From:
The Dental Institute of Experimental
Research and Department of Anatomy,
Dental Faculty,
University of Oslo,
Norway

A STUDY OF EXPERIMENTALLY EXPOSED AND FLUORIDE TREATED DENTAL CEMENTUM IN PIGS

by
RANDI FURSETH

INTRODUCTION

Microradiographic studies have demonstrated that human cementum frequently develops a highly mineralized surface layer when exposed to the oral environment (*Forsberg, Lagergren & Lönnerblad*, 1960; *Selvig & Zander*, 1962; *Furseth*, 1970a) but cementum may also undergo carious changes (e.g. *Kostlán*, 1963; *Furseth & Johansen*, 1968).

Numerous studies have demonstrated the caries inhibiting effect of fluoride on enamel (e.g. *Brudevold* et al. 1963; *von der Fehr*, 1967). *In vivo* experiments on dentine have given similar results (*von der Fehr*, 1970). *In vitro* experiments on ground surfaces of dentine have also shown that F-treated surfaces are more resistant to acid decalcification (*Selvig*, 1968; *Selvig, Sand & Mörch*, 1968). Fluoride application is also believed to have a beneficial effect on cervical hypersensitivity of teeth (*Kanouse & Ash*, 1969; *Miller et al.*, 1969).

The purpose of the present study was to investigate the effect of the oral environment on experimentally exposed sound cementum, and specifically to find out whether a topical application of sodium fluoride to newly exposed cementum would alter the reactions of this tissue to the oral environment.

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MATERIALS AND METHODS

The experimental material consisted of 26 deciduous teeth from 4 pigs of the Norwegian land race. The pigs were obtained at the age of 8—9 weeks, and they were kept for 1 week in their new environment. The animals were anesthesized with an intravenous injection of 5 % nembutal. The difference between an effective dose and a lethal dose was small. The tolerance of the different pigs to the anesthetic varied, and the dosage could not be based entirely on body weight. A light narcosis was therefore used, and for this reason the animals were fairly difficult to handle. Therefore, a local anesthetic was also administered.

Gingivectomies were then carried out on the buccal side of 3—4 teeth in the right and left side of the jaws. After 2—3 weeks gingivectomies were carried out on another 3—4 teeth. Parts of the gingiva as well as buccal bone were removed. Surgical packs were not used, but the wounds healed rapidly. The teeth most frequently used were the first and second incisors in the lower jaw, and the first and second molars in the upper and lower jaw. Fifteen of the exposed surfaces were treated with a 2 % solution of NaF at pH 6.8 for 10 min, while the remaining 11 exposed surfaces were left exposed without further treatment. The teeth on one side of the jaw were F-treated, while those on the contralateral side were left exposed without further treatment. In the front region the surfaces which were not to be F-treated, were covered with a layer of wax to prevent contamination during the topical application. In two teeth the F-treatment was repeated after 14 days. The observation periods varied from 16 to 42 days.

At the end of the observation period the teeth were extracted and immediately fixed in 2.5 % cacodylate-buffered glutaraldehyde or 2 % cacodylate-buffered formalin at pH 7.2 to which had been added 7.5 % sucrose. Three teeth were divided longitudinally in two parts, and one part was decalcified, embedded in paraffin, sectioned and stained with hematoxylin and eosin.

The teeth which were intended for electron microscopic studies were postfixed in 1 % cacodylate-buffered osmium tetroxide at pH 7.2, and embedded in Vestopal W. Ground sections parallel to the long axes of the teeth through the exposed areas were cut with a diamond wheel and microradiographs were prepared. Based on microradiographic observations, selected areas of 52 ground sections from 26 teeth were dissected out and re-embedded for electron microscopy. Ultrathin sections were cut with a diamond knife on an LKB Ultrotome III. Some sections from each specimen were examined unstained while others were decalcified on the grid with phosphotungstic acid (PTA). Some sections were also stained with lead citrate and uranyl acetate. The sections were examined in a Siemens Elmiscope Ia electron microscope operated at 80 kV. Selected-area electron diffraction was carried out. Hypermineralized surface layers were observed in some of the specimens, and a visual scoring of the microradiographs was therefore carried out. The lingual side of the experimental teeth, areas located apical to the experimental areas as well as 21 normal teeth served as control material. The normal material and further details concerning methods have been described previously (*Furseth*, 1970b).

FINDINGS

Light microscopy

The cementum surface of the exposed teeth often had an uneven appearance. This may be due to damage during the gingivectomies or during the observation period. Some of the cementum lacunae were found to be empty, while others contained cellular remnants (Fig. 1).

Microradiography

The degree of mineralization of the exposed surface layers varied between the different teeth as well as within the individual tooth. The visual scoring of the microradiographs was carried out scoring the degree of hypermineralization as none, slight or pronounced. The results of the scoring is presented in Table I.

Table I

Distribution of material and hypermineralized surface layers

	Number of teeth	Hypermineralization None	Hypermineralization Slight	Hypermineralization Pronounced
Exposed	11	4	7	0
Exposed + F-treated	15	1	7	7

It became apparent that in the group where the cementum surfaces had been exposed to the oral cavity but received no fluoride treatment, some of the surfaces did not exhibit any increased degree of mineralization as compared to the underlying tissue (Table I). Where a highly mineralized surface layer was seen, it was usually fairly narrow (Figs. 3,4).

