COMPARISON OF FLUORIDE CONTENT IN CAFFEINATED, DECAFFEINATED AND INSTANT COFFEE

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SUMMARY: A previous study has reported the mean fluoride (F) level of decaffeinated tea infusions, 3.19 ppm, is significantly (P<0.01) higher than those of caffeinated tea infusions, 1.74 ppm. The present study is designed to determine F concentrations of coffees available in the Houston area and to determine if different types of coffee may vary in their F content. Forty different brands and types of coffee were obtained from the supermarket or specialty coffee stores. Mean fluoride content in coffee drinks is rather low. Content ranged from 0.10 to 0.58 ppm and is much less than those in tea infusions. Unlike the tea infusions, there is no statistically significant difference between caffeinated and decaffeinated coffees. In view of the results of this study, coffee consumption has no major impact on total daily dietary fluoride intake.

Key words: Coffee; Fluoride content; Total dietary intake.

Introduction

Recent studies have reported an increase in the mild to very mild type of enamel fluorosis in US children.[1] Whether dental fluorosis is a minor esthetic concern or an early toxicological sign is an international controversy and will not be addressed in this paper. In the US where 60% of the population drink water fluoridated at recommended optimal levels, the US Public Health Service found no associated health risks in their review of 50 epidemiological studies and animal toxicity data.[1] However it is important to note that low levels of fluoride affect populations differently in parts of the world where nutrition, climate, work habits, dietary patterns and fluid consumption are different.[2,3]

One of the suggested causes of enamel fluorosis is an increase in dietary fluoride intake by children.[4] This has been attributed to accidental ingestion of fluoride dentifrices, topical gels, foods and beverages prepared with fluoridated water, and foods and beverages with a high natural fluoride content.[4] In 1994, the Council on Dental Therapeutics of the American Dental Association adopted a new schedule for dietary supplementation for US children which lowered previous recommendations.[5] This was done in an attempt to reverse or stop the increase in fluorosis indicated by epidemiological studies.[5]

A previous study by Chan and Koh reported that excessive tea consumption during early childhood "could result in excessive fluoride intake and lead to enamel fluorosis."[6] The study reported that depending on infusion time, fluoride concentrations of infusions of tea ranged from 0.84 - 5.12 ppm.[6] Significant differences

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in fluoride concentrations were found among the three types of tea: caffeinated (mean = 1.50 ppm), decaffeinated (mean = 3.19 ppm), and herbal (mean = 0.05 ppm). The high level of fluoride in tea has been known for years and has been suggested to have a potential impact on total dietary fluoride intake.[5,7] Previous studies from our laboratory have reported the fluoride content of many popular beverages and bottled and filtered drinking water.[7-12]

Coffee is a popular US beverage. To the extent of our knowledge, fluoride levels of the different types of coffee have not been reported. These data could be useful in calculating total dietary fluoride intake for at risk populations. The purpose of this study was to determine levels of fluoride concentration in coffees available in the Houston area and also to determine if a difference exists among the different types of coffee; caffeinated, decaffeinated, and instant.

Materials and Methods

Forty different brands and types of coffee were obtained from the supermarket and specialty coffee stores. Coffee specimens were prepared by pouring 180 mL of deionized distilled water, preheated to 85°C through a paper coffee filter containing 15 cc of coffee. The resulting coffee was allowed to cool to room temperature and was tested the same day as preparation. To facilitate the accuracy of fluoride determination, each coffee sample was diluted 1:1 (v:v) with total ionic strength adjusted buffer solution (TISAB, Orion No. 940909) prior to F measurement. Duplicate F measurements were made and F level was reported in ppm.

Fluoride measurements were performed with a fluoride specific electrode (Orion Model 960900) coupled to a millivolt meter (Orion Model 811). ANOVA were used to determine statistical significance (at $P < 0.05$) in differences of F content among the three types of coffee.

Results and Discussion

The fluoride content in coffee infusion ranged from 0.10 to 0.58 ppm (Table 1) which is much lower than those in tea infusions. The mean fluoride concentration (Table 2) is the highest in instant coffee (0.30 ± 0.09 ppm), followed by the caffeinated coffee (0.17 ± 0.02 ppm), and the decaffeinated coffee (0.14 ± 0.01 ppm). However, none of the differences in fluoride content is statistically significant. Unlike the fluoride content of caffeinated and decaffeinated tea infusions, the fluoride contents of caffeinated and decaffeinated coffees showed very little difference.

Among the forty coffee samples that were analyzed for fluoride, thirty seven (92.5%) contained less than 0.5 ppm F; three (7.5%) contained slightly more than 0.5 ppm F (Table 1). The low fluoride content of all of the types of coffee tested suggests that coffee is not a major contributor to total dietary fluoride intake. Since health professionals use fluoride content information to evaluate at risk populations for excessive fluoride consumption, continued monitoring and evaluation of foods and beverages is needed to provide current fluoride content data.

TABLE 1. Fluoride content of various coffee in parts per million

Coffee Brand	F Content
Aguila Roja Colombia	0.21
Amway Nine to Five Med. Bodied	0.15
Chock Full of Nuts All method Grind	0.11
Cimmeron Blend Steaming Becen	0.17
Community Dark Roast	0.11
Community Between Roast	0.13
1st Colonial Coffee and Tea:	
Colombian Supreme	0.11
Plantation Kenya AA	0.10
Swiss Chocolate Almond	0.10
Cyrano's Irish Cream Decaf	0.15
Fama de America	0.54
Folger's Aroma Roasted Instant	0.56
Folger's Auto Drip	0.10
Folger's Colombian Supreme	0.24
Gevalia Mocha Kaffee	0.14
Hillside French Decaf	0.19
Hillside Vanilla Nut	0.13
Hills Brothers Drip	0.15
Hills Brothers French Roast	0.15
Hills Brothers 100%olombian	0.10
House of Coffee Coconut Creme	0.15
Kroger for all makers	0.12
Macys SR #17 Chocolate Mint	0.15
Macys SR #34 Chocolate Raspberry Truffle	0.15
Maryland Club for all makers	0.13
Maxwell House Auto Drip	0.12
Maxwell House Columbian Supreme Naturally Decaffeinated	0.13
Maxwell House French Roast Decaffeinated	0.15
Maxwell House Filter Packet Singles	0.21
Maxwell House Filter Packet Singles Decaffeinated	0.29
Maxwell House Lite	0.13
Maxwell House Master Blend	0.21
Maxwell House Private Collection Privee'	0.13
Nescafe Deluxe Instant	0.15
Rey from Costa Rica	0.13
S&D Coffee Suite 123 Filter Packets Decaffeinated	0.13
San Domingo from Venezuela	0.58
Starbuck's House Blend Decaffeinated	0.10
Taster's Choice Original Instant	0.20
Yauco Selecto de Puerto Rico	0.13

TABLE 2. Range and mean fluoride content of different types of coffee in parts per million

Coffee type	Range	Mean±SEM
Caffeinated (30)	0.10 - 0.58	0.17±0.02
Decaffeinated (6)	0.10 - 0.19	0.14±0.01
Instant (4)	0.15 - 0.56	0.30±0.09

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