AGRICULTURE AND RURAL DEVELOPMENT

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THE CANADA AND ALBERTA BSE SURVEILLANCE PROGRAM (CABSESP)

GUIDELINES FOR AGE VERIFICATION IN CATTLE[1]

The CABSESP accepts eligible cattle 30 months of age and older. The preferred method of determining age is by farm records, ear tags (farm tags, CCIA[2] tags, RFID[3] tags), or tattoos, or other verifiable means. However, since this is not possible in all herds, in Alberta the CABSESP is now allowing veterinarians more flexibility in determining the age of cattle presented for sampling by using dentition as an estimate for cattle reported to be between the ages of 30 and 107 months. Animals with incomplete, worn to the gum and spaces between dentition are to be consider as older than 107 months.

Age determination by examination of the permanent erupted incisors is a fairly reliable indication of age from 30 up to 48-60 months, when the permanent dentition is complete (Fig 1). After this period, the rate of wear provides a more useful criterion for age estimation.

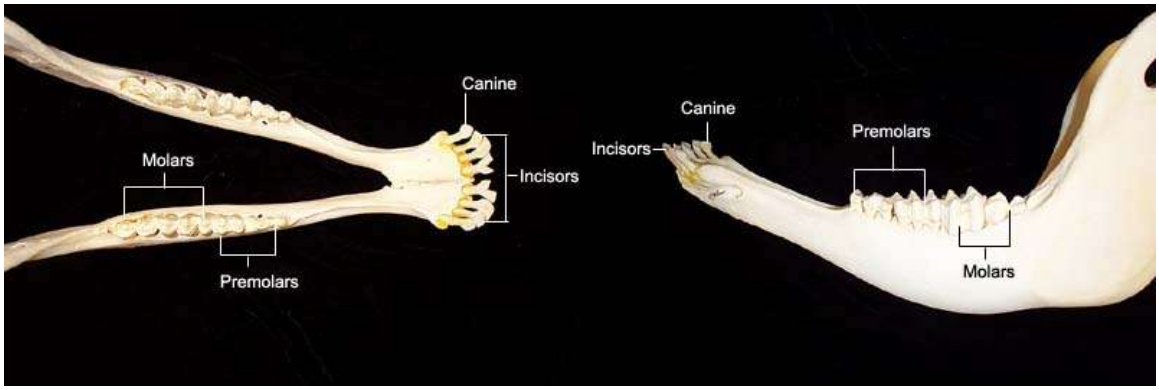


Fig 1. Dorsal and lateral views of the lower mandible of a bovine showing the permanent dentition of an adult (Taken with permission from vetmedicine.about.com).

The rate of wear depends on genetics, diet, soil conditions, and other factors such as the presence, or absence, of minerals in the diet. Wear converts the cutting edge into a

[1] Prepared by Dr. Hernan Ortegon and reviewed, Alberta Agriculture and Rural Development, Edmonton. Last review on January 2013.
[2] Canadian Cattle Identification Agency
[3] Radio frequency identification

gradually broadening flat surface. The lingual edge of this surface originally has a sharply uneven surface that becomes smooth when the tooth is worn down. Exposure of the root coincides with this flattening of the crown. In all cases, age determination by dentition provides an approximation of the real age of an animal.

Tooth anatomy

In ruminants the tooth is comprised of two different parts: the *crown,* which is the exposed part of the tooth, and the *root,* which is inserted in the alveolus and represents proportionally most of the body of the tooth. The outer layer of the root is covered by cementum, while the crown is covered by enamel, which provides extra strength and resistance to the tooth. The enamel covers the dentin, a bone-like material, and makes up most of the tooth. The pulp is most internal structure and is a complex organ composed of connective tissue, blood vessels, and nerve axons (Fig 2). There are three different surfaces in the tooth: the lingual (medial), the labial (lateral) and the occlusal, or the cutting edge surface.

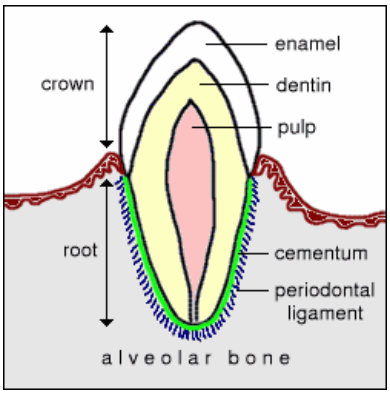


Fig 2. Anatomy of a tooth (Taken with permission from vetmedicine.about.com)

Calves

At birth calves have their two deciduous (temporary) middle incisors. By two weeks of age, all eight deciduous incisors have erupted. By one year of age, all the deciduous incisors are in place and will show evidence of wear (Fig 3 and 4).