PLATE I

Fig. 1. Photomicrograph from molar showing part of cementum which has been exposed to the oral cavity for 29 days. The cementum surface is covered with bacterial plaque (BP). Some lacunae appear empty while others contain cellular remnants. Cemento-dentinal junction (CDJ). *Hematoxylin and eosin.* × 180.

Fig. 2. Microradiograph from molar showing dentine which has been exposed to the oral cavity for 42 days. This surface has been F-treated. The surface layer appears hypermineralized (HZ). Disturbed dentine formation (DD) is seen corresponding to the area which has been exposed. Pulpo-dentinal junction (arrow). × 70.

Fig. 3. Microradiograph from incisor showing area which has been exposed to the oral environment for 21 days. A narrow, highly mineralized surface layer can be seen in one area of the root (arrow) while this zone becomes wider in the apical direction. Cemento-dentinal junction (CDJ). × 30.

Fig. 4. Microradiograph from molar showing cementum which has been exposed to the oral cavity for 35 days. There is a narrow highly mineralized surface layer and a fairly large calculus deposit (Cal). Cemento-dentinal junction (CDJ). × 80.

Fig. 5. Microradiograph from incisor showing F-treated cementum which has been exposed to the oral environment for 15 days. The hypermineralized surface zone (HZ) is fairly wide, and the cementum lacunae are not as clearly visible as in the underlying cementum. Cemento-dentinal junction (CDJ). × 30.

Fig. 6. Microradiograph from molar showing F-treated cementum which has been exposed to the oral environment for 35 days. There is a pronounced hypermineralized surface zone (HZ). Calculus can be seen adjacent to the cementum surface. Cemento-dentinal junction (CDJ). × 30.

Fig. 7. Microradiograph from molar showing F-treated cementum which has been exposed to the oral environment for 29 days. There is a wide hypermineralized surface zone (HZ), and the cementum lacunae are not as apparent in this zone as in the underlying cementum. Cemento-dentinal junction (CDJ). × 80.

Fig. 8. Microradiograph from incisor showing F-treated cementum which has been exposed to the oral environment for 21 days. The hypermineralized surface zone (HZ) is pronounced and cementum lacunae cannot be seen in this layer. × 90.

PLATE II

Fig. 9. Electron micrograph from molar showing cementum surface which has been exposed to the oral environment for 35 days. The corresponding microradiograph showed a narrow hypermineralized surface zone. The surface layer (SL) is more electron-dense than the underlying cementum. Fiber bundles oriented perpendicularly to the surface can be observed. Bacterial plaque (BP), large calculus deposits (arrows), cementum lacunae (L). No staining. × 2500.

Fig. 10. Electron micrograph from incisor showing F-treated cementum surface which has been exposed to the oral cavity for 21 days. The corresponding microradiograph showed a highly mineralized surface layer. The surface layer is densely mineralized and the crystals appear plate-like. Bacteria (Ba), unmineralized area which might represent unmineralized core of Sharpey's fiber (UC). No staining. × 37,800.

Fig. 11. Electron micrograph from incisor showing F-treated cementum surface which has been exposed to the oral cavity for 21 days. The corresponding microradiograph showed a slight hypermineralization in the surface layer. The crystals are plate-like and the crossbanding of collagen is reflected in the mineral deposition. Bacteria (Ba). No staining. × 50,400.

Fig. 12. Electron micrograph from molar showing cementum surface which has been exposed to the oral cavity for 15 days. The crossbanding of collagen is clearly visible, even in the surface layer. Cementum surface (arrow). The section has been treated for 30 min with PTA. × 44,100.

PLATE III

Fig. 13. Electron micrograph from molar showing cementum (C) which has been exposed to the oral cavity for 29 days. The corresponding microradiograph did not exhibit a highly mineralized surface layer. The cementum surface is uneven and is covered by a layered pellicle (Pe). On the surface of the pellicle a bacterial plaque (BP) can be noted. No staining. × 17,600.

