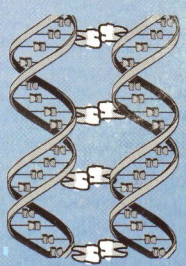
DENTAL MORPHOLOGY 1998



Proceedings of the 11th International Symposium
on Dental Morphology
Oulu, Finland, August, 1998
President: Professor Lassi Alvesalo

Editors: John T. Mayhall and Tuomo Heikkinen

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THE PRESENT SYMPOSIUM

Now with the 11th Symposium there is a long heritage of 33 years of hard work by many organizers. Who would have suspected that a non-organization such as this could exist for a third of a century and still be as anticipated and vibrant as the meetings have been, are and will be? We are indebted to all the organizers of the past meetings and especially to Drs. Alexandersen, Dahlberg and Pedersen for their legacy of bringing together scientists from throughout the world and from various disciplines to discuss “dental morphology’, which as has been noted earlier is a much too restrictive term for our wide ranging discussions.

I have avoided including the names of all those who have consistently participated in these Symposia because I know that I would omit someone. The photo of the 11th Symposium (Figure 2) includes some that have attended all or nearly all of the previous Symposia as well as many “new” recruits. Rather than dwell on the past, even though it has provided us with a forum for our meetings, I want to acknowledge the participants who have presented their papers at the meeting in Oulu and who have contributed to the present volume. This volume will, hopefully, begin a new tradition of a consistent title that will make it easier to locate the volumes that emanate from the symposia. I look forward to the next meeting and am happy to state that I have been attending meetings since 1968. These have energized my research and given me an opportunity to meet the leaders in the amazingly wide field of dental morphology. We have many to thank over the past years but I believe that we should congratulate all of the participants and, especially, our founders for maintaining the interest in our non-organization. May there be more meetings like these!

PREVIOUS PROCEEDINGS VOLUMES

There have been eight volumes that contained the proceedings for all but two of the symposia. To aid your search for past papers, I have listed the editors and dates; Pedersen et al. in 1967, Dahlberg in 1971, Butler and Joysey in 1978, Kurtén in 1982, Russell et al. in 1988, Smith and Tchernov in 1992, Moggi-Cecchi in 1995 and Radlanski and Renz also in 1995. The complete citations are in the References below.

Fig. 2. Participants at the 11th International Symposium on Dental Morphology, 1998, Oulu, Finland. Professor Lassi Alvesalo, organizer.

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Amelogenesis Imperfecta on a Deciduous Molar of *Coelodonta antiquitatis* (Blumenbach) (Mammalia, Perissodactyla, Rhinocerotidae) from Grotta di Fumane (Verona, Northern Italy): A Rare Case Report

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INTRODUCTION

In a cave, described as Grotta di Fumane (about 350 m asl) (Lessini Mountains, Verona, Northern Italy), in the aurignacian levels, in addition to the skeletal remains of several mammalian and bird species, a tooth, belonging to a Rhinocerotidae, was discovered. It is the first and only discovery of Rhinocerotidae remains in this site. The deposit, rich in levels - the oldest is referable to the Middle Palaeolithic and the most recent to the Aurignacian - shows evidences of intense human occupation. The remains are mainly the result of hunting (Cassoli and Tagliacozzo, 1994). A series of C^{14} dates place the aurignacian occupation between 37,000-35,000 and 32,000 years B.P. (Bartolomei et al., 1994). According to the authors, the introduction of the tooth into the cave could probably be due to an occasional human action.

Compared to the permanent teeth, the discovery of rhinoceros deciduous teeth in archaeo-palaeontological sites is very rare, moreover, very often they are recovered as single specimens. The tooth is preserved at the Museo Nazionale Preistorico Etnografico “Luigi Pigorini” in Rome (inv. RF 93).

MORPHOLOGICAL DESCRIPTION OF THE SPECIMEN FROM FUMANE

The tooth is a very worn upper deciduous molar - probably a second. On most of its surface there is a good quantity of MnO_2. The tooth was very likely lost during the life of the animal because of the eruption of the second upper premolar. Although it is damaged in the bucco-distal and linguo-distal portion, the dimensions of the specimen are drastically reduced (the length, along the buccal axis, is 27.5 mm), but the profile of the ectoloph shows the characteristic undulation.

