Short Communication

Fluoride-containing mouthrinses in three European countries

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Abstract The caries-preventive effect of fluoride is well known. The widespread use of fluoride-containing toothpastes and mouthrinses has been recommended to reduce dental caries. Many kinds of fluoride containing toothpastes are available in Japan. However, only two kinds of mouthrinses which contain fluoride are comically available. The aim of this study was to investigate the current status of fluoride-containing mouthrinses on the market in three European countries. Fluoride-containing mouthrinses were purchased from retail outlets in Athens, Amsterdam and Geneva. The labels of ingredients were studied to determine the type and concentration of fluoride. Most of the mouthrinses contained sodium fluoride (90%); some contained stannous fluoride (5%) or potassium fluoride (7%). The concentrations of fluoride ranged from 100 ppm to 500 ppm.

Key words

Fluoride,
Mouthrinses,
Prevention of dental caries

The effectiveness of fluoride for the prevention of dental caries has been clearly established. There are several methods for the application of the fluoride, including water fluoridation, varnishes, and several other commercially available professional and self-applied products. In Japan, according to the water quality standards of the Japan Waterworks Law, the fluoride concentration of tap water should be kept at a level not exceeding 0.8 ppm. However, in fact, the concentration of fluoride in the public water supply in most districts of Japan has been reported to be less than 0.1 ppm^{1,2}. The World Health Organization (WHO) recommends a concentration of 0.5–1.0 ppm of fluoride in the drinking water for

the prevention of dental caries³.

Many kinds of fluoride-containing toothpaste are available throughout the world. In Japan, 87% of the toothpastes currently on the market contain some form of fluoride⁴. It has been reported that preventive fraction of fluoride-containing toothpastes for the dental caries is 20–40%⁵. Moreover, it has been suggested that fluoride-containing mouthrinses may also have an anti-caries effect in children⁶, and the daily use of mouthrinses containing 0.2% sodium fluoride has been shown to effectively reduce the incidence of dental caries⁷. In Japan, two mouthrinses containing fluoride are classified as dangerous drugs and supplied only in a powdered state. Because many mouthrinses contained fluoride are available in Europe, we carried out a field survey to gain an understanding of the market

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Table 1a The mouthrinses that contained fluoride in Athens, Greece