PLATE I

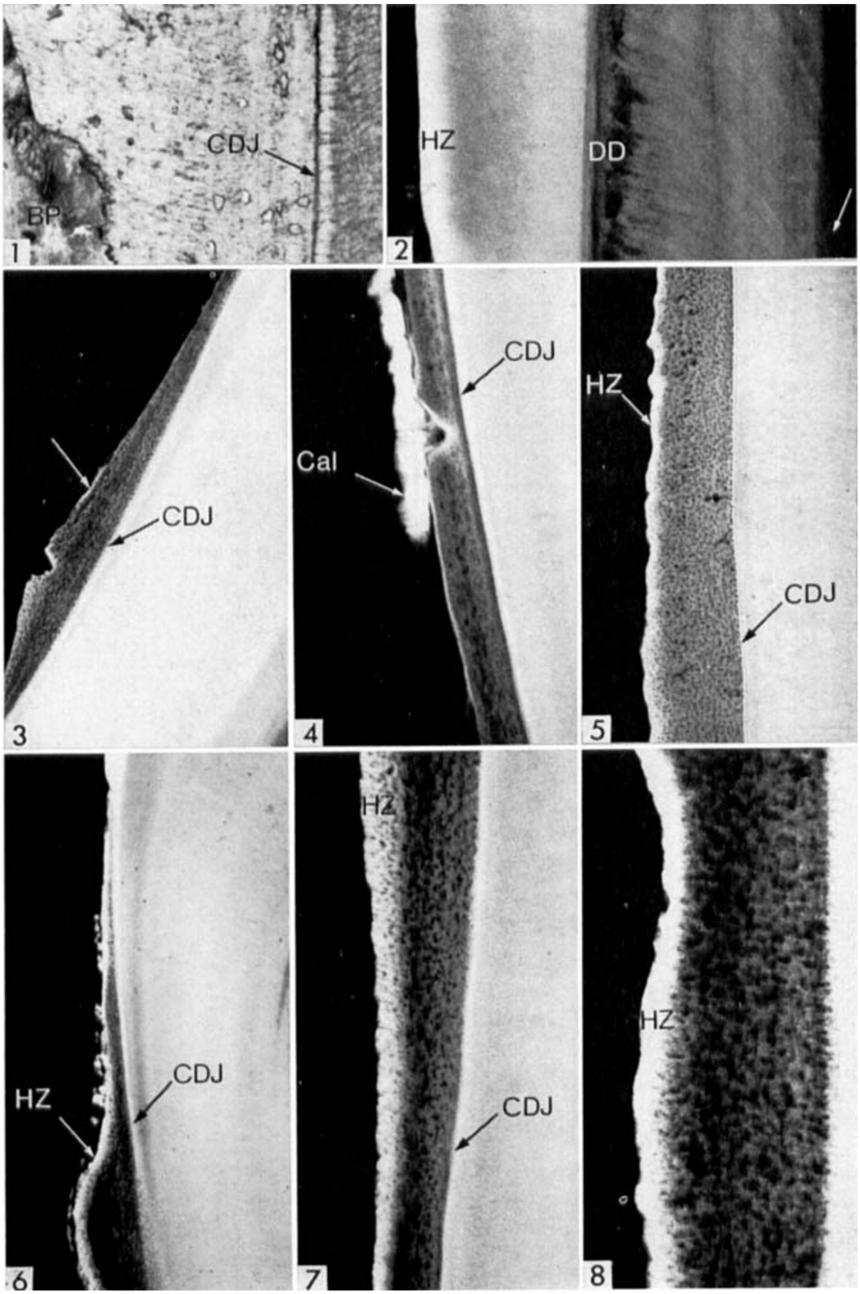

PLATE II

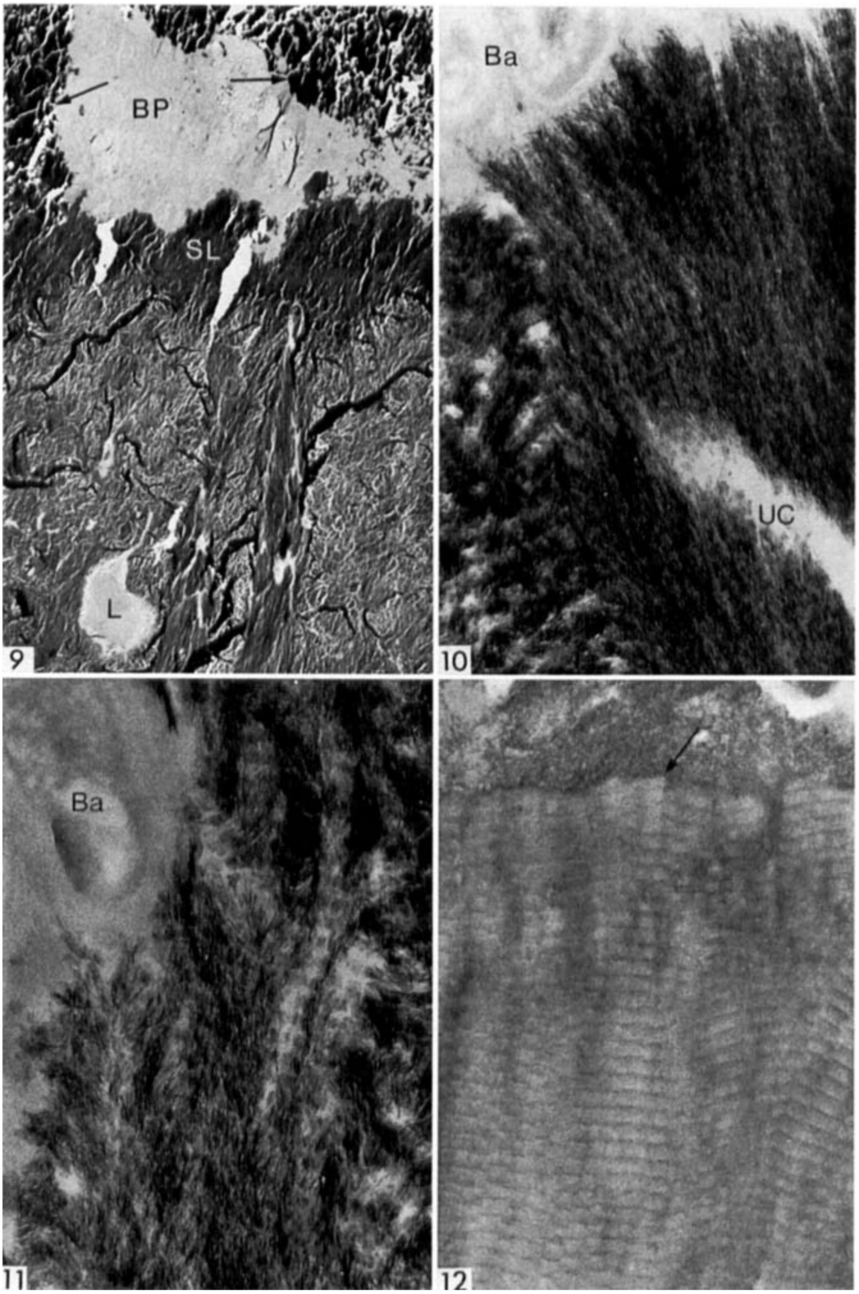

PLATE III

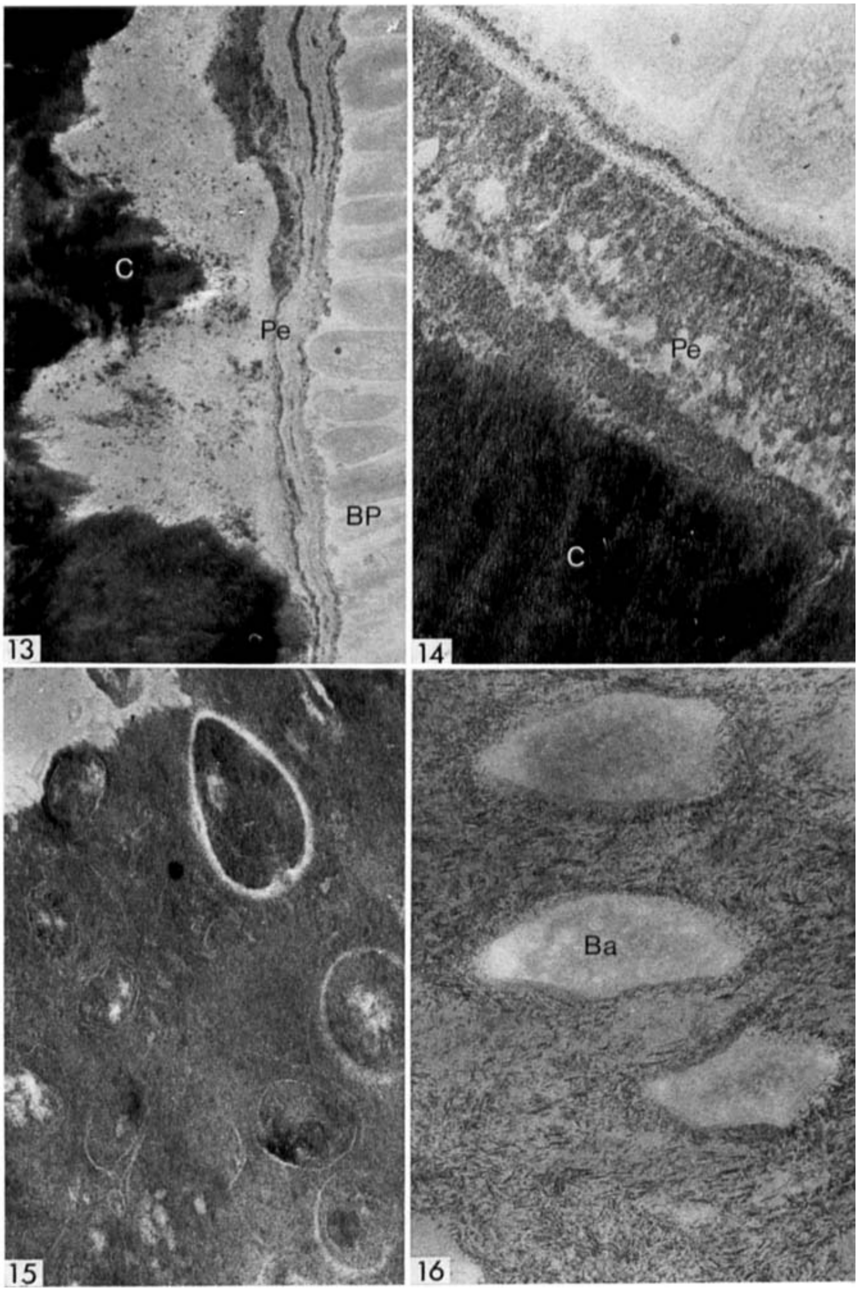

PLATE IV

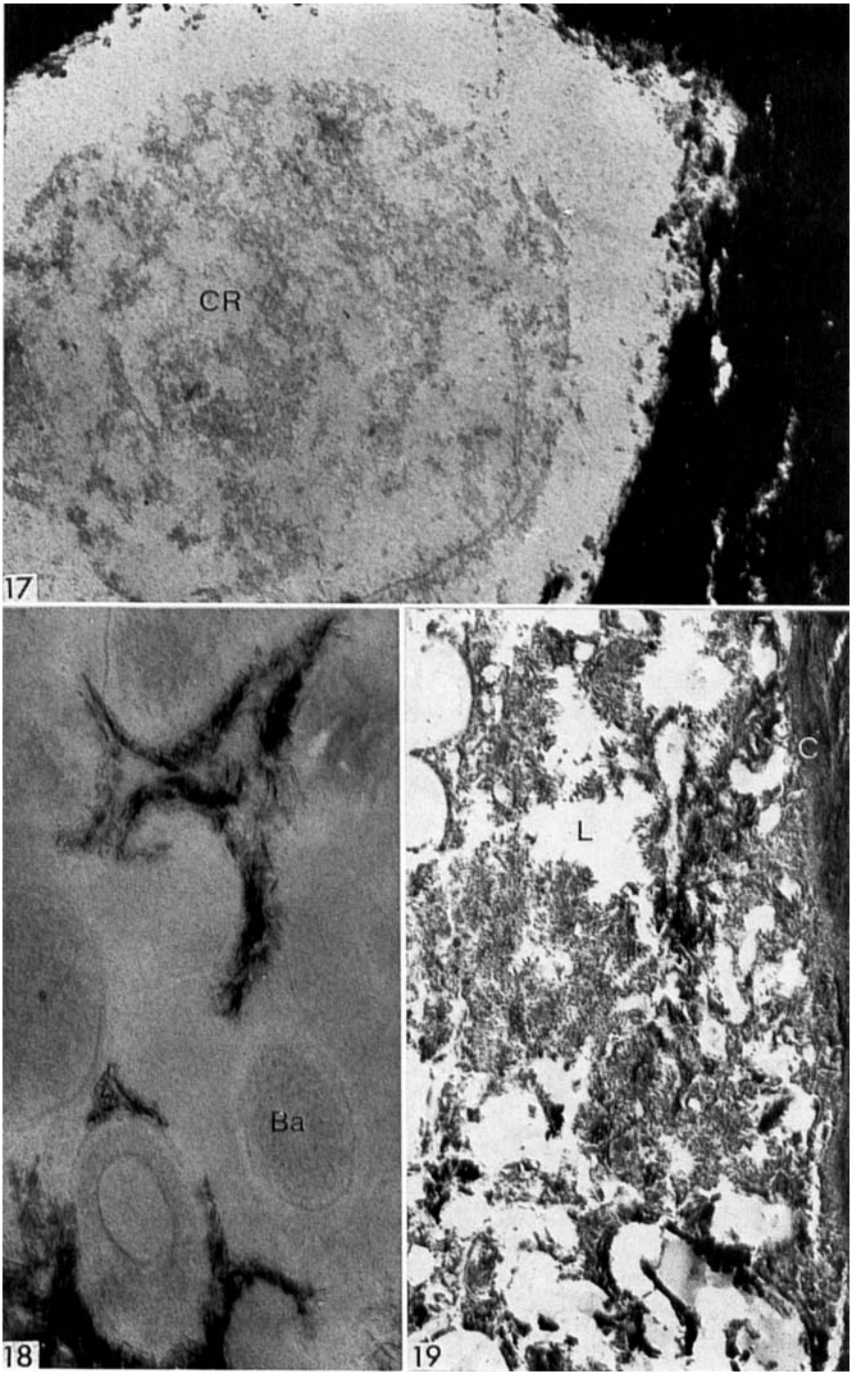

Fig. 14. Electron micrograph from the same specimen as seen in Fig. 13. showing the pellicle (Pe) at higher magnification. The pellicle appears to contain a fairly electron-dense material. Cementum (C). No staining. × 50,200.

Fig. 15. Electron micrograph showing calculus deposit with intra- as well as inter-bacterial mineralization. The presence of bacteria is reflected in the mineral deposition. The calculus crystals appear to be quite small. The cementum surface has been exposed to the oral cavity for 29 days. No staining. × 37,600.

Fig. 16. Electron micrograph showing calculus deposits from cementum surface which has been exposed to the oral cavity for 16 days with inter-bacterial mineralization. The calculus crystals appear small and needle-shaped or plate-like and are not densely packed. Bacteria (Ba). No staining. × 50,200.

PLATE IV

