

## HEALTH/BIOLOGICAL EFFECTS

### Reassessment of the role of aluminum in the development of Alzheimer's disease

The pathophysiology of Alzheimer's disease (AD) is related to the alterations in neurotransmission, beta-amyloid production, plaque formation and cytoskeletal abnormalities. The question of aluminium relevance to the etiology of AD cannot yet be adequately answered. Aluminium is currently regarded as the putative risk factor for the disease. Our paper shows that some of pathologic changes are not raised by aluminium alone, but by the aluminofluoride complexes. These complexes may act as the initial signal stimulating impairment of homeostasis, degeneration and death of the cells. By influencing energy metabolism these complexes can accelerate the aging and impair the functions of the nervous system. In respect to the etiology of AD, the long term action of aluminofluoride complexes may represent a serious and powerful risk factor for the development of AD.

Authors: Strunecká A, Patočka J.

For Correspondence: Department of Physiology and Developmental Physiology, Faculty of Sciences, Charles University, Viničná 7, 128 00, Prague 2, Czech Republic.  
astrun@cesnet.cz

Keywords: Aluminum, Aluminofluoride complexes, Alzheimer's disease.

Source: *Cesk Fysiol* 1999 Feb;48(1):9-15. [Article in Czech]

### Some observations on endemic fluorosis in domestic animals in Southern Rajasthan (India)

Chronic fluoride toxicity in the form of osteo-dental fluorosis was observed in cattle, buffaloes, sheep and goats from 21 villages of Banswara, Dungarpur and Udaipur districts of Southern Rajasthan where the mean fluoride concentration in drinking water varied from 1.5 to 4.0 ppm. The prevalence of dental fluorosis in calves (< 1 year age) was greater than that in adult cattle and buffaloes. At a fluoride concentration in the water of 4.0 ppm, 100% of calves, 65.6% of buffaloes and 61.0% of cattle were found to be affected with dental fluorosis to varying degrees. In the older group of buffaloes, their teeth were brownish black instead of creamy yellow as found in calves and cattle. Out of 780 goats and 564 sheep, none revealed evidence of osteo-dental fluorosis. The overall prevalence of skeletal fluorosis was 8.5%, with the highest prevalence of 29.0% in cattle and 37.5% in buffaloes at a fluoride concentration of 3.2 ppm. None of the calves were affected with skeletal fluorosis. Intermittent lameness was observed in the older group of animals (> 7 years age) at 2.8 ppm fluoride or more in the water. None of the fluorotic animals exhibited any apparent evidence of hypothyroidism, stunted growth or low milk production. There

was no correlation between gender and the prevalence of fluorosis, but the prevalence and severity of skeletal fluorosis increased with increasing fluoride concentration and age. Possible factors causing variation in fluorosis in the cattle and buffaloes in villages with identical fluoride concentrations are discussed.

Author: Choubisa SL.

For Correspondence: P.G. Department of Zoology, S.B.P. Government College, M.L. Sukhadia University, Dungarpur, Rajasthan, India.

Keywords: Domestic animals, Endemic fluorosis, India.

Source: Vet Res Commun 1999 Nov;23(7):457-65.

### **Prevalence and distribution pattern of enamel fluorosis in Langtang town, Nigeria**

Dental fluorosis, a defect which causes white flecks or brown staining of the teeth, has been reported in some parts of the world. This study, a descriptive, cross-sectional survey, was designed to determine the prevalence and distribution pattern of dental fluorosis in Langtang town, Plateau State of Nigeria, between April and June 1997. Community members had recognised the discolouration of teeth as a public health problem for which solution had been sought from the near-by public health agency. A representative sample of 475 persons drawn from the 7 wards of the local government area were interviewed. Information on their age, ethnicity, occupation, and source of drinking water was obtained. Intra-oral examinations were conducted to determine the status of participants' enamel using a modified version of Dean's classification of enamel mottling. Results revealed a 26.1% prevalence rate of enamel fluorosis, with 20.6% of the cases classified as mild and 5.5% as severe. While the prevalence rate was not influenced by sex and ethnicity, it was strongly associated with the source of drinking water ( $P < 0.05$ ). Drinking from streams seemed to increase the likelihood of participants having dental fluorosis. A pattern of distribution with age also emerged with the highest prevalence being among the 10-19 years age group. Six cases were detected in deciduous teeth. In view of the strong indication of an environmental aetiological basis, there is need for the determination of the current levels of fluoride in water, foods, beverages, and other likely sources of exposure in that community.

