The Relationship of Age to First Molar Tooth Eruption in Bulls of the Red Coated Beef Breeds

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Introduction

Estimation of age in cattle by eruption of their teeth has been undertaken for many years. In most cases examination is confined to the incisors and canines. Some of the age variation which can exist in the degree of eruption of each tooth was described in a survey of 2900 cattle (1). Thus the mean age for both permanent central incisors to emerge was 684 days (1 year 10.5 months) but it could be seen in animals as early as 536 days (1 year 5.6 months) or as late as 825 days (2 years 3.1 months), a difference of 289 days (9.5 months). Similar variations were found at each stage of tooth eruption and the differences tended to be greater with the appearance of each succeeding rostral tooth pair. In addition, by using the central teeth, there was no way of determining age before the appearance of the first permanent incisors, i.e. on average under 1 year 10.5 months.

In America a similar problem has occurred and studies of the premolar and molar teeth as well as the rostral teeth have been undertaken (2). The use of 29 distinct eruption stages between 8 and 38 months was stated but no definitions of the stages were given (3).

Observations on the relationship between the eruption of the maxillary first molar (fourth cheek) tooth and age have been made in groups of Hereford x Friesian steers (4). This work resulted in the definitions of varying stages of tooth eruption for the first molar tooth (see table 1); the terms rostral and caudal are used in accordance with current anatomical terminology (5). The first molar tooth consists of four cusps which are grouped in pairs as rostral and caudal units or parts of the tooth. The cusps in each unit are separated by an infundibulum. It will be noted that the rostral part of the tooth was always in advance of the caudal part (see Figures 1 and 2). The maxillary tooth was examined in preference to the mandibular counterpart because it was easier to observe in the live animal as it was not obscured by the tongue. The previous work (4) had indicated that estimation of age by eruption of the cheek

Table 1 Classification of First Maxillary Molar Tooth Development

Molar Code Number	Stage of first maxillary molar tooth intra-oral development
0	First molar absent
1	Rostral part emerging
2	Rostral part ¼ up, caudal part not visible
3	Rostral part ¼ up or more, caudal part emerging
4	Rostral part ½ up, caudal part well emerged
5	Rostral part ¾ up, caudal part ½ up or under
6	Rostral part ¾ up or over, caudal part over ½ up
7	Rostral part fully up, caudal part ¾ up
8	Rostral and caudal parts fully up

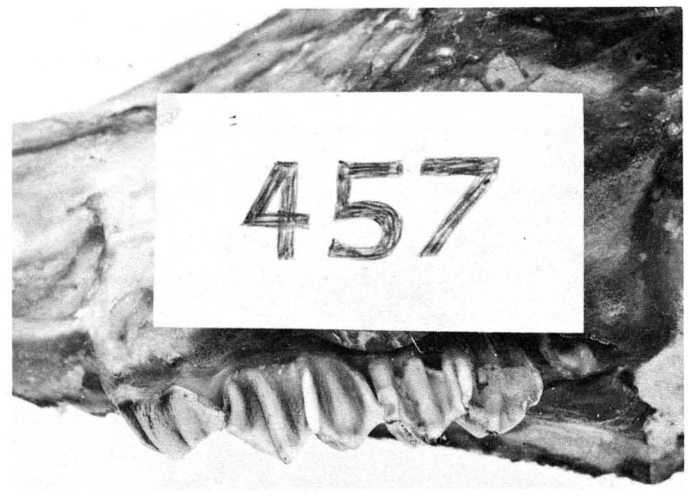

Figure 1 Left maxilla of 200 days (6.6 month) Jersey showing the Rostral part of the first molar emerging (molar code 1).

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Figure 2 Left maxilla of 336 day (11.1 month) Friesian steer showing the Rostral part of the first molar fully up and the Caudal part 3/4 up (molar code 7).

teeth in cattle might be of use. This study involved young bulls of three red-coated beef breeds being reared at a bull performance testing centre.