Fig. 17. Electron micrograph from incisor showing cementum lacuna with cellular remnants (CR). The contour of the cementocyte can be discerned, but no identifiable structures can be seen. The cementum has been exposed to the oral environment for 21 days. Lead citrate, uranyl acetate. × 22,200.

Fig. 18. Electron micrograph from incisor showing part of cementum lacuna located close to the cementum surface. The lacuna is filled with bacteria (Ba), and a slight inter-bacterial mineralization can be noted. The crystals are small and plate-like or needle-shaped. The cementum has been exposed to the oral environment for 20 days. No staining. × 53,800.

Fig. 19. Electron micrograph from molar which has been exposed to the oral cavity for 29 days showing cementum lacunae (L) located close to the surface. The lacuna is filled with bacteria which are partly calcified. Cementum (C). No staining. × 21,500.

In the group of teeth which had received F-treatment concomitant with the exposure, part of, or the entire exposed cementum surface showed a highly mineralized surface layer in most instances (Table I, Figs. 2, 5—8). The width of this layer was up to 70 μ (Fig. 7), which was wider than that observed in the exposed non-treated group. The teeth which had received F-treatment twice did not show any particularly high degree of mineralization. Often the highly mineralized surface layers were seen after long times of exposure, but in a few specimens they were also seen after short observation periods. The presence of cementum lacunae could be observed in the highly mineralized layers in some areas (Fig. 7), but in other areas cementum lacunae could not be observed (Fig. 8). In a few instances exposed dentine with a highly mineralized surface layer was seen, and disturbed dentine formation was sometimes observed in the area corresponding to the exposed dentine (Fig. 2).

Varying amounts of calculus deposits were observed on several of the exposed surfaces in both groups. In some teeth relatively large deposits were observed (Fig. 4) while in other teeth only traces of deposits as judged microradiographically were present (Fig. 6). In some areas the deposits were in contact with the tooth surfaces in the plane of section, but quite frequently the deposits were at a slight distance from the tooth surface as judged microradiographically (Fig. 6).

