeks | 3 months | 6 months | 9 months |
| **Percentile** | | | | |
| 0 (minimum) | 0 | 0 | 0 | 0 |
| 25 | 0.05 | 0.06 | 0.11 | 0.06 |
| 50 (median) | 0.26 | 0.21 | 0.29 | 0.22 |
| 75 | 0.49 | 0.56 | 0.68 | 0.49 |
| 90 | 0.83 | 1.06 | 0.98 | 0.80 |
| 100 (maximum) | 1.24 | 1.57 | 1.65 | 1.73 |
| **Overall mean (SD)** | 0.32 (0.32) | 0.38 (0.41) | 0.42 (0.37) | 0.34 (0.36) |
| **Means (SD) by water fluoride level (ppm)** | | | | |
| <0.3 | 0.09 (0.10) | 0.07 (0.08) | 0.12 (0.11) | 0.12 (0.14) |
| 0.3-0.6 | 0.20 (0.12) | 0.19 (0.11) | 0.26 (0.14) | 0.13 (0.08) |
| >0.6 | 0.48 (0.33) | 0.60 (0.41) | 0.65 (0.35) | 0.49 (0.39) |

take estimates between those responding and those not responding at later time points (six months and nine months).[18] Although we found no statistically significant differences, those responding at more time points tended to have a higher estimated fluoride intake.[18]

Table 1 summarizes the previously reported[18] frequency distribution of estimated total fluoride intake from water for the total sample at each age checkpoint. There is substantial variation in intake, with the standard deviations larger than the means. The distributions are skewed; the means are approximately twice as large as the medians. The medians were 0.14 mg of estimated ingested fluoride daily, except at age 6 months with median intake of 0.24 mg, while the mean intakes were from 0.29 to 0.38 mg. The maximum individual intakes ranged from 1.24 to 1.73 mg per day. Table 1 also presents the means separately for water fluoride levels (weighted average of home, bottled and child-care–setting water sources) and categorizes them as <0.3, 0.3 to 0.6, or >0.6 ppm fluoride.

Table 2 summarizes the use of dietary fluoride supplements. Supplement use varied little at the different time points, and there was no apparent increase or decrease over time. Among those who gave their children supplements, the mean percentages of weeks (in each time period) that they used supplements were 63 to 84 percent. In the weeks that supplements were used, they were used an average of 83 to 91 percent of the days. Among the children using supplements, estimated mean daily fluoride intake from supplements varied only from 0.13 mg at 6 weeks to 0.19 mg at 6 months.

No parents reported their infants' using fluoride dentifrice before their 9-month questionnaires. At 9 months, 88 percent of the mothers reported that their infants had 1 or more teeth and 56 percent of these said their infants' teeth were being brushed. Among these 37 children, 40 percent had teeth brushed less than once daily, 57 percent brushed once daily and 3 percent brushed twice daily (mean=0.80, SD=0.36). Thirty percent of those whose teeth were brushed used fluoride dentifrice (n=11). The estimated quantity of fluoride dentifrice used per brushing varied from less than 0.01 to 0.25 grams (mean=0.08, SD= 0.07). The estimated quantity of fluoride ingested daily ranged from less than 0.01 to 0.25 mg (mean= 0.06, SD=0.08).

Table 3 summarizes the estimated total fluoride intake from water, supplements and dentifrice combined. The results are very similar to, but slightly higher than, those shown in Table 1 for fluoride intake from water, since most infants received neither fluoride supplements nor dentifrice. There is substantial variation in total estimated fluoride intake from these sources, and the distributions are positively skewed (means were greater than medians). There was a fairly consistent trend toward increased daily fluoride intake with increasing age (except at 9 months). However, when adjusted on the basis of fluoride in-