Authors: Wongdem JG, Aderinokun GA, Sridhar MK, Selkur S.

For Correspondence: Primary Health Care and Disease Control Division, Ministry of Health HQ, Plateau State, Nigeria.

Keywords: Dental fluorosis, Epidemiology, Nigerian, Prevalence.

Source: Afr J Med Med Sci 2000 Sep-Dec;29(3-4):243-6.

### **Has the level of dental fluorosis among Toronto children changed?**

We conducted a survey during the 1999-2000 school year to obtain valid estimates of the oral health status of a probability sample of children in the 4 regions of the newly amalgamated city of Toronto. The results will be used in developing recommendations for programs to address the oral health problems identified. The Dental Indices System is the Ontario protocol whereby information on the oral health status and treatment needs of children can be obtained by direct assessment of the children. One of 2 specially trained dental hygienists examined each child's teeth and periodontal tissues using sterilized mouth mirrors and blunt probes with a standard light source. Overall, there were 3657 participants in the survey, of whom 2435 were aged 7 or 13 years; these 2 age groups formed the basis for the analysis. Forty percent of those aged 7 or 13 had had one or more decayed teeth. Approximately 7% of children in the younger age group had at least one condition requiring urgent care. Dental fluorosis of moderate severity (Tooth Surface Index of Fluorosis 2) was found among 14.0% of 7-year-olds, 12.3% of 13-year-olds and 13.2% of the 2 age groups combined. The prevalence of fluorosis was of the same order as all but one of the more recent studies performed in Toronto. The prevalence may fall as the recently imposed reduction in concentration of fluorides in city water takes effect. On the basis of these findings of fluorosis, Toronto Public Health should continue to monitor levels of dental fluorosis and caries and should continue its efforts to inform parents of very young children about the safe use of fluoridated dentifrice.

Authors: Leake J, Goettler F, Stahl-Quinlan B, Stewart H.

For Correspondence: Community Dentistry, Faculty of Dentistry, University of Toronto, Toronto, ON M5G 1G6. james.leake@utoronto.ca

Keywords: Canada, Children, Dental fluorosis.

Source: J Can Dent Assoc 2002 Jan;68(1):21-25.

### **A community-based caries control program for pre-school children using topical fluorides: 18-month results**

Dental caries in Chinese pre-school children is common, and restorative treatment is not readily available. This prospective controlled clinical trial investigated the effectiveness of topical fluoride applications in arresting dentin caries. We divided 375 children (aged 3-5 yrs) with carious upper anterior teeth into five groups. Children in the first and second groups received annual applications of silver diamine fluoride solution (44,800 ppm F). NaF varnish (22,600 ppm F) was applied every three months onto the lesions of children in the third and fourth groups. For children in the first

and third groups, soft carious tissues were removed prior to fluoride application. The fifth group was the control. We followed 341 children for 18 months. The mean numbers of new caries surfaces in the five groups were 0.4, 0.4, 0.8, 0.6, and 1.2, respectively ( $p = 0.001$ ). The respective mean numbers of arrested carious tooth surfaces were 2.8, 3.0, 1.7, 1.5, and 1.0 ( $p < 0.001$ ).

Authors: Lo EC, Chu CH, Lin HC.

For Correspondence: Faculty of Dentistry, The University of Hong Kong, China.

hrdplcm@hkucc.hku.hk

Keywords: Children, China, Dental caries, Topical fluoride.

Source: J Dent Res 2001 Dec;80(12):2071-4.

### **Current concept on the anticaries fluoride mechanism of the action**

The paper discusses a possible new concept of the role of fluoride and its mechanism of action in caries prevention. In the past fluoride inhibition of caries was ascribed to reduced solubility due to incorporation of fluoride (F) into the enamel minerals (firmly bound fluoride or fluorapatite). Based on the new findings, it appears that fluoride, either released into or present in the fluid phase bathing the hard tissue, is more important for the reduction of caries development and progression. There is convincing evidence that fluoride has a major effect on demineralization and remineralization of dental hard tissue and that it interferes with acid production from cariogenic bacteria. The provision of dissolved fluoride is the key to successful therapy. The source of this fluoride could either be fluorapatite or calcium fluoride ( $\text{CaF}_2$ ) (like) precipitates, which are formed on the enamel and in the plaque after application of topical fluoride. The precipitates of calcium fluoride do not dissolve quickly as was initially believed. Calcium fluoride coating at neutral pH by pellicle proteins and phosphate is the main reason for this. The dissolution of the fluoride from calcium fluoride is pH dependent. At lower pH, the coating is lost and an increased dissolution rate of calcium fluoride occurs. The  $\text{CaF}_2$ , therefore, act as an efficient source of free fluoride ions during the cariogenic challenge. These are subsequently incorporated into the enamel as hydroxyfluorapatite or fluorapatite.