Electron microscopy

The cementum surface of the exposed teeth often had an uneven appearance, and in a few instances exposed dentine was observed. Exposed cementum surfaces which microradiographically showed a narrow densely mineralized surface layer, showed a corresponding electron-dense surface zone (Fig. 9). Due to difficulties in sectioning sufficiently large sections of the wider highly mineralized layers (40—70 μ), the same difference in electron density cannot be documented for these layers, but the crystals in the surface layers of these specimens were densely packed (Figs. 10, 11).

The crystals in the surface layer of the exposed as well as the exposed and F-treated cementum surfaces had the same appearance as the crystals in the deeper layers, i.e. they were plate-like (Figs. 10, 11). The hypermineralized surface layers gave the diffraction pattern of hydroxyapatite. In PTA-decalcified sections, the crossbanding of the collagen fibers was clearly visible in the surface layer as well as in the deeper layers of the cementum (Fig. 12).

Most of the teeth in both groups had a bacterial plaque on the surface, and often the plaque was calcified (Figs. 9, 15, 16). Where calculus deposits were observed, the presence of bacteria was reflected in the mineralization pattern (Fig. 15). Intra- as well as inter-bacterial mineralization was observed (Figs. 9, 15, 16). In some instances the calculus was composed of small plate-like or needle-shaped crystals (Fig. 16), while in other specimens the deposits were made up of smaller particles difficult to identify (Fig. 15). Both these types of deposits gave diffuse selected-area diffraction patterns, indicating a low degree of crystallinity, while the calculus deposit seen in Fig. 9 gave the diffraction pattern of hydroxyapatite. In a few instances the tooth surfaces were covered with a layered pellicle which seemed to contain no bacteria (Figs. 13, 14). This layer was partly calcified as judged by its electron density, but crystals could not be recognized (Fig. 14). These layered pellicles were covered by an uncalcified bacterial plaque (Figs. 13, 14).

Some of the cementum lacunae were empty while others contained cellular remnants (Fig. 17). Some lacunae close to the surface in the plane of section were filled with bacteria, and mineralization of these bacteria was also seen in some specimens (Figs. 18, 19).

DISCUSSION

When comparing the exposed cementum surfaces with unexposed surfaces (*Furseth*, 1970b), it was apparent that the pig cementum often developed a hypermineralized surface layer when exposed to the oral environment.

This is in agreement with findings in human material (*Forsberg et al.*, 1960; *Selvig & Zander*, 1962; *Furseth & Johansen*, 1968; *Selvig*, 1969; *Furseth*, 1970a). A hypermineralized surface layer was also observed in exposed dentine, and this also agrees with findings in human material (*Mjör*, 1967).

In previous studies of human cementum tablet-shaped crystals have been found in exposed hypermineralized surface layers (*Herting*, 1967; *Yamada*, 1968; *Selvig*, 1969; *Furseth & Johansen*, 1970; *Furseth*, 1970a). In the present study, however, the surface crystals seemed to have the same morphology as the crystals of the sound tissue (*Furseth*, 1970b) i.e. they were plate-like. This could be due to the fact that the surfaces had not been exposed long enough. The longest observation period was 42 days. However, *Selvig* (1969) in a study of scaled human root-surfaces where the surface layer of the cementum had been removed, found tablet-shaped crystals in hypermineralized surface layers in one specimen after 3 weeks, and in many specimens after longer observation periods. Thus, while exposed as well as exposed and F-treated pig cementum often demonstrated hypermineralized surface layers like in human material, there seemed to be no change in crystal morphology. The selected-area electron diffraction showed that the crystals in the surface layer were hydroxyapatite. Some of the mineral in the hypermineralized surface layers may be located in the cementum lacunae, since surface lacunae with bacteria undergoing mineralization were observed. It may also be that individual crystals had increased in size or that there was an increased number of plate-like crystals. Small plate-like crystals were the only crystal form observed in calculus, and the concentration of calcium and phosphate ions and/or the nature of the organic matrix in the pig might favour this crystal type.

There was an increase in the degree of hypermineralization in the F-treated teeth as compared to those which had not received F-treatment. *Selvig et al.* (1968) showed that F-treatment of ground surfaces of dentine *in vitro* did not cause any demonstrable changes in the surface or in deeper layers when studied with microradiography. This indicates that the higher degree of mineralization observed in the F-treated group was not an immediate effect, but occurred during the observation period.

Uptake and topographic distribution of fluoride in enamel following topical treatment with acidulated fluoride-phosphate solutions have been studied by *Baud* and *Bang* (1970). They found that the fluoride penetrated the enamel to a depth of 10—12 μ, and after long washing a moderate concentration of fluoride was still observed to a depth of 18—20 μ. Experiments with P^{32} have shown that the rate of penetration of phosphorus into the tooth is inversely proportional to the density of the dental structures (*Sognnaes, Shaw & Bogorogh*, 1955). It is therefore reasonable to presume that a topical application of fluoride on cementum would result in a deeper penetration of this element than that observed in enamel. A greater uptake would also be expected because of the greater reactive surface area of the crystals in cementum as compared to enamel. It has been shown that cementum concentrates fluoride to a higher degree than surface enamel (*Yardeni, Gedalia & Kohn*, 1963; *Singer & Armstrong*, 1962).