Materials And Methods

The performance testing centre was managed by the Meat and Livestock Commission at the National Agricultural Centre, Stoneleigh, Warwickshire. Two groups were examined. The first group consisted of 7 Devon (mean age at first visit 212±S.D. 30.1 days), 5 Lincoln Red (227±245 days) and 8 Sussex bulls (230±17.9 days). The twenty animals were seen on six occasions between 25th May 1972 and 19th October 1972. A second group of bulls consisting of 6 Devons (206±13.0 days), 6 Lincoln Reds (201±30.3 days) and 7 Sussexs (212±24.1) was examined six times between 1st August 1972 and 2nd January 1973. All the cattle had been born and reared until about 7 months old on their farms of origin which were scattered in various parts of Great Britian. Animals in each group were transported to the testing centre at the same time. They were then housed individually in loose boxes and were fed ad libitum a complete diet together with a small quantity of hay at the rate of 1 kg of hay to each 5 kg of complete diet. The complete diet consisted of cobs 24 mm in diameter and made up of 49% rolled barley, 49% unmilled dried grass and 2% vitamin and mineral mixture. The animals remained at the Centre until approximately 14 months old. Visits were made at monthly intervals, and the oral examination was undertaken in a cattle crush without the aid of a gag. Students' t test was used in the statistical analysis.

Results

In the first group of 20 bulls the number of Devons was small and so few molar codes had sufficient observations to obtain significant differences (Table 2). However, there was a significant difference ($P = < 0.01$) between the ages of animals at Molar Codes 4 and 5. There were also few observations at several molar codes for the 5 Lincoln Red bulls (Table 3), but the age of animals at Molar Code 4 was highly significantly ($P = < 0.001$) less than those at Molar Code 5. In addition there was a probably significant difference ($P = < 0.05$) between the mean ages at Molar Codes 5 and 7. The larger number of Sussex bulls (8) resulted in several stages showing differences (Table 4). A significant difference ($P = < 0.05$) less than that at Molar Code 3. A significant difference ($P = < 0.01$) was present between the

Table 2.
The age in days for each stage of first molar development in a group of 7 Devon bulls.

Molar Code	Number of Observations	Minimum Age	Maximum Age	Mean	± S.D.
0	2	181	191	186.0	± 7.07
1	2	184	225	204.5	± 28.99
2	3	215	239	230.3	± 13.31
3	4	201	271	236.0	± 32.13
4	18	235	358	281.1	± 34.81*
5	7	300	373	335.4	± 35.55
6	-	-	-	-	-
7	6	328	401	355.0	± 30.33
8	-	-	-	-	-

* Molar Code 4 < Molar Code 5 $P = < 0.01$

Table 3.
The age in days for each stage of first molar development in a group of 5 Lincoln Red bulls.

Molar Code	Number of Observations	Minimum Age	Maximum Age	Mean	± S.D.
0	-	-	-	-	-
1	1	-	-	189.0	-
2	4	216	249	236.3	± 14.36
3	1	-	-	223.0	-
4	13	245	320	283.	± 23.07*
5	5	308	362	337.4	± 22.08**
6	-	-	-	-	-
7	6	336	396	373.0	± 22.01
8	-	-	-	-	-

* Molar Code 4 < Molar Code 5 P = < 0.001
** Molar Code 5 < Molar Code 7 P = < 0.05

ages of those animals at Molar Codes 3 and 4. The mean age at Molar Code 4 was highly significantly (P = < 0.001) less than that at Molar Code 5. There was only one animal showing the stage of Molar Code 6, but there was a probably significant difference (P = < 0.05) between the mean ages at Molar Code 5 and 7.

There were 6 Devon bulls among the second group of animals examined (Table 5). The mean age at Molar Code 2 was significantly (P = < 0.01) less than at Molar Code 3. A similar difference (P = < 0.01) was found between the mean ages of Molar Codes 3 and 4. The age of bulls at Molar Code 4 was on average significantly (P = < 0.01) less than of those at Molar Code 5. A probably significant difference (P = < 0.05) was present between the mean ages of the animals at Molar Codes 5 and 6. The stages seen in the 6 Lincoln Red bulls of the second group are given in Table 6. The mean age at Molar Code 1 was probably significantly (P = < 0.05) less than that at Molar Code 2. A highly significant difference (P = < 0.01) less than that at Molar Code 5. A probably significant difference (P = < 0.05) was present between the

Table 4.
The age in days for each stage of first molar development in a group of 8 Sussex bulls.