Authors: Rosin-Grget K, Lincir I.

For Correspondence: Department of Pharmacology, School of Dental Medicine,

University of Zagreb, Croatia.

Keywords: Anticaries mechanisms.

Source: Coll Antropol 2001 Dec;25(2):703-12.

### **Fluoride modifies adhesion of *Streptococcus pyogenes***

*Streptococcus pyogenes* grown in the presence of subinhibitory concentrations of sodium fluoride had a diminished ability, compared to control cells, to adhere to buccal cells, collagen, fibronectin, and laminin. In addition, sodium fluoride was a competitive inhibitor of streptococcal adhesion to collagen and fibronectin, but not laminin. It is suggested that sodium fluoride may be useful in therapy or prophylaxis in infections involving group A streptococci.

Authors: Cao J, Doyle RJ.

For Correspondence: Department of Microbiology and Immunology, University of Louisville, Health Science Center, 40292, Louisville, KY, USA

Keywords: Adhesion, Buccal cells, Collagen, Fibronectin, Fluoride, Laminin, *Streptococcus pyogenes*.

Source: FEMS Immunol Med Microbiol 2002 Jan;32(2):175-7.

### **Effect of tamarind ingestion on fluoride excretion in humans**

*Objective:* To evaluate the effect of tamarind (*Tamarindus indicus*) ingestion on excretion of fluoride in school children.

*Design:* Randomized, diet-control study.

*Subject:* Twenty healthy boys were included and 18 completed the study.

*Interventions:* Each subject consumed 10 g tamarind daily with lunch for 18 days at the social welfare boys' hostel. The nutrient composition of the daily diet was constant throughout the experimental period.

*Results:* Tamarind intake led to significant increase ( $P < 0.001$ ) in the excretion of fluoride in 24 h urine ( $4.8 \pm 0.22$  mg/day) as compared to excretion on control diet ( $3.5 \pm 0.22$  mg/day). However, excretion of magnesium and zinc decreased significantly ( $7.11 \pm 1.48$  mg of Mg and  $252.88 \pm 12.84$   $\mu$ g of Zn per day on tamarind diet as compared to  $23.39 \pm 3.68$  mg of Mg and  $331.78 \pm 35.31$   $\mu$ g Zn per day on control diet). Excretion of calcium and phosphorous were not significantly different while creatinine excretion decreased with tamarind intake ( $225.66 \pm 81$  mg creatinine/day with tamarind and  $294.5 \pm 78.76$  mg creatinine/day without tamarind).

*Conclusion:* Tamarind intake is likely to help in delaying progression of fluorosis by enhancing urinary excretion of fluoride.

*Sponsorship:* National Institute of Nutrition, Hyderabad, India (ICMR). DOI: 10.1038/sj/ejcn/1601287.

Authors: Khandare AL, Rao GS, Lakshmaiah N.

For Correspondence: National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India.

Keywords: Fluoride excretion, Tamarind.

Source: Eur J Clin Nutr 2002 Jan;56(1):82-85.

**New recommendations concerning the fluoride  
content of toddler toothpaste - consequences  
for systemic application of fluoride**