Fig 3. Deciduous incisors teeth (frontal view)

Fig 4. Complete set of deciduous incisors at one year of age (caudo-dorsal view).

(Taken from "A comparison of the USDA ossification-based maturity system…" T. E. Lawrence et al, 2001).

Steers and Heifers from one (1) to two (2) years

After one year of age, cattle are aged according to, whether or not, their permanent incisors have erupted and, whether or not, they have come into wear. The eruption of the two central permanent incisors (I_1), when the third permanent incisor is NOT above the gum line (not erupted), is an indication that the animal is between one and two years of age (or less than 30 months). By two years of age, they are in full wear (Figures 5 and 6).

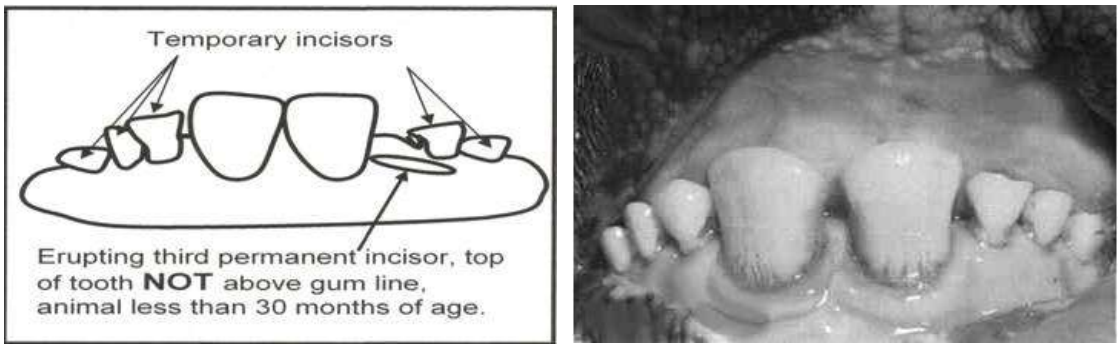


Fig 5 and 6. The two permanent middle incisors have erupted indicating that the animal is less than 30 months old (or between one and two years of age).

Other parameters:

- 15 months - Central permanent incisors appear.
- 18 months - Central permanent incisors showing some wear.

Pre-calving from two (2) to three (3) years

By two years, the second set of permanent incisors (I_2) has started to erupt. For the purposes of the CABSESP, cattle are considered to be over 30 months of age, if at least one of the second set of permanent incisors has erupted and is halfway (Fig 7 and 8).

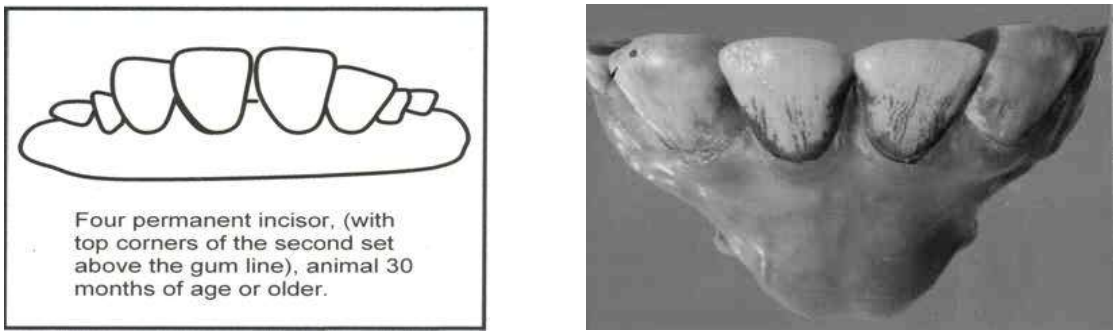


Fig 7 and 8. Frontal view of the four permanent incisors in bovine 30 months or older.

Adult cattle from three (3) to four (4) years

From 36 to 39 months, the lateral permanent incisors (I_3) erupt and by 42-48 months, the corner incisors (I_4) (also called canine teeth) erupt presenting a total of eight permanent incisors (Fig 9 and 10). The guidelines for the CABSESP specify that, when both lateral incisors (canines) are in wear, the animal is considered to be five (5) years of age, or older.

