

## Staining and hypoplasia of enamel caused by tetracycline: case report

P. Fleming, BDentSc, FDS C.J. Witkop, Jr., DDS, MS  
W.H. Kuhlmann, DDS, MSD

### Abstract

*Staining of developing teeth due to tetracycline therapy has been publicized widely. However, the ability of tetracyclines to cause hypoplasia of enamel has not been accepted universally. This is a case report of enamel hypoplasia and staining presumably caused by a high dosage of tetracyclines in childhood. Restoration of the teeth with bonded composite resins produced an esthetic result.*

Schwachman and Schuster (1956) were the first to report unsightly staining of teeth due to tetracycline administered during the period of tooth formation in children with cystic fibrosis. This observation was confirmed by Zegarelli et al. (1961) who noted staining of the teeth in 38 of 52 cystic fibrosis patients who had been treated with large doses of antibiotics, frequently tetracyclines. With reports by Davies et al. (1962) and articles by Wallman and Hilton (1962) and Witkop and Wolf (1963) this complication of tetracycline therapy became widely recognized.

Hypoplasia of enamel of the primary dentition associated with extensive use of tetracycline therapy was reported first by Wallman and Hilton in 1962. Some authors disputed the role of tetracyclines in producing enamel hypoplasia (Rushton 1962; Stewart 1962) and attributed it to the illness for which the tetracyclines were given, or to premature birth. However, Witkop and Wolf (1963) reported that high doses of tetracycline administered during childhood resulted in severe hypoplasia and staining of the permanent teeth developing at that time. Those who had received higher doses had more severe hypoplasia of enamel.

A study of the UV fluorescence of teeth affected with a wide variety of environmental and genetic defects and of a control group of 585 children from the general population showed that only those with a history of tetracycline ingestion had bright yellow fluorescence. This indicated that the presence of yellow fluorescence of teeth was a reliable method of diagnosing exposure to the drug during the period of odontogenesis (Witkop et al. 1965).

### Case Report

A 23-year-old white male requested restoration of his stained and hypoplastic anterior teeth (Fig 1). A history revealed that between 2 and 3 years of age he had received extensive tetracycline therapy for tonsillitis. There was no history of a prolonged fever at the time of the illness.

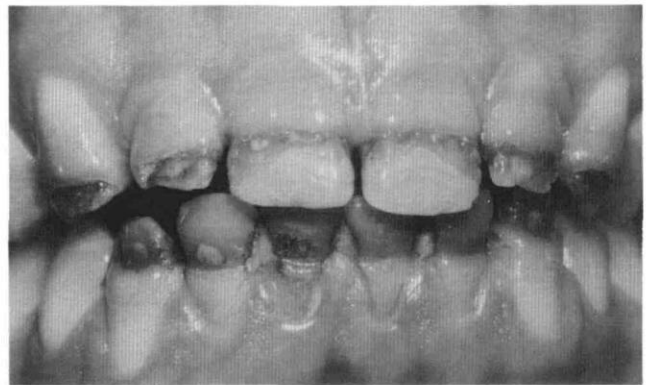


FIG 1. Tetracycline staining and hypoplasia of the permanent anterior teeth.

Examination of the teeth showed symmetrical linear gray stained bands of hypoplastic enamel involving the labial surfaces of all incisors and yellow stained bands of hypoplastic enamel involving the lingual aspect of all incisors and both surfaces of canines and first permanent molars. Under UV light (270mU) the yellow stained areas fluoresced a bright yellow, confirming tetracycline as the cause of staining. The location of the hypoplastic bands in the maxillary teeth was as follows: central incisors — one-half the distance between the incisal edge and cervix of the crown; lateral incisors — one-third the distance from the incisal edge toward the cervix of the crown; canines — one-quarter the distance from the cusp tip toward the cervix of the crown; first permanent molars — one-half the distance from the cusp tips toward the cervix of the crown. In the mandibular teeth the bands were placed slightly more toward the cervix of the crown, but involved essentially the same crown areas as those of

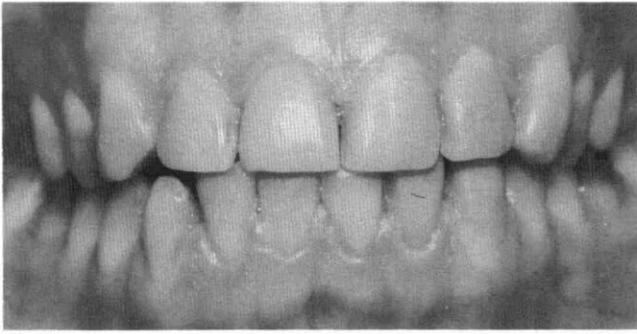


Fig 2. Esthetic result following restoration with bonded composite resins.

the maxillary teeth.

