Department of Morphology, Dental School of Bauru,
University of São Paulo,
Bauru (SP), Brazil

Histological Study on the Prenatal Development of the Cheek-Teeth of Rabbits (*Oryctolagus cuniculus*)

J. A. C. NAVARRO, D. SOTTOVIA-FILHO, R. TAGA
and
J. L. TOLEDO-FILHO

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Summary. The prenatal development of cheek-teeth of rabbits was studied by histological methods. Females from 15 to 30 days of gestation were sacrificed and their fetuses were collected and decapitated. The heads were fixed in buffered neutral formalin and paraffin embedded. Sagittal and frontal sections of 7μ were obtained and stained with hematoxylin-eosin. The first tooth-germs observed were the m^3 and m_3 , in the animal of 16 days of fetal life. One day after the m^4 and m_4 are observed in the bud stage. The last teeth to initiate development in the fetal rabbits are the M^3 and M_3 at 30 days. Only the m^3 , m^4 , m_3 and m_4 start cementogenesis in the prenatal stage.

The postnatal development of maxillary and mandibular cheek-teeth of rabbits was the subject of our previous papers (NAVARRO et al., 1975, 1976), in which we also made an extensive literature review on the subject. We have not found many reports on the development of cheek-teeth of rodents in prenatal life, with the exception of the studies carried out by ROUSSEAU (1839), CARADONNA (1909), LISTGARTEN and KAMIN (1969), LESBRE (1972), HOROWITZ et al. (1973), who made some observations on development of cheek-teeth of the rabbit fetus, by GLASSTONE (1938) on the rat and rabbit and by PAYNE et al. (1977) on the hairless mouse.

Materials and Methods

Thirty-two fetuses of rabbits *Oryctolagus cuniculus* (Giant of Flandres) with ages from 15 to 30 prenatal days were used. The animals were divided according to age in days into 16 groups of 4 fetuses each.

Females were sacrificed by ether inhalation and the fetuses were collected and decapitated. The heads were fixed for 48 hrs in buffered neutral formalin, prepared according to CLARK (1973).

The heads and hemi-heads were paraffin embedded and 7μ sagittal serial sections were obtained of the hemi-heads (animals from 20 to 30 days) and of the heads of each group from 15 to 19 days. The heads of the other animals of these groups were sectioned in frontal plane. The sections were stained with hematoxylin-eosin, according to CLARK (1973). The notation system of dentition is the same as that used in the previous study (NAVARRO et al., 1975, 1976).

Results

Fetus from 15 to 20 days

At 16 days of prenatal life development the first teeth-germs were observed in the jugal region, the m^3 and m_3 in the bud stage (Fig. 1). At 17 days the m^4 and m_4 were evident in the same developmental stage. The m_3 was observed in the cap stage. At 18 days the m^2 appeared in the bud stage; the m^3 and m_4 were in the cap stage. At 19 days the m^2 was observed in the cap stage, which was more evident in the m^3 , m^4 , m_3 and m_4 .

At 20 days the m^2 , m^3 and m^4 could still be observed in the cap stage, but the m_3 and m_4 were in the bell stage. On that day the germ of M^1 was observed in the bud stage.

Fetus from 21 to 26 days

A panoramic aspect of the cheek dentition at 21 days of prenatal life is given in Figure 2. At this age the M_1 was in the bud stage (Fig. 3); and the m^2 was in the cap stage. The m^3 , m_3 , m^4 and m_4 began the bell stage. At 22 days the bud stage was observed of M_2 and the M^1 and M_1 were in the cap stage. The bell stage was evident in the m^2 , m^3 , m^4 , m_3 and m_4 .

At 23 days, dentinogenesis began in the m_4 and the bud of the M^2 appeared; In the M_2 the cap stage began and the m^3 , m^4 , M^1 and M_1 were observed in the bell stage. At 24 days the dentinogenesis was evident in the m^3 , m^4 and m_3 while the M^2 was in the cap stage.

Fig. 1. Fetus of 16 days. Frontal view of the primordial aspect of dental germs: premaxilla (PMA); premandibula (PMD) and tongue (T). Hematoxylin-eosin. $\times 250$

At 25 days the M_2 was observed in the cap stage and the m^2 , M^1 and M_1 in the bell stage.

Fig. 2. Fetus of 21 days. General aspect of cheek dentition. Hematoxylin-eosin. $\times 4$

Fig. 3. Fetus of 21 days. The m_1 in bell stage and the M_1 in bud stage. Hematoxylin-eosin. $\times 100$

Fig. 4. Fetus of 26 days. Beginning of dentinogenesis in the M_1 . A ameloblasts, D dentin, O odontoblasts, P pulp. Hematoxylin-eosin. $\times 250$

At 26 days the dentinogenesis began in the m^2 , M^1 and M_1 (Fig. 4); and the m^3 , m^4 , m_3 and m_4 showed the beginning of amelogenesis. All the premolars initiated their development by that day, with the P^2 , P^3 , P^4 , P_3 and P_4 in the bud stage.

Fetus from 27 to 30 days

At 27 days the bell stage began in the M^2 , M_2 , P^4 , P_3 and P_4 . At 28 days the dentinogenesis was evident in the M_2 and the amelogenesis in the m^2 (Fig. 5); the cap stage was observed in the P^2 and P^3 , and still could be observed in the P_3 and P_4 . The bell stage was found now in the P^4 .

At 29 days, dentinogenesis was observed in the M^2 and the amelogenesis began in the M^1 and M_1 . The P^2 was observed in the cap stage and the P_3 and P_4 in the bell stage.