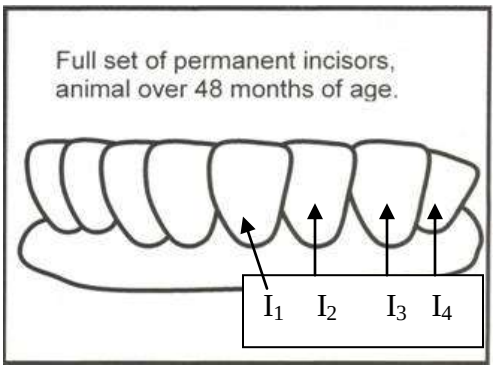


Fig 9. A “full mouth”: complete set of permanent incisors indicating that the age of the animal is over 48-60 months.

Fig 10. Caudo-dorsal view showing wear of the eight permanent incisors, indicating that the animal is considered to be over 5 years of age. (Taken from “A comparison of the USDA ossification-based maturity system…” T. E. Lawrence et al, 2001).

Adult cattle from five (5) to six (6) years

The teeth development is quite complete from five to six years. At that time, the border of the incisors has been worn away, a little below the level of the grinders (molars). The occlusal surface of incisor one (I_1) begins to level (Fig 11).

Fig 11. Dentition of five to six year old cattle. The occlusal surface of I1 begins to level.

Adult cattle from six (6) to seven (7) years

At six years, the first molars are beginning to wear, and are on a level with the incisors. The lingual surface and the cutting edge of the I_1 level making a broad masticatory surface (Fig 12 and 13).

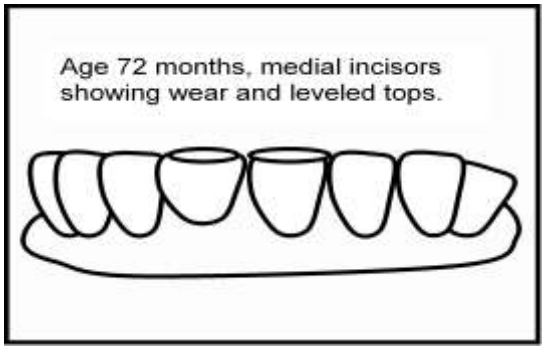


Fig 12 and 13. Dentition on six to seven year old cattle: I_1 is leveled and gum retraction becomes apparent.

Adult cattle from seven (7) to (8) years

From seven to eight years, the lingual surface and cutting edge of the I_2 broaden and level with I_1 (Fig 14). The retraction of the gum initially exposes the roots of the medial incisors (I_1).

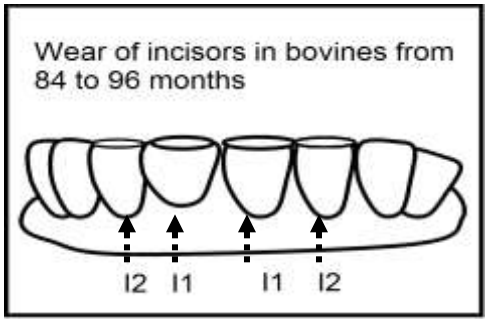


Fig 14. Illustration of a seven to eight year old bovine showing that I_1 and I_2 masticatory surfaces are flat, broaden and “level”.

Adult cattle from eight (3) to nine (9) years

At eight years, the lingual surface and cutting edge of I_3 broaden and becomes leveled with I_1 and I_2. At this age, the wear of the first grinders is very apparent, and the neck of I_1 is clearly visible (Fig 15).

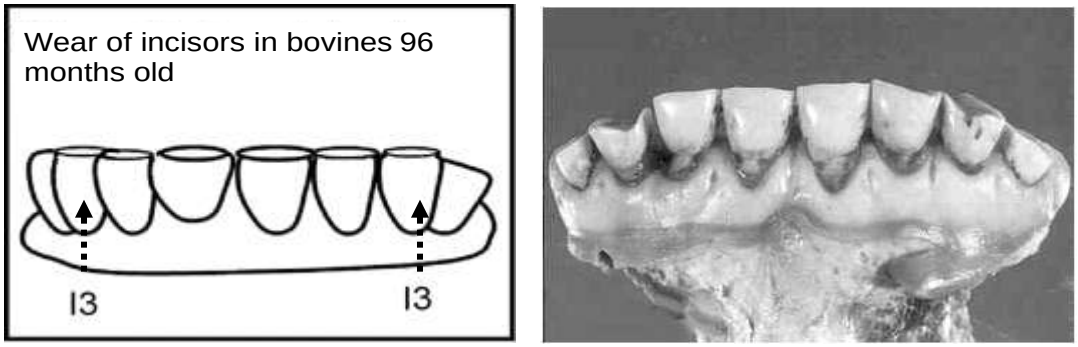


Fig 15. Frontal view of the dentition of an approximately eight-year old bovine. The illustration on the left shows that I_3 becomes leveled, while the picture in the right shows that, at this age, an increased retraction of the gums is observed.