Esthetic restoration of the anterior teeth was achieved using bonded composite resins<sup>a</sup>, including the use of suitable opaquers to mask the darkly stained bands (Fig 2).

## Discussion

Wallman and Hilton (1962) studied 50 infants who had received tetracyclines during the neonatal period, 23 prophylactically, and found that 46 had stained teeth. The data further indicated that those receiving an average dose of 26-29 mg/kg of body weight/day had hypoplasia of enamel. Witkop et al. (1963) reported hypoplasia and staining of the dentition in 17 children following previous administration of tetracycline in doses of 20-75 mg/kg of body weight/day. Those with higher doses had more severe hypoplasia of enamel. In another series (Witkop, personal communication) it was noted that administration of tetracyclines in doses of 25-35 mg/kg of body weight/day resulted in staining in all, and hypoplasia of enamel in slightly less than half of the children receiving this dose. However, all children receiving doses higher than 35 mg/kg of body weight/day had hypoplastic and stained enamel. Studies using very high doses of tetracyclines in healthy animals have confirmed the ability of tetracyclines to induce hypoplasia of enamel (Nylen et al. 1964; McIntosh and Storey 1970).

<sup>a</sup> Silux — 3M Dental Products; St. Paul, MN.

In the present case the hypoplastic and stained bands involving the permanent incisors, canines, and first molars correspond to an injury to enamel between 2 years, 6 months ( $\pm 6$  months) and 3 years ( $\pm 6$  months). The history of extensive tetracycline therapy for tonsillitis between 2 and 3 years of age indicates that the most likely cause of injury was administration of high doses of tetracycline ( $> 35$  mg/kg of body weight/day), because there is no history of a prolonged fever ( $> 104^{\circ}$  F) concurrent with the illness for which the drug was administered.

Dr. Fleming is a tutor/registrar, paediatric dentistry, Royal Victoria Hospital, Belfast, Northern Ireland; Dr. Witkop is a professor and head of human and oral genetics and Dr. Kuhlmann is an assistant professor, cleft palate and maxillofacial clinic, University of Minnesota. Reprint requests should be sent to: Dr. P. Fleming, Dept. of Paediatric Dentistry, School of Dentistry, Royal Victoria Hospital, Belfast BT12 6BP Northern Ireland.

- Davies PA, Little K, Aherne W: Tetracyclines and yellow teeth. *Lancet* 1:743, 1962.
- McIntosh HA, Storey E: Tetracycline induced tooth changes. Part 4. Discoloration and hypoplasia induced by tetracycline analogues. *Med J Aust* 1:114-19, 1970.
- Nylen MV, Omnell K-A, Lofgren C-G: Fine structure of tetracycline induced hypoplastic and hypomineralized defects in rat incisor enamel. *J Dent Res* 43:850, 1964.
- Rushton MA: Tetracycline in teeth and bone. *Lancet* 1:970, 1962.
- Schwachman H, Schuster A: The tetracyclines. *Applied pharmacology*. *Pediatr Clin North Am* 3:295-303, 1956.
- Stewart DJ: Tetracycline in teeth and bone. *Lancet* 1:970, 1962.
- Wallman IS, Hilton RB: Teeth pigmented by tetracycline. *Lancet* 1:827-29, 1962.
- Witkop CJ Jr, Wolf RO: Hypoplasia and intrinsic staining of enamel following tetracycline therapy. *J Am Med Assoc* 185:1008-11, 1963.
- Witkop CJ Jr, Wolf RO, Mehaffey HH: The frequency of discolored teeth showing yellow fluorescence under ultraviolet light. *J Oral Ther Pharm* 2:81-87, 1965.
- Zegarelli EV, Denning CR, Kutscher AH, Tuoti F, di Sant'Agnese PA: Discoloration of the teeth in patients with cystic fibrosis of the pancreas. A preliminary report. *NY State Dent J* 27:237-38, 1961.