**TABLE 4**

**PERCENTAGES OF FLUORIDE INTAKE FROM WATER, SUPPLEMENTS AND DENTIFRICE.**

| VARIABLE | AGE | | | |
|---|---|---|---|---|
| | 6 weeks | 3 months | 6 months | 9 months |
| **From water** | | | | |
| Range | 1-100 | 0-100 | 0-100 | 1-100 |
| Mean (all) | 86 | 88 | 82 | 86 |
| SD (all) | 32 | 30 | 36 | 30 |
| Mean (among users only) | 86 | 89 | 83 | 86 |
| **From supplements** | | | | |
| Range | 0-99 | 0-100 | 3-100 | 0-98 |
| Mean (all) | 14 | 12 | 18 | 12 |
| SD (all) | 32 | 30 | 36 | 27 |
| Mean (among users only) | 65 | 80 | 77 | 52 |
| **From dentifrice** | | | | |
| Range | – | – | – | 0-46 |
| Mean (all) | 0 | 0 | 0 | 2 |
| SD (all) | – | – | – | 15 |
| Mean (among users only) | – | – | – | 19 |

take per unit body weight (milligrams of fluoride per kilogram of body weight), fluoride ingestion remained relatively constant or declined slightly with increasing age.[14,18] Table 3 also presents the means reported separately for the different water fluoride levels (composite of home, bottled and child-care–setting water). Standard deviations also were higher for those with higher water fluoride levels.

Table 4 summarizes the separate distributions of total combined fluoride intake from water, supplements and dentifrice that come from each source separately. The mean percentage of this intake from water varied only slightly, from 82 percent for 6-month-olds to 88 percent for 3-month-olds. Overall, supplements and dentifrices contributed little to the fluoride intake. However, among those using supplements or dentifrice, these sources contributed more substantially to fluoride ingestion. For example, supplements contributed 12 percent (among 3-month- and 9-month-olds) to 18 percent (among 6-month-olds) of the total fluoride intake from these three sources for the whole sample. However, when considered for only those receiving supplements, the percentage contributions ranged up to maximums of 98 to 100 percent, and the mean percentage contributions ranged from 52 percent (at nine months) to 80 percent (at three months). Dentifrice ingestion was not reported until the 9-month checkpoint. Among the total sample of 9-month-olds, the mean percentage of fluoride intake contributed by dentifrice ingestion was only 2 percent. However, among only users of fluoride dentifrice, dentifrice contributed up to 46 percent, with a mean of 19 percent.

## DISCUSSION

**Sample.** There are several factors to consider in interpreting the results of this study. Although the infants in this convenience sample did show a wide range of feeding patterns, water fluoride levels and patterns of use of supplements and dentifrice, the sample is not necessarily representative of the broader population of infants.[18] The values of fluoride intake calculated are estimates only, derived from parents' reports that were not validated.[18] And fluoride intake from ready-to-consume infant formulas, juices, baby foods and other foods and beverages was not included in this study.[18] Also, the ages of the participating infants actually varied by anywhere from a few days to several weeks, which could affect food and beverage intake patterns.[18]

Furthermore, the numbers of infants for whom we have data varied across the time periods. However, comparisons of baseline data from respondents and non-respondents and of three- and six-month data according to response/non-response at later time points showed few significant differences. In addition, other analyses (not described in this article) showed similar dietary patterns and estimated dietary intake for respondents who provided data at all four time points as for the respondents overall.[18] Individual body weights were not available; thus calculations of fluoride intake per unit of body weight used only aggregate weights linked to individual fluoride intake data and, therefore, are only estimates.[18] For these and

**TABLE 5**

**PERCENTILES OF DISTRIBUTION OF ESTIMATED FLUORIDE INTAKE FROM WATER, SUPPLEMENTS AND DENTIFRICE.***

| PERCENTILE | ESTIMATED F INTAKE FROM THIS STUDY (MG/DAY) | BODY WEIGHT† (KG) | EXPECTED "OPTIMAL" F INTAKE (MG/DAY)** |
|---|---|---|---|
| **6 weeks** | | | |
| 50 (median) | 0.26 | 4.8 | 0.24-0.34 |
| 75 | 0.46 | 5.1 | 0.26-0.36 |
| 90 | 0.83 | 5.4 | 0.27-0.38 |
| **3 months** | | | |
| 50 (median) | 0.21 | 6.0 | 0.30-0.42 |
| 75 | 0.56 | 6.4 | 0.32-0.45 |
| 90 | 1.06 | 6.8 | 0.34-0.48 |
| **6 months** | | | |
| 50 (median) | 0.29 | 7.6 | 0.38-0.53 |
| 75 | 0.68 | 8.1 | 0.41-0.57 |
| 90 | 0.98 | 8.5 | 0.43-0.60 |
| **9 months** | | | |
| 50 (median) | 0.22 | 8.7 | 0.44-0.61 |
| 75 | 0.49 | 9.3 | 0.47-0.65 |
| 90 | 0.80 | 9.8 | 0.49-0.69 |