It has been demonstrated that fluoride has an effect on mineralization. *Koulourides* (1968) showed that in enamel which had been demineralized *in vitro*, even 1 ppm of fluoride accelerated the rehardening 4—5 times. Fluoride also increased the rate of hydroxyapatite precipitation from supersaturated calcifying solutions (*Grön & Messer*, 1964). It is therefore possible that the increased mineralization observed in F-treated cementum surfaces in the present study was due to increased apatite formation with minerals derived from the oral fluids.

The time for topical treatment was only 10 min, but studies of the F-content of plaque in humans have shown that increased F-concentrations were observed about 24 hours after rinsing with 0.2 % NaF (*Birkeland, Jorkjend & von der Fehr*, 1970). It has been demonstrated that following topical application of fluoride, an accumulation of fluoride in the surface layer of the enamel is produced partly as calcium fluoride and partly as fluorapatite (*Baud & Bang*, 1970). The calcium fluoride dissolves from the enamel within a day or two (*McCann*, 1968), but this fluoride may serve as a possible source for further fluorapatite formation. The above findings also indicate that a certain amount of contamination by fluoride of the untreated surfaces might have occurred, but if so, the contamination was not of such a magnitude as to affect the mineralization to the same degree as the topical application. Repeated topical application of fluoride which was done on two teeth did not seem to increase the degree of mineralization, indicating that a threshold might have been reached.

The extent to which flourapatite was formed due to the topical application, however, is unknown. Selected-area electron diffraction is not a suitable method to determine this, since the d-values and intensities of fluorapatite are very close or similar to those of hydroxyapatite.

It is a well known phenomenon that F-treatment leads to increased resistance to caries. Also routine use of a fluoride containing dentifrice has shown to have a beneficial effect on cervical hypersensitivity of teeth (*Kanouse & Ash*, 1969), and the use of a stannous fluoride gel had the same effect (*Miller* *et al.*, 1969). The present study showed a high degree of mineralization in F-treated surfaces in cementum as well as in dentine. The beneficial effect of fluoride application on cervical hypersensitivity may be due to higher mineral content which creates a calcific barrier that reduces or prevents hypersensitivity. Since dental hypersensitivity is often experienced after gingivectomies, topical application of fluoride seems indicated, provided it does not harm the pulp or effect the healing of the gingiva. Early investigations showed more severe pulp reactions in fluoride-treated teeth than in the control teeth (*Lefkowitz & Bodecker*, 1945; *Rovelstad & St. John*, 1949). However, recent investigations have given different results. The incorporation of sodium fluoride into a filling material up to 4 % produced no significant harm to the pulp within a 32-day period (*Maurice & Schour*, 1956). Fluoride treatment of freshly cut dentine in rats did not produce any pulp reactions and the effects of 10 % stannous fluoride applied directly to the exposed pulp was essentially the same as when water was applied directly to the exposure (*Evans & Massler*, 1968). It should be added that application of a 4 % aqueous solution of sodium fluoride during periodontal flap surgery did not change the rate of healing (*Griffin, Wagner & Collings*, 1969). The latter studies indicate that a topical application of fluoride to exposed root surfaces would not be harmful, although further studies are indicated.

Empty lacunae or lacunae containing cellular remnants were often observed in the exposed cementum. Similar observations have been made by *Erausquin* and *Muruzábal* (1967) who found necrosis of cementocytes underlying areas with acute periapical inflammation. Lack of nutrition as well as toxic substances may play a role in the destruction of the cementocytes.

In a few instances a layered pellicle which was partly mineralized as judged by its electron density, was observed on the cementum surface. Similar observations have been made on bovine cementum exposed to the oral environment (*Listgarten*, 1968) as well as on human cementum (*Selvig*, 1969). Calculus deposits were often observed, indicating that pig saliva like human saliva is supersaturated with respect to calcium and phosphate. The deposits seemed to be removed from the tooth surface in the plane of section in some specimens, but were probably connected with the tooth in other areas. The calculus crystals occasionally appeared small and needle- or plate-like, and sometimes minute particles were observed. Small plate-like crystals have also been demonstrated in human calculus, but in addition much larger crystals have been reported to be present (e.g. *Schroeder*, 1965; *Yamada*, 1968; *Selvig*, 1969; *Furseth*, 1970a). The shape and minute size of the crystals as well as the diffraction data indicate that pig calculus was composed of hydroxyapatite crystals while the other crystal varieties often described in human calculus were absent.

In summary, this study shows that a single 10 min application of sodium fluoride to the cementum surface during gingivectomy may significantly alter the mineral content of the root surface. By analogy with earlier reports on the effect of fluorides on other dental hard tissues, it can be concluded that such treatment will increase the resistance of the root surface to acid dissolution and caries, and reduce cervical hypersensitivity. Therefore, fluoride application to exposed root surfaces seems indicated, provided it is not harmful to the pulp.

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SUMMARY

The purpose of the present study was to investigate the effect of the oral environment on experimentally exposed sound cementum from pigs, and to see if topical application of sodium fluoride would alter the reactions of this tissue to the oral environment.

