The Use of Dentition to Determine Age in British Cattle

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Introduction

Recent articles (1,2) have described how dentition is utilized in the determination of age at various American cattle, beef and steer shows. Accordingly the British experience on the same subject may therefore be of interest. The premier British fatstock show is the Royal Smithfield Show which is staged annually during the first week of December at the Earls Court Exhibition Hall in London. The show has been held since 1798 although not always at the same venue. Following the resolution of the council of the Smithfield Club, Professor G. T. Brown of the Royal Agricultural College, Cirencester, examined the dentition of all the cattle exhibited at the shows of 1884 and 1885. As a result of his observations he produced a series of guidelines for aging animals known as the Smithfield Rules.

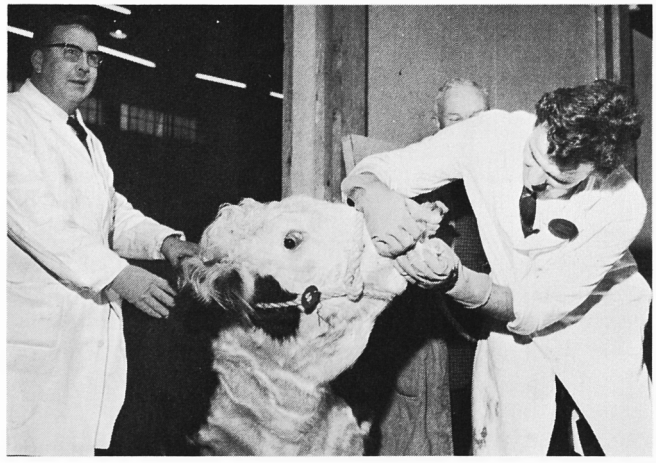
These rules were first used at the show of 1889 and state: Cattle having their central permanent incisors cut will be considered as exceeding 1 year and 6 months; Cattle having their permanent central incisors fully up will be considered as exceeding 1 year and 9 months; Cattle having their second pair of permanent incisors fully up will be considered as exceeding 2 years and 3 months; Cattle having their third pair of permanent incisors cut will be considered as exceeding 2 years and 8 months; Cattle having their fourth pair (corner) permanent incisors fully up and their anterior molars showing signs of wear will be considered as exceeding 3 years.

These regulations have been used since that time until the present day with only minor modifications. One such alteration was introduced by Mr. F. O. L. Walpole, M.R.C.V.S., sometime after his appointment as veterinary surgeon to the Smithfield Show in 1906 and stated: Cattle having their fifth molar up will be considered as exceeding 1 year and 2 months.

Another minor amendment to the rules was initiated in 1971 by Mr. F. A. Edgson, M.R.C.V.S., the present veterinary surgeon to the Royal Smithfield Club. The regulation now reads: Cattle having a central permanent incisor cut will be considered as exceeding 1 year and 6 months.

It can be seen that as with the American system (2), a maximum stage of development is defined for any given age, the object being to stop the unscrupulous owner entering animals in a class for which they are too old and thereby gaining an unfair advantage. It will also be noted that the ages quoted in the British regulations are much earlier than the equivalent ones for the American standards. In relatively recent times the accuracy of the Smithfield Rules has begun to be questioned as evidenced by several of the reports to the Royal Smithfield Club by the chief veterinary surgeon to the show. Thus in 1968 Mr. Edgson found that approximately 18% of the animals that entered the Royal Smithfield Show were showing dentition less than would have been expected for their age by consulting the appropriate rule. At the show of 1969, 16% showed the same anomaly. It was therefore argued that, as it was extremely unlikely that any farmer would prejudice his chance of winning a championship prize by entering his animal in an older age class than was necessary, the accuracy of the Smithfield Rules in conditions at present prevailing should be investigated. As a result of this, a Royal Smithfield Club Research Fellowship was endowed to study "the growth and health of cattle with special reference to dentition and the eruption of teeth."

During the course of the Fellowship several lines of investigation were pursued but, for the purpose of



Dr. Andrew Edgson (left), Chief Veterinary Officer of the Royal Smithfield Show, and Dr. A. H. Andrews examine a Hereford heifer at the show.