* Adapted from Levy and colleagues.[17]
† Average weight of boys and girls combined.[23] Body weight of 6-week-old infants has been calculated by taking the average of weights of infants aged 4 weeks and 8 weeks.
** Expected range of fluoride intake based on 0.05=0.07 mg fluoride/kg body weight traditionally being accepted as optimal.

other reasons, caution is necessary in generalizing from the results of this study, and specific assessment of fluoride exposures and ingestion must be done at the individual level.

Despite these limitations, this report has demonstrated substantial variation in estimated total ingestion of fluoride from water, dietary fluoride supplements and dentifrice among children ranging from 6 weeks to 9 months of age. Virtually every child received some fluoride from drinking water, whether only at home or both at home and in the child care setting. Supplements were used by about 25 percent of the children, and only a small percentage of 9-month-olds ingested fluoride dentifrice.

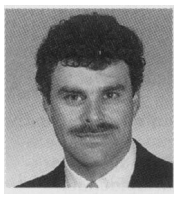
**Contributions of fluoride sources on ingestion and intake levels.** We evaluated the contributions of the three fluoride sources—supplements, dentifrice and water (alone and in food and beverages)—to ingestion and intake levels.

*Supplements and dentifrice.* When we averaged the contributions of dietary fluoride supplements and fluoride dentifrice over the whole study group, we found that they contributed small absolute quantities of fluoride ingestion and small percentages of total fluoride intake at each age from 6 weeks to 9 months. However, in the children who ingested supplements or fluoride dentifrice, absolute quantities of intake from these sources and percentages of total intake were substantially larger. For some infants, estimated ingestion of fluoride from supplements and/or dentifrice exceeded that from water and all beverages and foods prepared with water. Thus, all three general sources of fluoride intake—water, supplements and dentifrice—should be considered when estimating total fluoride intake.

Since children in this study were studied only until 9 months of age, fluoride dentifrice use was not yet nearly universal, as it generally becomes by about age 18 months to 24 months. Fluoride dentifrice was used at 9 months by only about 30 percent of those whose teeth were brushed, as many mothers initially brush without dentifrice until more teeth have erupted. Thus, dentifrice would be a much more important source of fluoride intake at 12 months of age and thereafter.

*Water.* Although infants who had higher fluoride levels in their drinking water generally received more fluoride and clearly had higher mean fluoride ingestion than did those with lower water-fluoride levels, there was substantial variability at the individual level. Some children ingesting large quantities of water with moderate fluoride levels may receive more fluoride than do others ingesting much smaller quantities of optimally fluoridated water.

*Ready-to-feed food and beverages.* It would be desirable also to include fluoride intake from ready-to-feed foods and beverages or those prepared without adding water. However, it generally is difficult to estimate fluoride intake from these sources since their levels can vary substantially, especially depending on the water sources



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used in their manufacture.[14,16,20-22] This does not negate the need for the clinician to estimate a child's total fluoride intake to account for any substantial quantities of ready-to-feed high-fluoride foods or beverages—for instance, ready-to-feed soy-based infant formulas, chicken baby foods, infant grape juices, tea—that the child may be consuming. Perhaps mean values could be used as estimates for these products' fluoride levels.

**The optimal intake level.** We reported previously that estimated daily fluoride intake only from water itself, from water added to beverages and from foods made with water probably exceeded the traditionally accepted optimal total daily fluoride intake of 0.05 to 0.07 mg fluoride per kg of body weight for a substantial percentage of the infants in this study.[18] Similar and slightly stronger patterns of fluoride intake that exceed optimal fluoride intake are evident when intake from supplements and dentifrice (Table 3) are included. For example, a total optimal daily fluoride intake of 0.05 to 0.07 mg fluoride/kg body weight would mean totals (Table 5) of about 0.24-0.34 mg fluoride for a 6-week-old with mean body weight of 4.8 kg,[23] 0.30-0.42 mg fluoride for a mean-weight (6.0 kg) 3-month-old, 0.38-0.53 mg fluoride for a mean-weight (7.6 kg) 6-month-old and 0.44-0.61 mg fluoride for a mean-weight (8.7 kg) 9-month-old.