The interior valley is connected to the *medifossetta* which is not completely closed. From the *norma pulparis*, the scarce development of the *bulbus pulparis* and the extremely reduced thickness of the enamel of the crown are evident. The morphological features of the specimen (Fig. 1), including not completely closed *medifossetta*, allow its attribution to *Coelodonta antiquitatis* (Blumenbach, 1799), the hypsodont Late Pleistocene “woolly rhino”. (The dental characteristics of the *Coelodonta antiquitatis* have been investigated by several authors [Gaudry, 1876; Pavlov, 1892; Schroeder, 1900; Passemard, 1924; Friant, 1957, 1963; Bouchud, 1966b; Borsuk-Bialynicka, 1973;

Rensbergen, 1973; Guérin, 1980; Fortelius, 1979, 1981, 1982, 1985]. In the rest of the Italian peninsula, *C. antiquitatis* is recorded at Fadalto nel Polesine [Rovigo, Northern Italy] [Leonardi, 1947a, 1947b], at Opicina [Trieste, Northern Italy] [Leonardi, 1947a, 1947b; Bartolomei, Peretto and Sala, 1977], at Monte Circeo [Lazio, Central Italy] [Palmarelli and Palombo, 1981], in Terra d'Otranto [Apulia, Southern Italy] [Botti, 1890; Vaufrey, 1927], in the Grotta dei Pipistrelli [Matera, Southern Italy] [Flores, 1895; Guérin, 1980], at Ingarano [Gargano, Southern Italy] [Capasso Barbato et al., 1992; Billia et al., 1995; 1996].)

Fig. 1. *Coelodonta antiquitatis* (Blumenbach, 1799); Late Pleistocene; Fumane (Verona, Northern Italy); upper deciduous molar; *norma occluso-labialis* (max length 27.5 mm).

DENTAL ANOMALIES OF RHINOCEROSES

The case under study is particularly interesting because in the literature some anomalies of rhinoceroses have been reported, but they only refer to malpositionings, irregular eruptions, *hyperodontiae*, asymmetries and rotations.

Capellini (1894) reported, in a fossil rhinoceros, a malpositioning of a premolar associated with the retention of the corresponding deciduous and Vialli (1955) identified a case of rotation, malpositioning and morphological anomaly in an fourth upper premolar of a modern African rhinoceros *Rhinoceros simus cottoni* Lyd. (=*Ceratotherium simum cottoni* Lyd.) preserved at National History Museum in Milan. Chow (1961) reports a mandible of *C. antiquitatis* from the site of Siki (China) presenting pathological features and Groiss et al. (1981) describe the malpositioning of second, third and fourth upper premolars always in *C. antiquitatis*; still in a *C. antiquitatis*, Garutt (1990) has described a supernumerary fourth upper premolar and a third lower molar (hyperodontia) as possible atavism, while the same author (1992, 1994) shows a case of malpositioning, again in *C. antiquitatis*, of a fourth upper premolar due to its delayed eruption; such anomaly, according to the author, might be related to a juvenile fracture. Another malpositioning and malformation of a fourth upper premolar was reported for a *Diceros bicornis* (Garutt 1994). Hillman-Smith et al. (1986) describe a supernumerary third lower molar in a *C.*

simum, in a *C. antiquitatis* of Tatarsan and in a *Rhinoceros mercki* (=*Stephanorhinus kirchbergensis*) preserved at the Halle Museum (Germany).

AMELOGENESIS IMPERFECTA IN *COELODONTA ANTIQUITATIS* FROM FUMANE

As is well known, amelogenesis imperfecta is hereditary and affects both arcades of the deciduous and permanent teeth. It may be present in three forms: hypoplastic, hypomineralized (Weinmann, 1945), and hypomature (Witkop and Sauk, 1971); the hypoplastic form - the case specifically of interest here - presents a normal structure of the enamel, but the quantity of tissue is reduced. In this reduced matrix, minerals are deposited in normal quantity, therefore, abrasion reduces the thickness of the crown in a very short time; the crown is smooth and bright.