Company	Product name	Country of production	Ingredient	Fluoride Concentration
COLGATE-PALMOLIVE	Plax Soft Minto	—	Aqua, Glycerin, Alcohol, Propylene Glycol, Sorbitol, PEG-40 Sorbitan Diisostearate, Sodium Benzoate, Menthol, Aroma, Cetylpyridium Chloride, Sodium Fluoride, Sodium Saccharin, CI 42090, CI 47005	0.025%
	Plax Original	—	Aqua, Sorbitol, Alcohol, Glycerin, Sodium Lauryl Sulfate, Sodium Methyl Cocoyl Taurate, PVM/MA Copolymer, Aroma, Menthol, Sodium Hydroxide, Disodium Phosphate, Triclosan, Sodium Fluoride, Sodium Saccharin, CI 16035	0.025%
Guaber	BLAN X	Italy	Aqua, Glycerin, Sorbitol, Polysorbate 20, Cetylpyridium Chloride, Usnea Barbata, Plantago Major, Sodium Bicarbonate, Mentha Piperita, Anethole, Menthol, Allantoin, Propylene Glycol, Disodium Phosphate, Sodium Lauryl Sulfate, Sodium Benzoate, Sodium Saccharin, Sodium Fluoride, Imidazolidinyl Urea, Citric Acid, Terasodium EDTA, Eugenol, CI 42051, CI 19140	0.05%
Johnson and Johnson	ACT FLUORIDE Classical Cinnamon	—	Aqua, Glycerin, Propylene Glycol, Poloxamer 407, Polysorbate 80, Aroma, Limonene, Sodium Benzoate, Sodium Fluoride, Sodium Phosphate, Disodium Phosphate, Benzyl Alcohol, Cetylpyridium Chloride, Sodium Saccharin, Calcium Disodium EDTA, CI 17200	—
Johnson and Johnson	ACT FLUORIDE Fresh Mint	—	Aqua, Sorbitol, Alcohol, Poloxamer 407, Sodium Benzoate, Sodium Fluoride, Polysorbate 80, Sodium Phosphate, Sodium Saccharin, Calcium Disodium EDTA, Aroma, Cinnamal, Limonene, CI 42090, CI 18965	—
Pfizer	LISTERINE	—	Aqua, Alcohol, Sorbitol, Aroma, Poloxamer 407, Benzoic acid, Sodium Saccharin, Eucalyptol, Methyl salicylate, Thymol, Menthol, Sodium Benzoate, Sodium Fluoride, CI 42053, CI 47005	100 ppm
GABA	elmex	—	Aqua, Glycerin, Propylene Glycol, PEG-40 Hydrogenated Castor oil, Olaflur, Aroma, PVP/Dimethylaminoethylmethacrylate Polycarbamyl Polyglycol Ester, Saccharin, Hydroxyethylcellulose, Potassium Fluoride, Potassium Hydroxide, Polyaminopropyl Biguanide	250 ppm
	elmex anti-caries	—	Aqua, PEG-40 Hydrogenated Castor oil, Olaflur, Aroma, Potassium Acesulfame, Sodium Fluoride, Polyaminopropyl Biguanide, Hydrochloric Acid	250 ppm
Glaxo Smith Kline	SENSODYNE	—	Aqua, Alcohol, Sorbitol, Poloxamer 407, Potassium Chloride, Methylparaben, Aroma, Sodium Saccharin, Sodium Benzoate, Propylparaben, Sodium Fluoride, Triclosan, CI 42051	—
INTERMED	Medinol MOUTHWASH	Greece	Aqua, Sorbitol, Xylitol, PEG-40 Hydrogenated Castor oil, PVP, Poloxamer 407, Olaflur, Propylene Glycol, Stannous Fluoride, Sodium Fluoride, Zinc Gluconate, Ammonium Glycyrrhizate, Cetylpridinium Chloride, Panthenol, Bisabolol, Allantoin, Sodium Saccharin, Aroma, CI 42090	—
CICCARELLI	CAPITANO	Italy	Aqua, Propylene Glycol, PEG-40 Hydrogenated Castor oil, Sodium Benzoate, Sodium Lauryl Sulfate, Polysorbate 20, Aroma, Lactic Acid, Sodium Lactate, Sodium Bicarbonate, Sodium Fluoride, Glycerin, Cetylpyridium Chloride, Centella Asiatica, 2-bromo-2-nitropropane-1,3-diol, Triclosan, Sodium Saccharin, CI 42051	—

— indicates the undocumented country of production or concentration of fluoride.

sales of these products in three countries. We visited pharmacies, supermarkets, general shops, and kiosks in Athens, Amsterdam, and Geneva, and purchased any mouthrinses that contained fluoride, according to the ingredients label. The products obtained are shown in Table 1a–c. A total of 11, 14, and 17 fluoride-containing mouthrinses were obtained in Athens, Amsterdam, and Geneva, respectively. The concentration of fluoride in these products ranged

from 100 ppm to 500 ppm.