Mean (and median) fluoride intake in this study from water, supplements and dentifrice (but excluding other dietary fluoride intake) in infants up to 6 months old was within or less than these optimal total daily intake ranges. However, the 75th percentiles from our data for 6-week-olds, 3-month-olds and 6-month-olds clearly exceeded the ranges for 75th percentiles of expected optimal intake by about 0.10 to 0.27 mg. The 90th percentile of estimated fluoride intake exceeded the expected optimal daily fluoride intake for all age groups from 6 weeks to 9 months, with the extra amounts being about 0.45 to 0.56 mg for 6-week-olds, 0.58 to 0.72 mg for 3-month-olds, 0.38 to 0.55 mg for 6-month-olds and 0.11 to 0.31 mg for 9-month-olds. These 90th percentiles of intake for 6-week-olds and 3-month-olds are more than twice the expected optimal intake, with the proportional differences somewhat less dramatic for those 6 months or older.

**Deciding when to use a supplement.** With the majority of children having much less decay than in the past, with diverse sources and variable quantities of ingested fluoride and with the role of systemic fluoride understood to be less important than previously believed, decisions about use of dietary fluoride supplements are more complex than they were in the past. Their use has been questioned[24] because it increases the risk of dental fluorosis, while average reductions in decay are more modest compared with those in the past. Therefore, our research group[14,16,20,25] and others[9,13,15] have recommended more conservative use of dietary fluoride supplements, although continued emphasis on dietary fluoride supplements has also been recommended.[26] Specifically, our research group recently recommended[14] that supplements be "considered a targeted preventive regimen instead of being used routinely for the general population of all children living in non-fluoridated areas."

When considering use of dietary fluoride supplements, assessment of the patient's caries risk should be a primary consideration.[14] Although this determination is especially difficult to make for young children, often the "previous caries history for the child, siblings, and parents; the family's dental knowledge and preventive orientation; the child's physical and cognitive status and use of medications; the child's oral preventive behaviors; the child's other fluoride exposures; and possibly results of caries activity tests"[14] are important aspects to consider.

**Monitoring fluoride intake.** The results of this study are consistent with our recent recommendations[14] concerning dietary fluoride. Since it is difficult to avoid excessive intake of fluoride by adjusting fluoride intake via control of food and beverage consumption,[14] primary emphasis should be on limiting fluoride ingestion from the more

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defined sources of supplements and dentifrices. However, manufacturers of bottled waters, juices and soft drinks; infant formulas; and baby foods should be required to monitor and list the fluoride levels on their products.[14] Also, "infants receiving substantial quantities of infant formula generally should not use powder or liquid concentrate if water fluoride levels are near optimal or above, since the water fluoride alone might then exceed total, recommended daily levels."[14]

**Monitoring dentifrice use.** Concerning dentifrice use, the prevention of ingestion of large quantities of fluoride dentifrice by young children should be a major emphasis of the whole dental team within the office, as well as of professional organizations and manufacturers. Use of small, pea-sized quantities of dentifrice by young children; parental responsibility for placement of dentifrice and actual brushing, with special attention to dentifrices flavored for children that may encourage ingestion[27] and those with high fluoride concentration; and eliminating corporate promotion of use of a full strip of dentifrice are all important components of such efforts.[12-17,19-30] In addition, emphasis on future research and acceptance of dentifrices that have a lower-than-conventional concentration of fluoride is warranted.[12-14,16,20,31]

## CONCLUSION

It is hoped that by considering all sources of ingested fluoride; making more conservative, individualized use of dietary fluoride supplements; and prudently using fluoride dentifrice, dentists and their patients can best balance caries prevention and the risks of dental fluorosis. Also, because physicians prescribe most of the dietary fluoride supplements used by infants and young children, it is important for dentists and/or other members of the dental team to discuss these considerations with their medical colleagues. ■

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