The hypothesis of a structural anomaly of the enamel produced by genetic factors referable to amelogenesis imperfecta of hypoplastic type is predicated on the macroscopic analysis of the specimen from Fumane that indicates extremely reduced dimensions in comparison with homologous specimens, it is made mainly of dentine, the whole surface is smooth and bright with reduced traces of thin and transparent enamel along the edges, inside the *medifossetta*, the distal *fossetta*, and the interior valley, the color is very close to that of amber and this anomaly affects both dentitions.

HISTOLOGICAL ANALYSES

In order to confirm the macroscopic diagnosis a histological examination of the specimen was undertaken. The specimen from Fumane has been observed under a binocular microscope and photographed from different views. Using fine diamond disks - in order not to damage the remain - two portions of dental tissues, one from the occluso-distal part (distal *fossetta*) in longitudinal section, and the other one from the disto-cervical part, were removed. From these thin sections were made by embedding them in a solid block of epoxy-resin Epo-thin (Buehler) and then sectioning them with a microtome until the desired thickness (110µ-80µ) was obtained. Each specimen was then polished with paper disks and powder (Micropolish B-0.05 µ gamma-alumina, Buehler).

During the operations, about 15% of sections was lost because of the fragility and porosity of the materials themselves. For the same reason, in only 40% of the cases was it possible to obtain samples where enamel and dentine were observable in the same plane.

The resulting thin sections were then examined and photographed through a microscope under transmitted polarized light (Laser-Scan ZEISS, Oberkochen-Germany) at the Faculty of Dentistry of Calvary Hospital in Rome.

RESULTS

On the occluso-distal section of the specimen from Fumane the presence of enamel and dentine can be observed; dentinal tubules are regular, branched, developing anastomosis and finishing with dead ends in the interglobular spaces and in the dentino-enamel

junction (Fig. 2). The enamel presents a normal qualitative aspect (Fig. 3), but quantitatively it is thinner than in normal cases (Fig. 4). Also, crack on dentine with MnO_2 sediments is observed (Fig. 5).

On the surface of the distal-cervical sample, which is irregular, dentine and MnO_2 sediments are present, but enamel is absent (Fig. 6). It is evident that on the surface of the crown the enamel was worn because of an anomalous development.

The fact that the enamel-dentine junction is undulating and the trend of the dentinal tubules is regular (Figs. 2, 5, 6) excludes the possibility of dentinogenesis imperfecta; if this were the case the enamel-dentine junction would be straight and the trend of the dentinal tubules would be irregular.

Fig. 2. Occlusal-distal section, EDJ (20x).

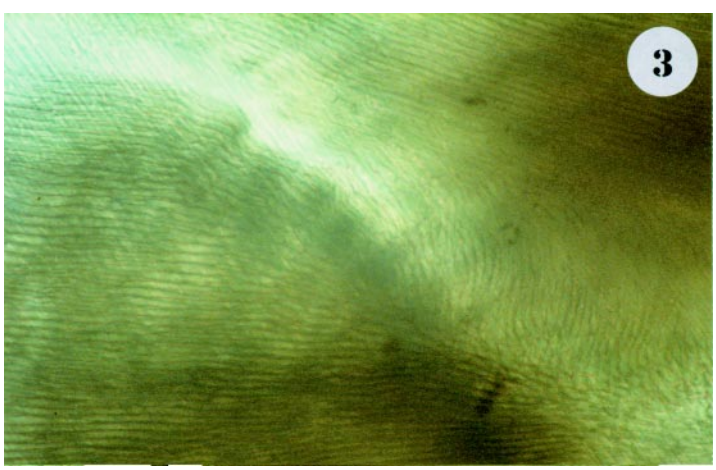

Fig. 3. Occlusal-distal section, enamel (40x).