A group of experts from 4 European countries, who gathered at a convention at Basel in November 1998, arrived at the recommendation to increase the fluoride (= F) content of toddler toothpastes from 250 ppm to 500 ppm. It was recommended to make parents brush the children's teeth with a pea-size piece of this toothpaste once a day, starting when the first deciduous teeth were erupting. Routine application of F-tablets would no longer be routinely prescribed, but restricted to individual indications in special high caries risk cases. This recommendation did not consider previous ones and was based exclusively on new scientific, mainly epidemiological evidence. In April 2000 the recommendation was officially issued by the German scientific dental association DGZMK. A careful case-control study resulted in the analysis of the risk to develop mottling of enamel under the influence of fluoridated water (1 ppm F) and fluoride toothpaste (1000 ppm F) when used in early childhood. It was found that excessive use of the fluoride toothpaste doubled the fluorosis risk, whereas when fluoride supplements (tablets, drops) were given the risk was about 20 times higher than without a fluoride supplement. Experiments in Germany and the Netherlands had shown that remineralisation of enamel under influence of 500 ppm F is achieved much more quickly than under application of 250 ppm F. A panel of WHO experts came to the conclusion that there was no evidence for the effectiveness of toothpastes containing less than 500 ppm. Statistics from the Netherlands have shown that the amount of fluoride tablets sold there is barely sufficient for the use by a quarter of all children 0 to 4 years old. In contrast to this low level of acceptance of fluoride tablets, fluoride toothpastes is widely accepted. It is their extensive use which explains the marked improvement of dentitions among the youth in this country during the last 20 years; the influence of topical fluoride gels, varnishes and other preventive measures was much less, and a reduction of sugar consumption (by the way less than 10 % of what it was in 1970) seems to have been the least important factor. The new recommendations based on topical rather than systemic fluoride application are better for preventive, toxicological, psychological and didactic reasons and should be implemented as soon as possible.

Author: König KG.

For Correspondence: Institut für Präventive und Konservierende Zahnmedizin Fakultät der Medizinischen Wissenschaften, Universität Nijmegen, Niederlande.

Keywords: Children, Europe, Fluoride supplements, Recommendations, Toothpaste, Topical fluoride.

Source: Gesundheitswesen 2002 Jan;64(1):33-8. [Article in German].

## BIOCHEMICAL EFFECTS

### Does sevoflurane inhibit serum cholinesterase in children?

Serum cholinesterase activity was measured at induction, and following anaesthesia in 41 children aged between 4 and 30 months. The median exposure to sevoflurane was 273%.min. The results did not demonstrate any significant difference in cholinesterase activity, when expressed by gram of serum proteins following inhalation anaesthesia using sevoflurane or intravenous anaesthesia using propofol. The values obtained were  $175 \pm 42$  UI/g before anaesthesia and  $177 \pm 43$  UI/g following anaesthesia. The only change in cholinesterase activity detected was related to haemodilution. We conclude that plasma fluoride concentration following sevoflurane administration [ $13.8 \pm 4.2$   $\mu\text{mol/L}$ ] is too low to exert an inhibiting effect on in vivo cholinesterase activity and that the previously reported decrease in mivacurium requirements during sevoflurane anaesthesia is unlikely to be due to inhibition by fluoride ions.

Authors: Lejus C, Delaroche O, Le Roux C, Legendre E, Rivault O, Floch H, Renaudin M, Pinaud M.

For Correspondence: Service of Anaesthesiology, Hotel Dieu, C.H.U. 44093 Nantes, cedex, France. corrine.lejus@chu-nantes.fr

Keywords: Children, Cholinesterase, Enzyme inhibition, Sevoflurane.

Source: Anaesthesia 2002 Jan;57(1):44-8.

## DIETARY FLUORIDE

### Bioavailability of fluoride in humans from commonly consumed diets in India

There is a paucity of data on the amount of fluoride absorbed in humans from whole cooked food, especially a combination of different foods taken at regular meal times. The present study was thus aimed at estimating the amount of fluoride present and absorbed in humans from four regional representative meals *viz.* North Indian Vegetarian, North Indian Non-vegetarian, South Indian, and East Indian. Twenty five healthy human volunteers aged 22-35 years participated in the study and each diet was tested on five volunteers. Each test diet was weighed into six equal parts, one part was kept for estimation of fluoride content and remaining five were given one each to the five test subjects in each of the four test diet groups. Eight hour plasma fluoride profiles were then studied after ingestion of weighed quantity of test diets and means calculated. The bioavailability of fluoride from these diets was evaluated in relation to that of sodium fluoride in solution form. The amount of fluoride estimated in different test diets varied between 1.53 - 10.0 mg. The bioavailability was found to be 1.6 per cent for north Indian vegetarian diet, 7.5 per cent for east Indian diet, 14.4

per cent for north Indian nonvegetarian diet and 31.7 per cent for south Indian diet, however, the amount of F(mg) absorbed in plasma from these diets was found to be low i.e. 0.06 mg, 0.75 mg, 0.72 mg and 0.48, mg respectively.

Authors: Goyal A, Gauba K, Tewari A.

For Correspondence: Postgraduate Institute of Medical Education & Research, Oral Health Sciences Center, Chandigarh.