At nine years, the lingual surface and cutting edge of I_4 (caninum) broaden and becomes leveled with the incisors (I_1, I_2 and I_3). More retraction of the gum exposes even more the roots of the medial and intermediate incisors, creating space between the teeth (Fig 16).

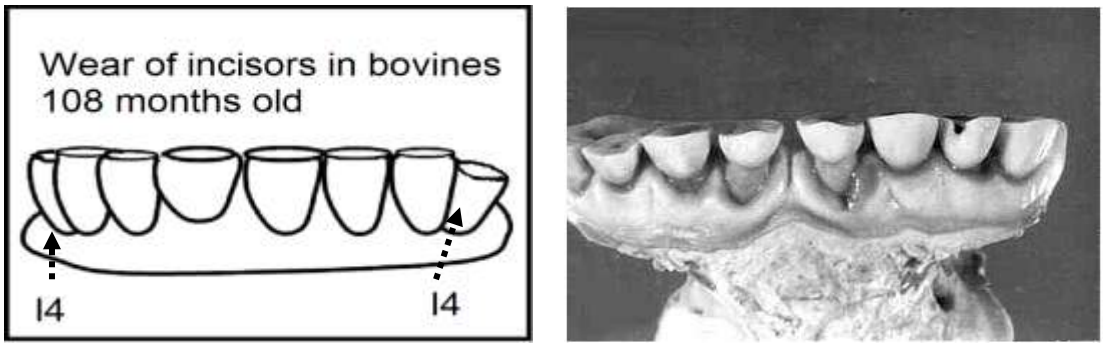


Fig 16. Frontal view of the incisors of an approximately nine to ten year old bovine. Notice the reduced proportion of visible crown, the exposed roots and broaden and leveled surfaces of all incisors, including the canine teeth (I_4).

Adult cattle ten (10) year old or more

At ten, or eleven years, there is increased space between the teeth, which are mostly exposed roots, with a small portion of visible crown, if any (Fig 17-19). Some teeth loosen and fall. Used surfaces of the teeth begin to bear a square mark surrounded by a white line. This is pronounced on all the teeth by the twelfth year; between the twelfth and the fourteenth year this mark takes a round form.

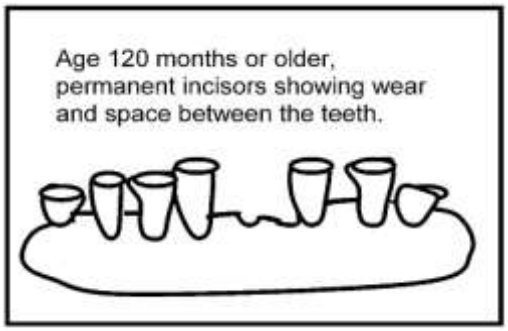


Fig 17. Illustration of dentition of bovines 10 years or older with a loose tooth. The root becomes the largest proportion of visible teeth.

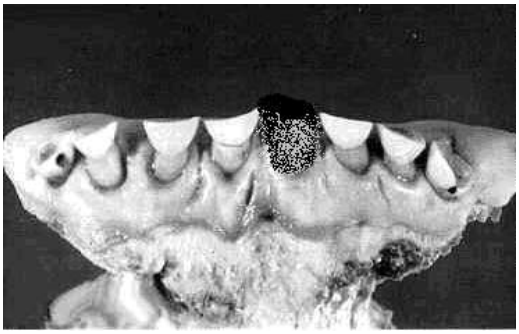


Fig 18. Frontal view of incisors in cattle 10 years old. Re-edited picture to show that at this age, some teeth may loosen and fall out.