Among the 42 products purchased in this study, 22 contained the Alcohol and 13 contained the Cetylpyridium Chloride, these ingredients may be effects as anti-microbe drugs. Thirty-five products contained Sodium Saccharin and 23 contained Sorbitol as edulcorant. There are not clear differences in the ingredients between three countries, however, some products that contained the Zinc Chloride

Table 1b The mouthrinses that contained fluoride in Amsterdam, the Netherlands

Company	Product name	Country of production	Ingredient	Fluoride Concentration
DA	Mondwater total care	—	Aqua, Alcohol, Sorbitol, Polysorbate 20, Aroma, Allantoin, Cetylpyridinium Chloride, Sodium Fluoride, Sodium Saccharin, Sodium Benzoate, Menthol, Zinc Chloride, Limonene, CI 42051	—
	Mondwater sensitive and whitening	—	Aqua, Sorbitol, Potassium Citrate, Polysorbate 20, Pentasodium Triphosphate, Lactic Acid, Aroma, Sodium Fluoride, Cetylpyridinium Chloride, Sodium Saccharin, Sodium Benzoate, Sodium Methylparaben, Caramel	—
	Mondwater extra sterk and fris	—	Aqua, Alcohol, Sorbitol, Polysorbate 20, Aroma, Cetylpyridinium Chloride, Sodium Fluoride, Sodium Saccharin, Sodium Benzoate, CI 18965, CI 42051	—
Pfizer	LISTERINE	—	Aqua, Alcohol, Sorbitol, Aroma, Poloxamer 407, Benzoic acid, Sodium Saccharin, Eucalyptol, Methyl salicylate, Thymol, Menthol, Sodium Benzoate, Sodium Fluoride, CI 42053, CI 47005	100 ppm
GABA	elmex	—	Aqua, Glycerin, Propylene Glycol, PEG-40 Hydrogenated Castor oil, Olaflur, Aroma, PVP/Dimethylaminoethylmethacrylate Polycarbamyl Polyglycol Ester, Saccharin, Hydroxyethylcellulose, Potassium Fluoride, Potassium Hydroxide, Polyaminopropyl Biguanide	250 ppm
	elmex anti-caries	—	Aqua, PEG-40 Hydrogenated Castor oil, Olaflur, Aroma, Potassium Acesulfame, Sodium Fluoride, Polyaminopropyl Biguanide, Hydrochloric Acid	250 ppm
Glaxo Smith Kline	SENSODYNE	—	Aqua, Alcohol, Sorbitol, Poloxamer 407, Potassium Chloride, Sodium Fluoride, Triclosan, Sodium Saccharin, Sodium Benzoate, Methylparaben, Polyparaben, Aroma, CI 42051	—
	Odol med Anti-plaque	—	Aqua, Alcohol, Sorbitol, Sodium Benzoate, Poloxamer 338, Cetylpyridium Chloride, PEG-60 Hydrogenated Castor oil, Sodium Fluoride, Aroma, Sodium Saccharin, Citric Acid, CI 42053	—
	Odol med green	—	Aqua, Alcohol, Flavour, Cocamidopropyl Betaine, Sodium Saccharin, Cetylpyridium Chloride, Sodium Fluoride, PEG-60 Hydrogenated Castor oil, Sodium Benzoate, CI 42051, CI 75810, CI 15985	—
Ardoz Research	Vitint Mond-Conditioner	Netherlands	Aqua, Glycerin, Sodium Lauryl Sulfate, PEG-40 Hydrogenated Castor oil, Sodium Gluconate, Cellulose Gum, Aroma, Sodium Citrate, Sodium Methylparaben, Sodium Perborate, Citric Acid, Sodium Chloride, Sodium Fluoride, Magnesium Sulfate, Sodium Saccharin	226 ppm
Purity Laboratories	Natural white whitening mouthrinse	—	Aqua, Alcohol, Glycerin, PEG-40 Hydrogenated Castor oil, Sodium Lauryl Sulfate, Triclosan, Sodium Saccharin, Sodium Benzoate, Aroma, Sodium Fluoride, CI 42090	0.05%
Oral B	Tanden en Tandvlees Dents et Gencivlees	UK	Aqua, Glycerin, Polysorbate 20, Aroma, Methylparaben, Cetylpyridium Chloride, Sodium Fluoride, Sodium Saccharin, Sodium Benzoate, Propylparaben, CI 42051, CI 47005	0.05%
Albert Heijn	Mond Water	Netherlands	Aqua, Glycerin, Cetylpyridium Chloride, Aroma, Sodium Fluoride, Cinnamal, Limonene, PEG-40 Hydrogenated Castor oil, Sodium Benzoate, 2-bromo-2-nitropropane-1,3-diol, Sodium Saccharin, Citric acid, Eugenol, CI 42051	—
etos	MONDWATER ANTI-SEPTISCH	Netherlands	Aqua, Alcohol, Xylitol, PEG-40 Hydrogenated Castor oil, Sodium Benzoate, Eucalyptus Globulus, Menthol, Sodium Fluoride, Methyl salicylate, Thymus Vulgaris, Potassium Sorbate, Parfum, Cinnamal, D-limonene, Eugenol, CI 19140	0.04%