Molar Code	Number of Observations	Minimum Age	Maximum Age	Mean	± S.D.
0	1	-	-	207.0	-
1	4	213	237	222.3	± 11.58*
2	4	243	253	248.0	± 4.16**
3	6	241	283	266.3	± 15.64***
4	18	247	332	297.0	± 22.96****
5	8	326	372	352.6	± 16.72*****
6	1	-	-	384.0	-
7	6	354	400	378.8	± 19.35
8	-	-	-	-	-

* Molar Code 1 < Molar Code 2 P = < 0.01
** Molar Code 2 < Molar Code 3 P = < 0.05
*** Molar Code 3 < Molar Code 4 P = < 0.01
**** Molar Code 4 < Molar Code 5 P = < 0.001
***** Molar Code 5 < Molar Code 7 P = < 0.05

Table 5.
The age in days for each stage of first molar development in a group of 6 Devon bulls.

Molar Code	Number of Observations	Minimum Age	Maximum Age	Mean	± S.D.
0	-	-	-	-	-
1	2	194	213	203.5	± 13.43
2	6	195	262	222.3	± 26.68*
3	8	244	289	268.5	± 17.56**
4	8	272	331	305.1	± 17.56***
5	6	327	359	339.0	± 13.03****
6	6	348	380	360.0	± 13.03
7	-	-	-	-	-
8	0	0	0	0	-

* Molar Code 2 < Molar Code 3 P = ▶ 0.01
** Molar Code 3 < Molar Code 4 P = ▶ 0.01
*** Molar Code 4 < Molar Code 5 P = ▶ 0.01
**** Molar Code 5 < Molar Code 6 P = ▶ 0.05

Table 6.
The age in days for each stage of first molar development in a group of 6 Lincoln Red bulls.

Molar Code	Number of Observations	Minimum Age	Maximum Age	Mean	± S.D.
0	3	167	190	176.7	± 11.93
1	5	205	244	225.2	± 16.17*
2	5	225	274	257.6	± 20.52
3	8	245	302	281.3	± 21.38**
4	7	306	338	321.4	± 10.95***
5	5	327	359	347.6	± 13.04****
6	2	378	379	378.5	± 0.70
7	1	-	-	399.0	-
8	-	-	-	-	-

* Molar Code 1 < Molar Code 2 P = < 0.05
** Molar Code 3 < Molar Code 4 P = < 0.001
*** Molar Code 4 < Molar Code 5 P = < 0.01
**** Molar Code 5 < Molar Code 6 P = < 0.05

mean ages at Molar Codes 5 and 6. There were 7 bulls of the Sussex breed (Table 7). Although there was no eruption in two animals, Molar Code 1 was not observed. There was a highly significant difference (P = < 0.001) between the mean ages of Molar Codes 2 and 3. The mean age at Molar 3 was highly significantly (P = < 0.001) less than that at Molar Code 6. A probably significant difference (P = < 0.05) was present between the mean age for observations at Molar Code 6 and Molar Code 7.

Discussion

In the first group of 20 bulls, 7 were of the Devon, 5 were of the Lincoln Red and 8 were of the Sussex breeds. As was to be expected with so few animals in each breed, the differences between the mean ages at various molar codes were few. However, in the case of the Sussex bulls significant differences were present between all molar codes with more than one observation. There were no differences in the mean

Table 7.
The age in days for each stage of first molar development in a group of 7 Sussex bulls.

Molar Code	Number of Observations	Minimum Age	Maximum Age	Mean	± S.D.
0	2	179	183	181.0	± 2.82
1	-	-	-	-	-
2	6	206	234	224.2	± 11.73*
3	7	237	283	262.0	± 15.89**
4	12	283	318	301.8	± 14.10***
5	8	333	365	342.3	± 9.95****
6	5	360	386	370.0	± 9.66*****
7	2	388	391	389.5	± 2.12
8	-	-	-	-	-

* Molar Code 2 < Molar Code 3 P = < 0.001
** Molar Code 3 < Molar Code 4 P = < 0.001
*** Molar Code 4 < Molar Code 5 P = < 0.001
**** Molar Code 5 < Molar Code 6 P = < 0.001
***** Molar Code 6 < Molar Code 7 P = < 0.05

ages at each molar code between the three breeds in this group. In the second group of 6 Devon, 6 Lincoln Red and 7 Sussex bulls, differences were present between the mean ages at several molar codes within each breed. A comparison between the three breeds showed that the mean ages of the Lincoln Red cattle at Molar Codes 2 and 4 were larger than those for the other two red breeds. As this difference occurred with few observations, it does tend to suggest that there are breed differences in rate of tooth eruption as has been found with the permanent central incisor teeth (6).