At 30 days, the end of the gestational period, the M^3 was seen in the bud stage (Fig. 6). The cap stage was evident in the P^3 (Fig. 7). The cementogenesis began in the m^3 , m^4 and m_4 (Fig. 8).

A general aspect of cheek-dentition is given in Figure 9, and the periods of duration of the bud, cap and bell stages and the beginning of dentinogenesis, amelogenesis and cementogenesis from 15 to 30 days are shown in Table 1.

Discussion

The literature concerning the odontogenesis in rabbit cheek-teeth is very scarce and so we have made some studies on the subject, first in postnatal life (NAVARRO et al., 1975, 1976) and now, in the present work, in prenatal life.

GLASSTONE (1938) states that the period of development of the deciduous molars

Fig. 5. Fetus of 28 days. Beginning of amelogenesis in the m^2 . *A* ameloblasts, *E* enamel, *D* dentin, *O* odontoblasts, *P* pulp. Hematoxylin-eosin. $\times 450$

Fig. 6. Fetus of 30 days. The M^3 in bud stage. Hematoxylin-eosin. $\times 35$

Fig. 7. Fetus of 30 days. The P³ in cap stage. Hematoxylin-eosin. $\times 100$

Fig. 8. Fetus of 30 days. Beginning of cementogenesis in the developmental groove of the m⁴ (arrow). Hematoxylin-eosin. $\times 450$

Fig. 9. Fetus of 30 days. General aspect of cheek dentition. Hematoxylin-eosin. $\times 4$

Table 1. Chronology of the prenatal development of the cheek-teeth of rabbits, in intrauterine days.

	Stages			Beginning of		
	Bud	Cap	Bell	Dentinogenesis	Amelogenesis	Cementogenesis
m ²	18	19-21	22-25	26	28	x
m ³	16	17-20	21-23	24	26	30
m ⁴	17	18-20	21-23	24	26	30
P ²	26	28-29	30-x	x	x	x
P ³	26	28-29	30-x	x	x	x
P ⁴	26	27	28-x	x	x	x
M ¹	20	21-22	23-25	26	29	x
M ²	23	24-26	27-28	29	x	x
M ³	30	x	x	x	x	x
m ₃	16	17-19	20-22	24	26	x
m ₄	17	18-19	20-22	23	26	30
P ₃	26	27-28	29-x	x	x	x
P ₄	26	27-28	29-x	x	x	x
M ₁	21	22	23-25	26	29	x
M ₂	22	23-25	26-27	28	x	x
M ₃	30	x	x	x	x	x

x=Stages to be found after birth.

of the rabbits is from day 15 to 26. Nevertheless, that period according to our observations is more extensive, from day 16 to 30. The deciduous molars were completely developed in the prenatal stage. Only the m_3 did not start cementogenesis before birth.

We observed that all the cheek-teeth initiated development in prenatal life. The first germs to appear are the m^3 and m_3 in the 16 intrauterine days. At 30 days, the end of gestation, the M^3 and M_3 initiated their development.

All the premolars, on the last day of gestation, are in the bell stage, while the permanent molars have started dentinogenesis (M^2 , M_2) and amelogenesis (M^1 , M_1).

None of the cheek-teeth erupted in the rabbit prenatal life and this observation is in accordance with the finding reported by ROUSSEAU (1839), CARADONNA (1909), LISTGARTEN and KAMIN (1969), but discordant with LESBRE (1922) and HOROWITZ et al. (1973) who described the cheek-teeth as already erupted at birth.

References

- Caradonna, G. B.:** Splancnologia. In: (ed. by) V. Bossi, G. B. Caradonna, G. Spampani, L. Varaldi and U. Simmerl: Trattato di anatomia veterinária. Francesco Vallardi, Milano, 1909. (p. 530).
- Clark, G.:** Staining procedures. 3rd ed., The Williams & Wilkins Co., Baltimore, 1973.
- Glasstone, S. A.:** Comparative study of the development in vitro and in vivo of rat and rabbit molars. Proc. Roy. Soc. B. 126: 315-330 (1938).
- Horowitz, S. L., S. H. Weisbroth and S. Scher:** Deciduous dentition in the rabbit (*Oryctolagus cuniculus*)—A roentgenographic study. Arch. oral Biol. 18: 517-523 (1973).
- Lesbre, F. X.:** Precis d'anatomie comparée des animaux domestiques. Baillière, Paris, 1966 (Vol. 1, p. 572-573).
- Listgarten, M. A. and A. Kamin:** The development of a cementum layer over the enamel surface of rabbit molars—a light and electron microscopic study. Arch. oral Biol. 14: 961-985 (1969).
- Navarro, J. A. C., D. Sottovia-Filho, M. C. Leite-Ribeiro and R. Taga:** Histological study on the postnatal development and sequence of eruption of the maxillary cheek-teeth of rabbits (*Oryctolagus cuniculus*). Arch. histol. jap. 38: 17-30 (1975).
- _____: Histological study on the postnatal development and sequence of eruption of the mandibular cheek-teeth of rabbits (*Oryctolagus cuniculus*). Arch. histol. jap. 39: 23-32 (1976).
- Payne, T. M., L. P. Gartner, J. L. Hiatt and D. V. Provenza:** Molar odontogenesis in the hairless mouse. Acta anat. 98: 264 (1977).
- Rousseau, L. F. E.:** (1839). Cited in S. L. Horowitz et al. (1973).

Dr. João Adolfo Caldas NAVARRO
Department of Morphology
Dental School of Bauru
Postal Box 73
17100 - Bauru - SP.
Brazil