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for the prevention of the malodors are found in Switzerland.

In Europe, water fluoridation has not been universally implemented, and fluoride is provided via mouthrinses and toothpastes. In 2000, the DMF index of caries prevalence was 2.2 in Greece, 0.6 in the Netherlands, and 0.9 in Switzerland. In all

three countries, the DMF index was lower than the 2.4 reported for Japan in 1999⁸). It has reported topical fluorides (varnishes, gels and mouthrinses) used in addition to fluoride toothpaste achieve a modest reduction in caries compared to toothpaste used alone⁹), and intensive fluoridation is effective in preventing enamel and dentine caries¹⁰). One of the

Table 1c The mouthrinses that contained fluoride in Geneva, Switzerland

Company	Product name	Country of production	Ingredient	Fluoride Concentration
MIGROS	CANDIDA MULTICARE DENTAL FLUID	Switzerland	Aqua, Glycerin, Sorbitol, Glycine, PEG-60 Hydrogenated Castor oil, Aroma, Zinc Chloride, Sodium Fluoride, Sodium Saccharin, Domiphen Bromide, Cetylpyridinium Chloride	220 mg/kg
	CANDIDA SENSITIVE PLUS ⁺ DENTAL FLUID		Aqua, Glycerin, Sorbitol, Poloxamer 407, PEG-60 Hydrogenated Castor oil, Potassium Citrate, Aroma, Methylparaben, Panthenol, Sodium Saccharin, Zinc Chloride, Sodium Fluoride, Cetylpyridinium Chloride, Citric Acid, BHT, Eugenol, Limonene	
	CANDIDA ANTI TARTARO DENTAL FLUID		Aqua, Alcohol, Glycerin, Sorbitol, Tetrasodium Pyrophosphate, Disodium Pyrophosphate, PEG-60 Hydrogenated Castor oil, Methylparaben, Aroma, Sodium Fluoride, Sodium Saccharin	
	CANDIDA ACTIVE FRESH DENTAL FLUID		Aqua, Glycerin, Sorbitol, Glycine, PEG-60 Hydrogenated Castor oil, Aroma, Zinc Chloride, Sodium Fluoride, Sodium Saccharin, Domiphen Bromide, Cetylpyridinium Chloride, Polyaminopropyl Biguanide	
	CANDIDA PARODIN DENTAL FLUID		Aqua, Glycerin, Sorbitol, Poloxamer 407, PEG-60 Hydrogenated Castor oil, Glycyrrhiza Glabra, Propylene Glycol, Allantoin, Aroma, Panthenol, Sodium Saccharin, Sodium Fluoride, Bisabolol, Polyaminopropyl Biguanide, BHT	
GABA	Meridol	—	Aqua, Xylitol, PVP, PEG-40 Hydrogenated Castor oil, Olaflur, Aroma, Stannous Fluoride, Sodium Saccharin, CI 42051	0.025%
	elmex sensitive		Aqua, Glycerin, Propylene Glycol, PEG-40 Hydrogenated Castor oil, Olaflur, Aroma, PVP/Dimethylaminoethylmethacrylate Polycarbamyl Polyglycol Ester, Saccharin, Hydroxyethylcellulose, Potassium Fluoride, Potassium Hydroxide, Polyaminopropyl Biguanide	250 ppm
	elmex anti-carries	—	Aqua, PEG-40 Hydrogenated Castor oil, Olaflur, Aroma, Potassium Acesulfame, Sodium Fluoride, Polyaminopropyl Biguanide, Hydrochloric Acid	250 ppm