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this communication only those concerned with the study of the eruption of anterior or rostral (3) teeth will be considered. An initial survey (4) showed that all stages of permanent anterior tooth development were likely to occur between the ages of one and five years. As a result of this finding, a second survey (5) was performed involving 2,900 animals between the ages of 12 and 60 months. All cattle were only seen on one occasion and because the maximum age for entry of animals to the Royal Smithfield Show was 2 years and 3 months, more animals were deliberately seen at the younger end of the age range. The study included as much variation as possible with regard to management, feeding and area of country where born and reared. Bulls, steers (castrated males) and females (heifers and cows) were studied as well as representatives of most of the major beef and dairy breeds found in Britain together with many cross-bred animals. Some representatives of several of the breeds newly imported into Britain were also examined. All animals had documented ages and checks were also made as to liveweight and molar tooth development.

The stages of anterior tooth development were defined as one permanent tooth of the pair present and/or one/both temporary teeth absent, both the permanent teeth emerging, ¼ up, ½ up, ¾ up and fully up. Where both of the permanent anterior pair of teeth were present and exhibited different stages of emergence, the results were based on the tooth less far advanced. Ages were calculated in days and where months are mentioned they are considered to equal 30.4 days. It can be argued that the results obtained were not pertinent to American conditions of management and feeding. However the mean age for emergence of each tooth in this survey was comparable with those obtained in a study (6) of 869 American purebred beef and dairy cattle receiving optimum nutritional levels.

Results

The minimum, maximum and mean ± standard deviation of the age in days for each stage of anterior tooth development is shown in Table 1. Looking at these values it can be seen that the average age for cattle to show one of the first permanent pair of teeth and/or one/both temporary incisors absent was 676 days (1 year 10.2 months). Obviously if the Smithfield Rule was absolutely correct no animal would show this stage below 1 year 6 months. However as is to be expected with any naturally occurring system there will be a range of ages over which a particular stage is found, in this case 265

Table 1

Table of Minimum, Maximum and Mean (±S.D.) Age in Days for Cattle at Each Stage of Anterior Tooth Development

Stage of anterior tooth development	No. of cattle	Age Range Minimum (days)	Maximum (days)	Mean (days)	S.D.
Cattle between 12 and 18 months without permanent teeth	934	---	---	---	---
Cattle over 18 months without permanent teeth	564	---	816	---	---
One of first permanent pair present and/or one/both temporaries absent	55	541	806	676	± 57
Both first permanent pair emerging	97	536	825	684	± 70
Both first permanent pair ¼ up	75	573	900	704	± 65
Both first permanent pair ½ up	180	538	970	733	± 77
Both first permanent pair ¾ up	125	569	964	752	± 71
Both first permanent pair fully up	162	584	1019	759	± 83
One of second permanent pair present and/or one/both temporaries absent	29	689	961	820	± 71
Both second permanent pair emerging	23	715	937	835	± 75
Both second permanent pair ¼ up	17	794	951	847	± 45
Both second permanent pair ½ up	38	700	956	857	± 75
Both second permanent pair ¾ up	9	806	1035	894	± 72
Both second permanent pair fully up	113	732	1275	967	±109
One of third permanent pair present and/or one/both temporaries absent	18	902	1277	1095	±104
Both third permanent pair emerging	12	978	1304	1120	± 94
Both third permanent pair ¼ up	6	1015	1225	1127	± 69
Both third permanent pair ½ up	23	974	1301	1131	± 99
Both third permanent pair ¾ up	17	955	1319	1135	±110
Both third permanent pair fully up	94	980	1498	1220	±107
One of fourth permanent pair present and/or one/both temporaries absent	41	1083	1742	1343	±146
Both fourth permanent pair emerging	29	1098	1715	1344	±152
Both fourth permanent pair ¼ up	3	1301	1479	1364	±100
Both fourth permanent pair ½ up	30	1103	1682	1377	±155
Both fourth permanent pair ¾ up	7	1208	1632	1392	±160
Both fourth permanent pair fully up	199	1103	---	---	---
Total	2900				

days (8.7 months). What is important is how many animals under 1 year and 6 months show this or more advanced phases. Only four cattle below 18 months showed the emergence of either one or both of the central incisor teeth or other stages, whereas 564 cattle above this age did not have any sign of permanent tooth eruption.