Keywords: Bioavailability, Fluoride in food, India.

Source: J Indian Soc Pedod Prev Dent 1998 Mar;16(1):1-6.

### **Total fluoride intake and urinary excretion in German children aged 3-6 years**

There have only been few investigations comparing total fluoride intake and the fluoride proportion excreted in urine in pre-school children. In addition, the results of available studies are conflicting. Total fluoride intake was assessed in 11 healthy children aged 3-6 years on 2 consecutive days and urinary fluoride excretion was determined. The duplicate-diet approach was used for the assessment of fluoride intake from solid and liquid foods. Fluoride intake from toothbrushing was calculated as the difference between the amount of fluoride in the paste put on the toothbrush and the drinking water (fluoride concentration 0.25 mg/L) used for rinsing vs. the fluoride amounts recovered in the toothpaste spat out and in the rinsing water. Use of fluoridated domestic salt and/or fluoride tablets was recorded. The children's intake of fluoride from food averaged  $202.5 \pm 116.2 \mu\text{g F/day}$ . They swallowed an average amount of  $273.9 \pm 175.6 \mu\text{g F/day}$  when brushing their teeth. Daily fluoride ingestion from all sources totalled  $930.7 \pm 391.5 \mu\text{g}$  or  $53.0 \pm 21.4 \mu\text{g/kg}$  body weight. On average 51.5% of the fluoride ingested was excreted in urine. The wide interindividual variation makes it necessary to evaluate the urinary excretion rate for fluoride in larger study populations with varied fluoride exposure.

Authors: Haftenberger M, Viergutz G, Neumeister V, Hetzer G.

For Correspondence: Department of Paediatric Dentistry, University of Technology, Dresden, Germany.

Keywords: Children, Fluoride in dentifrice, Fluoride in food, Fluoride intake, Fluoride in urine, Germany.

Source: Caries Res 2001 Nov-Dec;35(6):451-7.

### **Fluoride intake by children from water and dentifrice**

*Objective:* To determine the total fluoride dose to which children were exposed during the critical age of developing dental fluorosis, in an optimally

fluoridated region, having diet (liquids and solids) and dentifrice as fluoride sources.

*Methods:* For the pilot study, 39 children (aged 20 to 30 months) were selected from a day care center in Piracicaba, Brazil. They drank and ate food prepared with fluoridated water. To determine the total dose of fluoride exposure, duplicate-plate samples and products from tooth brushing were collected for two consecutive days, in four periods of the year. Fluoride was determined using an ion specific electrode. A 5% level of significance variance analysis (Anova) was carried out.

*Results:* Children were exposed to a total fluoride dose of 0.090 mg/day/kg of body weight, of which 45% came from the diet and 55% from dentifrice.

*Conclusions:* Assuming 0.07 mg/kg as a threshold value of fluoride systemic exposure, children were exposed to a risk dose for dental fluorosis. Thus, measures to reduce fluoride intake at the studied age range would be recommended. Reducing the amount of dentifrice used for tooth brushing seems to be the best measure, given the risk/benefits of fluoride use from the public health perspective.

Authors: Lima YB, Cury JA.

For Correspondence: Laboratorio de Bioquímica Oral, Departamento de Ciências Fisiológicas, Universidade Estadual de Campinas, Piracicaba, SP, Brasil.

Keywords: Brasil, Children, Dental fluorosis, Fluoride in dentifrice, Fluoride in food, Fluoride intake.

Source: Rev Saude Publica 2001 Dec;35(6):576-81. [Article in Portuguese]

## ENVIRONMENTAL FLUORIDE POLLUTION

### **Speciation of aluminum in rainwater using a fluoride ion-selective electrode and ion-exchange chromatography with fluorometric detection of the aluminum-lumogallion complex**

Soluble aluminum in rainwater was separated into three categories: free aluminum ( $\text{Al}^{3+}$ ), fluoride complexes (sum of  $\text{AlF}_2^+$  and  $\text{AlF}^{2+}$ ), and other forms of aluminum. The free form of the aluminum ion ( $\text{Al}^{3+}$ ) was directly obtained from the separation data of aluminum species according to their charge using gradient elution cation-exchange chromatography. The aluminum fluoride complexes were estimated by combining the data of the free and total fluoride determined using a fluoride ion-selective electrode, with the assumption that 2+ charged aluminum species consisted only of  $\text{AlF}^{2+}$ . The rest of the aluminum species had a 1+, neutral, or negative charge and mainly consisted of organic complexes. The origin of the organically bound aluminum is discussed. The concentration range of the total dissolved fluoride and aluminum in the rainwater samples was usually in the micromolar to submicromolar range, and the ratio of  $[\text{T-F}]/[\text{T-Al}]$  was

found to be between 1 and 4. The speciation of dissolved aluminum into three categories was carried out on the basis of data of 15 rainwater samples collected in the city of Otsu.