COLGATE-PALMOLIVE	Colgate Rinc Dent Sans	—	Aqua, Glycerin, Propylene Glycol, Sorbitol, Sodium Phosphate, Poloxamer 407, Sodium Benzoate, Disodium Phosphate, Aroma, Cetylpyridinium Chloride, Sodium Saccharin, Sodium Fluoride, Cinnamal	0.025%
	Colgate Total	—	Aqua, Sorbitol, Alcohol, Glycerin, Aroma, Disodium Phosphate, PVM/MA Copolymer, Sodium Fluoride, Sodium Hydroxide, Sodium Sulfate, Sodium Methyl Cocoyl Taurate, Sodium Saccharin, Tricosan	—
Glaxo Smith Kline	Odol-dent 3 MINT	—	Aqua, Alcohol, Sodium Benzoate, Poloxamer 338, Cetylpyridinium Chloride, PEG-60 Hydrogenated Castor oil, Sodium Fluoride, Aroma, Sodium Saccharin, Citric Acid	—
LEVER FABERGE	Mentadent	—	Aqua, Alcohol, Sorbitol, Sodium Fluoride, Zinc Sulfate, Glycine, Sodium Lauryl Sulfate, Aroma, Poloxamer 188, Sodium Saccharin, CI 16255, CI 42051, CI 47005	225 ppm
Johnson and Johnson	ACT Dental Fluid junior	—	Aqua, Glycerin, Propylene Glycol, Poloxamer 407, Polysorbate 80, Aroma, Sodium Benzoate, Sodium Fluoride, Sodium Phosphate, Disodium Phosphate, Benzyl Alcohol, Cetylpyridinium Chloride, Sodium Saccharin, Calcium Disodium EDTA, CI 17200	—
Johnson and Johnson	ACT FLUORIDE Classical Cinnamon	—	Aqua, Glycerin, Propylene Glycol, Poloxamer 407, Polysorbate 80, Aroma, Limonene, Sodium Benzoate, Sodium Fluoride, Sodium Phosphate, Disodium Phosphate, Benzyl Alcohol, Cetylpyridinium Chloride, Sodium Saccharin, Calcium Disodium EDTA, CI 17200	—
Johnson and Johnson	ACT FLUORIDE Fresh Mint	—	Aqua, Sorbitol, Alcohol, Poloxamer 407, Sodium Benzoate, Sodium Fluoride, Polysorbate 80, Sodium Phosphate, Sodium Saccharin, Calcium Disodium EDTA, Aroma, Cinnamal, Limonene, CI 42090, CI 18965	—
Dr. Wild and Co.	EMOFORM with Fluor	Switzerland	Aqua, Propylene Glycol, Potassium Chloride, Sodium Laureth Sulfate, Aroma, Sodium Fluoride, Sodium Chloride, Sodium Saccharin	250 ppm
Pfizer	LISTERINE ANTI-BACTERIAL MONDWATER	—	Aqua, Alcohol, Sorbitol, Aroma, Poloxamer 407, Benzoic acid, Sodium Saccharin, Eucalyptol, Methyl salicylate, Thymol, Menthol, Sodium Benzoate, Sodium Fluoride, CI 42053, CI 47005	100 ppm

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reasons of this difference may be derived from the easily-obtainable fluoride-containing mouthrinses as commercialized products in Europe, but not in Japan.

In conclusion, the availability of fluoride-containing mouthrinses may be determined and influenced by local policy; however, there is little doubt that these products contribute to the prevention of dental caries.

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