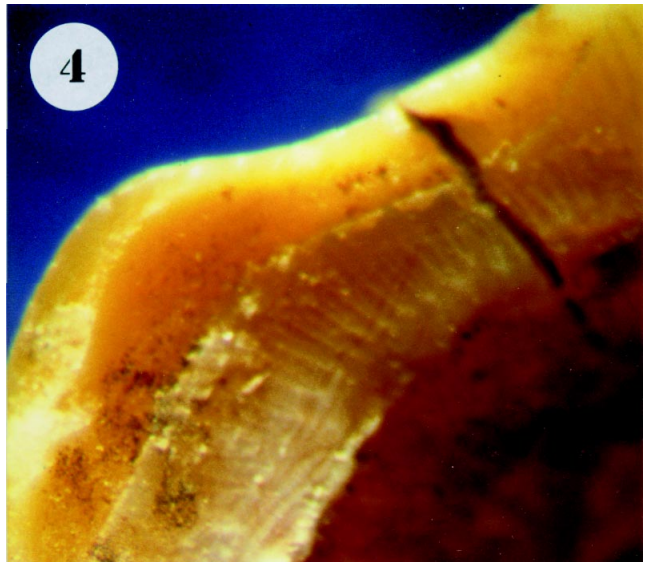

Fig. 4. Thickness of the enamel in the distal *fossetta*.

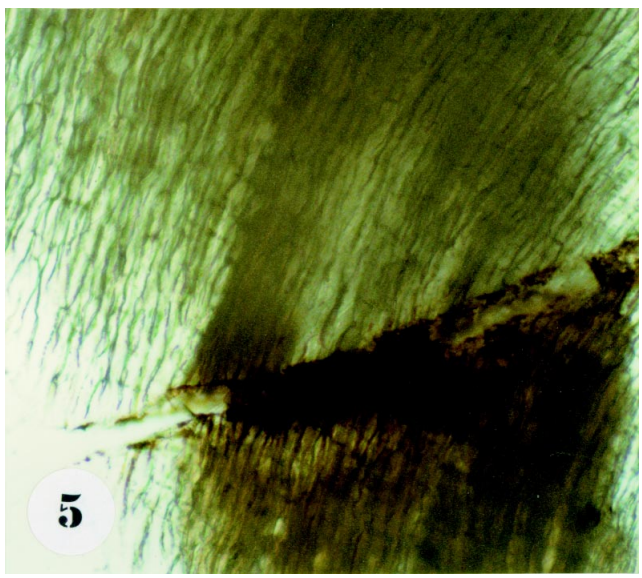

Fig. 5. Occlusal-distal section, dentine-crack (20x).

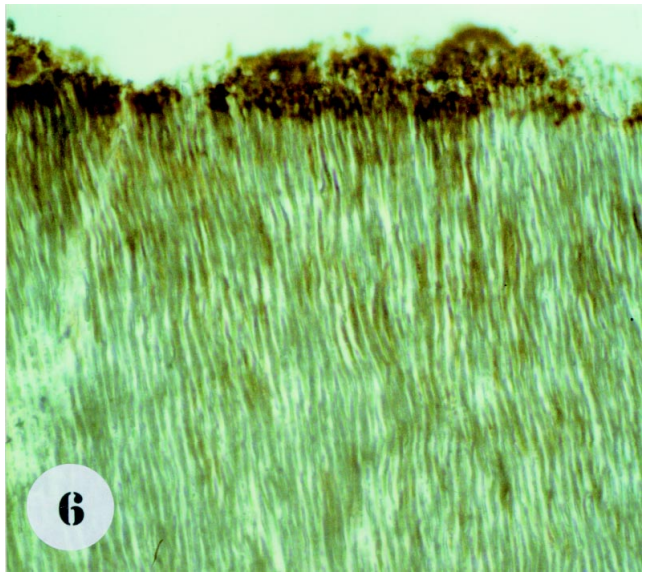

Fig. 6. Distal-cervical section, dentine (40x).

CONCLUSIONS

The condition observed on the tooth from Fumane supports the initial hypothesis of amelogenesis imperfecta of the hypoplastic type. The analyses performed are only quantitative. At the present time histochemical (specific coloration) and immuno-histochemical analyses, to evaluate the organic vs. non-organic components, are not appropriate for providing reliable data in the case of fossil remains. DNA analyses are not possible in this specific case because of the reduced dimensions of the remains and because they have been manipulated possibly contaminated by other DNA; furthermore, in these cases, it would be very difficult to find a whole molecule of DNA. In this case, it would be necessary to pulverize the tooth in order to take away from it a non-contaminated portion, a process that would require the destruction of this rare specimen.

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