The possibility of breed variation and the observations in the two groups being undertaken at different times did not allow the data to be combined. However the age range obtained at each molar code is shown in Table 8 and Figure 3. The maximum and minimum age levels withing the previously predicted ranges (4) except the upper age for

Table 8.
Results in days for the combined observations of the 39 bulls of the three red-coated breeds.

Molar Code	Number of Observations	Minimum Age	Maximum Age	Difference
0	8	167	191	24
1	14	184	244	60
2	28	195	274	79
3	34	201	302	101
4	76	235	358	123
5	39	300	373	73
6	14	348	386	38
7	21	328	401	73
8	-	-	-	-

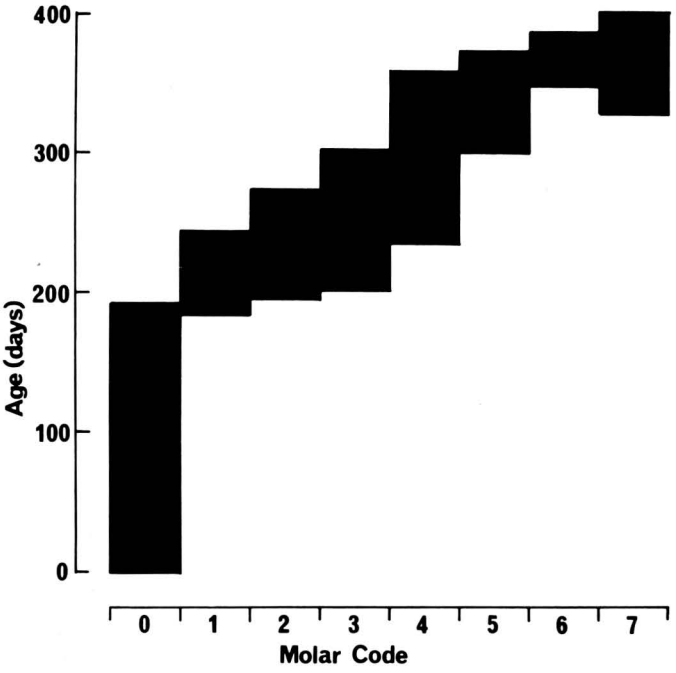

Figure 3 The range of ages in days for each stage of development of the first molar.

Molar Code 4 was 2 days greater than predicted and the minimum age at Molar Code 7 was 4 days lower than previously estimated. The age range for each molar code was very variable but was around 2.6 months although it varied between 38 days (1.3 months) and 123 days (4.0 months).

Using the values obtained it was possible to differentiate bulls of varying age by the eruption of the first molar. Thus in this study those with no eruption of the first molar (Molar Code 0) were younger than those at Molar Code 2 (rostral part ¼ up, caudal part not visible). Bulls at Molar Code 1 (rostral part emerging) and Molar Code 2 could be distinguished from those at Molar Code 5 (rostral part ¾ up, caudal part ½ up or under). Cattle at Molar Code 3 (rostral part ¼ up or more, caudal part emerging) were younger than those showing Molar Code 6 (rostral part ¾ up or over, caudal part over ½ up). However those at Molar Code 4 (rostral part ½ up, caudal part well emerged) could not be absolutely differentiated from those bulls at later ages. Thus animals could be differentiated into age groups at a time before the appearance of the permanent rostral teeth. These results indicate the possible value of maxillary first molar eruption in age determination of the live animal. However, the possible differences resulting from breed variation require more work to be undertaken on this method of age determination.

Summary

Two groups of 20 and 19 bulls respectively were examined at monthly intervals while at a bull performance testing centre. Observations involved the eruption of the maxillary first molar tooth and six records were made on each animal between approximately 7 and 14 months of age. It was found that in each breed group there were significant differences in the age at which various molar codes were seen. Because there was an indication of possible breed variation the results of all animals could not be combined. However, the age range for each molar code obtained with the combined data showed that young animals could be differentiated from old ones by the degree of first molar eruption.

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