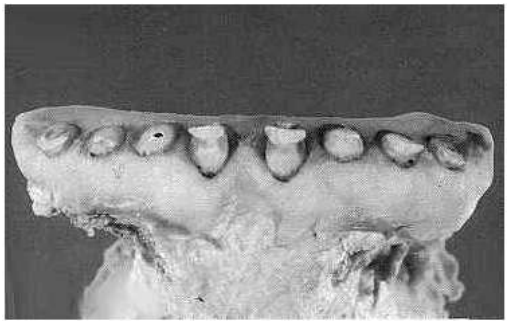


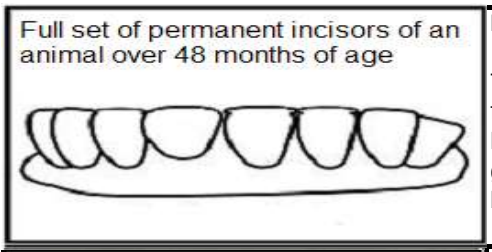
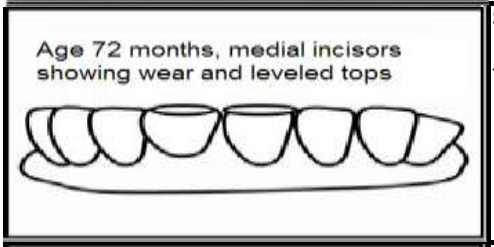
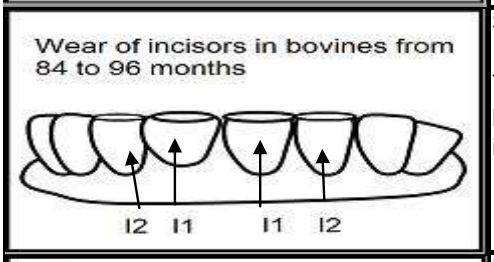
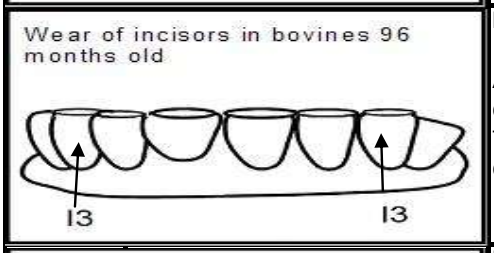
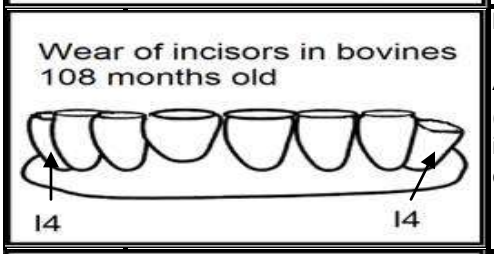
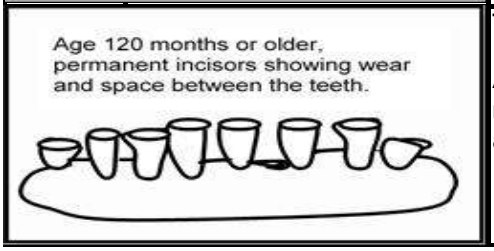
Fig 19. Frontal view of a bovine 10 to 15-year old, as cattle continue to age, the teeth wear shorter, and more neck becomes visible; the crown disappears in most teeth, and they loosen in the sockets and eventually drop out.

As a guideline for the CABSESP, animals that don't have verifiable records of birth should still have <u>all eight incisor teeth present with some crowns visible</u> to be considered less than 107 months. **Animals with incomplete, worn to the gum and spaces between dentition are to be consider as older than 107 months.**

References

1. Meat Inspection Manual. Alberta Agriculture and Rural Development, Regulatory Services Division, Edmonton 2002.
2. A comparison of the USDA ossification-based maturity system to a system based on dentition, T. E. Lawrence et al., 2001.
3. Textbook of veterinary anatomy. Saunders edits, 3rd edit., Dyce et al., 2002.
4. The Merck Veterinary Manual. Whitehouse Station: Merck and Company, 8th edit, 1998.
5. Methods of Determining Age of Cattle. Cattle Producer's Library. Toell et al., 2003.

The Canada and Alberta BSE Surveillance Program (CABSESP)
GUIDELINE FOR AGE DETERMINATION IN BOVINES OLDER THAN 5 YEARS

	**Five to six year old bovines** The teeth development is quite complete from five to six years. At that time, the border of the incisors has been worn away a little below the level of the grinders(molars). The occlusal surface of incisor one begins to level
	**Six to seven year old bovines** The lingual surface and the cutting edge of the I1 level making a broad masticatory surface
	**Seven to eight year old bovines** The lingual surface and cutting edge of the I_2 broaden and level with I1 . The root of I1 becomes increasingly exposed
	**Eight to nine year old bovines** At eight (8) years, the lingual surface and cutting edge of I3 broaden and becomes leveled with I1 and I2. The neck and part of the root of I1 iand I2 are clearly exposed
	**Nine to ten year old bovines** At nine (9) years, the lingual surface and cutting edge of I_4 (caninum) broaden, and becomes leveled with the incisors (I1, I2 and I3). More retraction of the gum exposes, even more, the medial and intermediate incisors.
	**Ten year old bovines, or older** As cattle continue to age, the teeth wear shorter and more neck becomes visible; the crown disappears in most teeth, and they loosen in the sockets and eventually drop out.