The average age for the central incisors to be fully up was 759 days (2 years 1.0 months) with a range of 435 days (1 year 2.3 months). Seven animals younger than 1 year 9 months showed this or other later development stages whereas 613 cattle of that age or older were below this phase of eruption. Looking at the results of the second pair of permanent teeth, the mean age for both to be fully up was 967 days (2 years 7.8 months) with a range of 543 days (1 year 5.9 months). Six animals had reached this or later stages under 2 years 3 months, however 133 cattle of this age or older were not as advanced in their development.

The mean age for emergence of the third permanent pair of incisors was 1120 days (3 years 0.8 months) and the range was 326 days (10.7 months). Two animals had reached this or later stages under 2 years 8 months, although 74 cattle of this age or older were not as far developed. No average age could be calculated for the fourth permanent pair of teeth being fully up as it could not be ascertained when they had just reached this stage, however 1103 days (3 years 0.3 months) was the earliest it was observed. No animal under 3 years old had a full complement of permanent teeth fully erupted although 244 cattle above this age showed various earlier stages of development.

Discussion

There is a considerable dilemma for anyone trying to produce rules for aging animals which depend on anterior tooth eruption. The wide variation in time over which each dental development stage occurs means that, unless an age is used for defining the stage which is close to the earliest at which the tooth is observed, some precocious animals of correct age will be disqualified when presented at a show. However the use of such an early age will also result in many animals with delayed development, which are much older than are eligible for a particular age class, being able to falsely enter that class. Thus provided the anterior dentition was the only criterion being used to age an animal, one beast aged 816 days (2 years 2.8 months) with a full complement of temporary teeth could easily have been entered in a class for cattle under 1 year 6 months when using the Smithfield Rules, although this animal would have been nearly 9 months too old. It could be argued that perhaps this particular beast was reared on a poor nutritional regime or had suffered some other setback and, as such, would not have been entered for a show. However the fact remains that with this wide variation in age, animals, albeit not quite as old as the example, could have been entered. Such a situation will always exist when classes are defined by age. Obviously when weight or some other criterion is used for this definition the difficulty is eliminated.

Provided the above limitations are realized and understood then the stage of anterior tooth eruption can be used as an indicator, although not absolute, that an animal is too old for a particular class. It can be seen that the Smithfield Rules are unlikely to result in the wrongful disqualification of many animals.

When actually trying to determine the exact age of an individual animal by its anterior tooth eruption the degree of accuracy is very limited. In absolute terms, all that can be said is that an animal with some stage of third permanent tooth development is older than one with all temporary teeth; and also that cattle with some development of the fourth pair of teeth are older than ones which have not reached full development of the second pair of anterior teeth.

The accuracy with which the standard deviation for each stage of anterior tooth development was calculated varied according to the number of animals seen at a particular stage. However it can in general terms be seen from Table 1 that the standard deviation approximated about one tenth of the mean age. Thus if a particular stage of tooth development occurs at 2.5 years, the standard deviation is 0.25 years. This means that two thirds of all animals exhibiting this stage of eruption will be 2.5 ± 0.25 years; also 19 out of every 20 cattle at this stage will be aged between 2.5 ± 0.5 years (i.e., 95% of the cattle population showing this developmental phase would be between 2 and 3 years).

Summary

The history of the Smithfield Rules which are used to determine the age of cattle entering the Royal Smithfield Show in London is outlined and the actual regulations defined. The results of a survey to study the eruption of the anterior teeth in 2,900 British cattle between 12 and 60 months are given and the data are compared with the Smithfield Rules. A brief discussion of the findings in relation to estimating the age of individual cattle is also presented.

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