The exposed cementum surfaces were covered with plaque. Some of the surfaces exposed to the oral cavity without F-treatment did not exhibit any increased degree of mineralization. Where a highly mineralized surface layer was seen it was usually fairly narrow. In the teeth which had received topical F-treatment concomitant with the exposure of the cementum, the exposed surfaces showed a hypermineralized surface layer in most instances. Exposed root dentine also had a hypermineralized surface layer. The hypermineralized surface layers in both groups contained plate-like crystals which gave the diffraction pattern of hydroxyapatite. In PTA-decalcified sections, the crossbanding of the collagen fibers was clearly visible in the surface layer as well as in the deeper layers of the cementum. Some lacunae close to the surface were filled with bacteria which were partly mineralized. Calculus deposits with intra- as well as inter-bacterial mineralization were also observed. The crystals within the concrement were small and plate-like or needle-shaped.

The present study shows that application of sodium fluoride to cementum surfaces might alter the mineral content of the root surface. The increased mineral content of the F-treated cementum surfaces was believed to be due

to an increased rate of apatite formation with minerals derived from the oral fluids.

RÉSUMÉ

ÉTUDE DU CÉMENT DENTAIRE EXPÉRIMENTALEMENT DÉNUDÉ ET TRAITÉ AU FLUORURE CHEZ LE PORC.

Le présent travail a été entrepris dans le but d'étudier chez le porc l'action du milieu buccal sur le cément sain expérimentalement dénudé et de constater si l'application locale de fluorure de sodium peut modifier les réactions de ce tissu au milieu environnant.

Les surfaces de cément dénudées étaient couvertes de plaque. Quelques unes des surfaces exposées au milieu buccal sans traitement au fluorure ne présentaient pas d'augmentation du degré de minéralisation. Lorsqu'une couche superficielle fortement minéralisée était constatée, elle était en général assez étroite. Dans les dents ayant reçu un traitement local au fluorure lors de la dénudation du cément, les surfaces exposées présentaient dans la plupart des cas une hyperminéralisation de la couche superficielle. La dentine radiculaire dénudée présentait aussi une hyperminéralisation de la couche superficielle. Les couches superficielles hyperminéralisées contenaient dans les deux groupes des cristaux en forme de plaques dont le mode de diffraction était celui de l'apatite. Dans les coupes décalcifiées au PTA, la striation transversales des fibres collagènes était clairement visible, tant dans la couche superficielle que dans les couches plus profondes du cément. Quelques lacunes proches de la surface étaient remplies de bactéries en partie minéralisées. Des dépôts de tartre avec minéralisation tant intrabactérienne qu'interbactérienne ont aussi été observés. Les cristaux à l'intérieur des dépôts étaient de petite taille et en forme de plaques ou d'aiguilles.

Il ressort de la présente étude que l'application de fluorure de sodium sur les surfaces de cément peut modifier la teneur de la surface radiculaire en substance minérale. L'augmentation de la teneur en substance minérale dans les surfaces de cément traitées au fluorure serait due à une augmentation du degré de formation d'apatite à partir des minéraux provenant des liquides de la cavité buccale.

ZUSAMMENFASSUNG

EINE UNTERSUCHUNG DES ZAHNZEMENTES VON SCHWEINEN NACH EXPERIMENTELLER EXPONIERUNG UND FLUORIDAPPLIKATION

Diese Untersuchung wurde ausgeführt, um die Einwirkung des Mundhöhlemilieus auf gesundem Zement von Schweinemilchzähnen nach experi-

menteller Blosslegung nachzuweisen. Es wurde auch untersucht ob Lokalapplizierung von Natriumfluorid die Reaktionen des Zementes auf die orale Umgebung ändert.

Die blossgelegten Zementoberflächen waren mit Belag behaftet. Einige der blossgelegten Oberflächen, die mit Fluor nicht behandelt waren, zeigten keine hypermineralisierte Aussenschicht. Wenn eine hypermineralisierte Aussenschicht vorhanden war, war sie allgemein ziemlich schmal. In den Zähnen, die gleichzeitig mit der Blosslegung des Zementes zu der Mundhöhle, mit Fluor behandelt wurden, wiesen die blossgelegten Oberflächen in den meisten Fällen eine hypermineralisierte Aussenschicht auf. Auch blossgelegtes Wurzeldentin wies diese hypermineralisierte Aussenschicht auf. Die hypermineralisierte Aussenschicht beider Gruppen enthielt plattenähnliche Kristalle, die das Diffraktionsbild des Hydroxyapatits zeigte. In den Schnitten, die mit Phosphorwolframsäure entkalkt wurden, waren die Querstreifung der Kollagenfasern sowohl in der Aussenschicht als auch in den tieferen Schichten des Zementes deutlich erkennbar. Einige nahe der Oberfläche liegenden Lakunen waren mit Bakterien, die zum Teil mineralisiert waren, gefüllt. Zahnsteinablagerungen mit sowohl intra- als interbakterieller Mineralisierung wurden auch beobachtet. Die Kristalle der Konkremente waren platten- oder nadelförmig.

Diese Untersuchung ergab, dass eine Lokalbehandlung der Zementoberflächen mit Natriumfluorid möglicherweise den Mineralinhalt der Wurzeloberfläche ändert. Es wurde angenommen, dass der grössere Mineralgehalt der fluorbehandelten Zementoberflächen durch zunehmende Apatitbildung der aus der Mundflüssigkeit stammenden Mineralien verursacht wurde.

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Address:
Dental Institute of Experimental Research, University of Oslo, Blindern, Oslo 3, Norway