Authors: Hara H, Kobayashi H, Maeda M, Ueno A, Kobayashi Y.

For Correspondence: Department of Chemistry, Faculty of Education, Shiga University, Otsu, Japan. [hara@sue.shiga-u.ac.jp](mailto:hara@sue.shiga-u.ac.jp)

Keywords: Aluminum fluoride complexes, Aluminum-lumogallion complex, Aluminum speciation, Rainwater.

Source: Anal Chem 2001 Nov 15;73(22):5590-5.

### **Dynamics of aluminum speciation in forest-well drainage waters from the Rhode River watershed, Maryland**

This paper reports an investigation of the dynamics of aluminum (Al) speciation in the forest-well waters from study site 110 of the Rhode River watershed, a representative sub-unit of Chesapeake Bay. Seasonal changes of Al speciation are evaluated by a modified MINEQL computer model using chemical equilibrium calculation. It was found that Al-F and Al-Org complexes were the dominate forms, whereas toxic forms of Al<sup>3+</sup> and Al-OH were not significant. This indicates that Al toxicity is not very serious in the Rhode River area due to the high concentrations of fluoride and organic materials, even though sometimes pH is very low (approximately 4). Increased H<sup>+</sup> or some other associated factors may be responsible for the decline in fish and amphibian population on the watershed.

Authors: Bi SP, An SQ, Yang M, Chen T.

For Correspondence: State Key Laboratory of Pollution Control and Resource Reuse, Department of Chemistry, Nanjing University, Nanjing 210093, People's Republic of China. [bsp@nju.edu.cn](mailto:bsp@nju.edu.cn)

Keywords: Aluminofluoride complexes, Aluminum speciation, Environmental fluoride, Rhode River.

Source: Environ Int 2001 May;26(5-6):377-80.

### **Assessing regional variation of environmental fluoride concentrations in western Germany by analysis of antler fluoride content in roe deer (*Capreolus capreolus*)**

To assess regional variation in ambient fluoride levels, we analyzed the fluoride content of 188 antlers of roe deer (*Capreolus capreolus*) killed between 1990 and 1999 in 14 areas of the federal state of North Rhine-Westphalia, Germany. Individual antler fluoride concentrations ranged between 113 and 11,995 mg F/kg bone ash, and sample means differed significantly ( $p < 0.0001$ ) among the study areas. Low average concentrations (geometric means of 262 and 277 mg F/kg bone ash, respectively) were found in antler samples from two control areas, located

quite remote to major fluoride emission sources. The highest geometric mean fluoride content (1,677 mg F/kg bone ash) was recorded for an antler sample from a study area exposed to fluoride emissions from an aluminium smelter and two mineral coal-fired power stations. In eight antlers obtained from roe deer living in the direct vicinity of the aluminium smelter, fluoride values ranged between 2,067 and 11,995 mg F/kg bone ash, thereby demonstrating the strong impact of this emission source on its surroundings. The study showed that by analyzing antler fluoride concentrations, large-scale surveys of environmental contamination by fluoride can be performed in a standardized and cost-effective way in areas inhabited by deer. Due to its rather narrow home range, abundance, and high adaptability, the roe deer is particularly suited for such studies.

Authors: Kierdorf U, Kierdorf H.

For Correspondence: Institute of General and Systematic Zoology, Justus-Liebig-University of Giessen, Heinrich-Buff-Ring 26-32 (IFZ), D-35392 Giessen, Germany.  
kierdorf@lindlar.de

Keywords: Environmental fluoride, Fluoride in antlers, Fluoride in bone, Germany, Roe deer.

Source: Arch Environ Contam Toxicol 2002 Jan;42(1):99-104.

---

### CORRECTION

Book review by HC Moolenburgh: *Treatise on Fluorosis* by AK Susheela. *Fluoride* 2001;34(3):181-3. The full title of the book is: *A Treatise on Fluorosis*. The year of publication (2001) was inadvertently omitted.