3. Histological study of an upper incisor and molar of a bonobo (*Pan paniscus*) individual

F. RAMIREZ ROZZI
UPR 2147 CNRS, 44 rue de l'Amiral Mouchez
75014 Paris, France
ramrozzi@ivry.cnrs.fr
and
Dept. of Human Evolution
Max-Planck-Institute for Evolutionary Anthropology
Leipzig, Germany

R.S. LACRUZ
Institute for Human Evolution
University of the Witwatersrand
P. Bag 3 WITS 2050
Johannesburg, South Africa
lacruzr@science.pg.wits.ac.za

Keywords: Striae of Retzius, appositional rate, perikymata, Bonobo, *P. paniscus, P. troglodytes*

Abstract

Work based on ground sections of teeth has provided accurate information on dental development in extant and extinct hominoid species. In contrast to radiographic studies, histological work is usually carried out using relatively small sample sizes. However, incremental lines in enamel and dentine enable us to interpret stages of crown formation and to establish patterns of dental development. Although these types of studies have been carried out in modern humans, common chimpanzees, gorillas, orangutans, and gibbons as well as in some extinct hominoids, almost nothing is known about the bonobo (*Pan paniscus*). In this paper we present some aspects of dental development for a young female with the I^1 crown just completed. Ground sections were obtained for the right I^1 and M^1. The spacing between successive cross striations was measured in the outer, middle and inner portions of occlusal, lateral and cervical thirds of the enamel. The periodicities of the striae of Retzius were obtained, and the number of striae/perikymata were used to calculate the lateral formation time. Prism length and the average distance between cross striations were used to determine the cuspal formation time. Spacing between cross striations shows a gradual increase from the inner to the outer portions, and a decrease from the occlusal to the cervical region, as observed in modern humans and great apes. It is noteworthy that average values in this *P. paniscus* individual appear to be high. Crown formation time of this *P. paniscus* I^1 was short. In addition, the perikymata packing pattern in *P. paniscus* was also different from that of *G. gorilla* and *P. troglodytes*, in that the number of perikymata increased towards the cervix.

S.E. Bailey and J.-J. Hublin (Eds.), Dental Perspectives on Human Evolution, 163–176.

Introduction

Recent studies on the tooth histology of the common chimpanzee (*Pan troglodytes*) have provided useful data for comparing the variation of microanatomical features expressed among the three great ape genera (Beynon et al., 1991a; Reid et al., 1998, Smith 2004). Additionally, these studies have increased the reliability of data on dental development in *P. troglodytes*, elucidating differences between histological and radiological methods (Reid et al., 1998). As a result, a clearer picture has emerged that allows correlations between developmental time and cuspal function in molars (Reid et al., 1998).

Most histological studies of great apes have focused on comparisons between genera (e.g. Beynon et al., 1991a,b; Dean, 1998). Little attention has been given to understanding the variation among closely related species from a histological perspective. Studies of this nature are necessary for assessments of species differences in the fossil record.

The pygmy chimpanzee or bonobo (*Pan paniscus*) is distinguished from its closest relative the common chimpanzee (*P. troglodytes*) on the bases of social behavior, morphological, and genetic differences (Johanson 1974; Shea 1984; Uchida 1992; Ruvolo 1994; Uchida 1996; White 1996; Braga 1998). Body size differences have been noted between these taxa, with *P. troglodytes* being slightly larger-bodied and showing more marked sexual dimorphism, even when the smallest of the *P. troglodytes* subspecies is considered (Jungers and Susman, 1984, Shea 1984). Some metrical and morphological differences exist in the dentitions of *P. paniscus* and *P. troglodytes* (Kinzey, 1984; Uchida, 1992). However, the greatest morphological difference appears to be the paedomorphic skull of *P. paniscus* (Shea, 1983).

The aim of this research was to provide preliminary histological data on crown formation time, age at death, variation of appositional rates and perikymata packing pattern for two tooth types of a young female *P. paniscus* individual. This information was subsequently compared with data for *P. troglodytes.* Although only one individual was available for this study, it marks the beginning of an investigation into interspecific hominoid variation.

Materials and Methods

The specimen was a young female brought from the Democratic Republic of Congo to a zoo in South Africa, that died before reaching maturity. The individual was buried at the zoo and was recently exhumed, some four years after death, due to construction plans on the zoo premises. The remains were donated to the Palaeontology Department at the University of the Witwatersrand.

Most of the post-cranial skeleton and part of the skull and face were preserved. The facial region consists of right and left maxillary fragments with deciduous dc, dm^1, dm^2 and an erupting permanent M^1. The permanent I^1, I^2, C, P^3, and P^4 crowns and one incomplete M^2 crown were encrypted in the maxilla. The roots of the first permanent molars were nearly complete but lacked apical closure (stage 6 of Demirjian et al., 1973). The M^1 protocone is the only cusp showing wear. Crown formation had just been completed on the right I^1, which shows 207 microns of root. The crowns of the remaining teeth (I^2, C, P^3, and P^4) had not yet completed their formation.

The central right incisor and the first permanent right molar were removed from the specimen and embedded in cyanoacrylate. The molar was then sectioned (150 μm in thickness) across the mesial and distal cusps and the incisor was sectioned labio-lingually. All sections were polished from both sides to a final thickness of about 100 μm. The sections were studied using polarized and transmitted light (Zeiss Universal Photomicroscope).