CONGENITAL FETAL HYPOTHYROIDISM SYMPT0MS (BIRTH DEFECTS) ON ELK (*Cervis canadensis*)

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A. ELK WITH BRACHYGNATHIA SUPERIOR AND RESULTANT UNDERBITE

Live male elk calf with severe, very visible underbite. Calf also had weak pastern joins in the rear legs and a crooked right front leg. Calf was given cell salts by MDFWP rehabilitation center caretaker and was normal when released. Necropsy at 1½ years of age showed legs and bite normal, when he was deliberately killed by MDFWP because they wanted to use him to test for CWD. At 1½ years of age, he had grown large antlers that had 11 points on each side. Consequently, he looked different than other yearling male elk. MDFWP knew where he came from and that he was released by them. He was shot because he looked different, being small in body because he was only 1½ years old, but with very large antlers. Brachygnathia superior was at approximately 50% in hunter-killed mostly adult elk male elk documented from throughout Montana in 2010, but appears to have decreased significantly since 2014. Pregnant female elk with brachygnathia superior often have calves with brachygnathia superior and other deleterious health effects consistent with thyroid hormone disruption. When pregnant cow elk suffer from inadequate nutrition, it usually results in fetal loss and high mortality in their newborn calves.

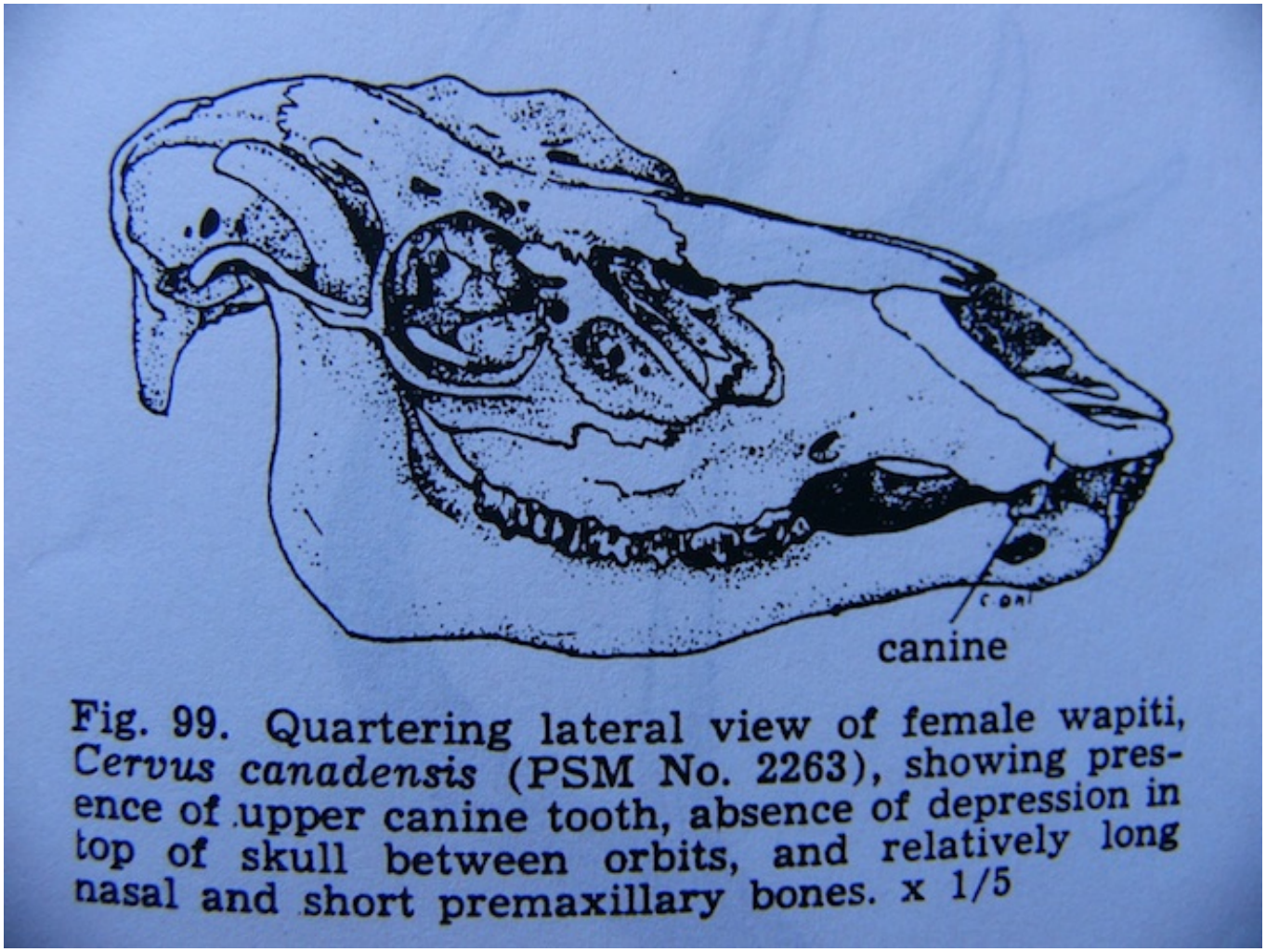


Fig. 99. Quartering lateral view of female wapiti, *Cervus canadensis* (PSM No. 2263), showing presence of upper canine tooth, absence of depression in top of skull between orbits, and relatively long nasal and short premaxillary bones. x 1/5

A college textbook drawing of a normal female elk skull showing the contact between all lower incisors with the premaxillary bone on which the premaxillary pad is located on a live animal.

Female calf elk underbite side view on left. Photo on right shows how width of pad is measured. Note, the pad is narrower than the incisors, opposite of the normal condition on a wild ungulate.


Front views of a female elk calf on left and an adult female elk on right, both with underbite and premaxillary pad much narrower than the incisors. The calf also had a herniated umbilicus, a very serious birth defect, usually resulting in a slow painful death, so it was euthanized.

This is a side-view of an adult female elk with a normal bite. The incisors all connect the premaxillary pad as they did on all ungulates prior to spring of 1995. With underbite, cow elk cannot get enough food to produce viable calves and the wolves get all the blame for the crashing elk populations.

The hunter-killed male elk head above shows a severe underbite and the lower photo shows a close-up of the elk's mouth with the lower incisors far forward of the dental pad on which they are supposed to contact for efficient grazing.

A front view of the incisors and premaxillary bone on another hunter killed male elk is shown in the above photo.

Side-view of the premaxillary pad and incisors, showing underbite on same hunter killed male elk.

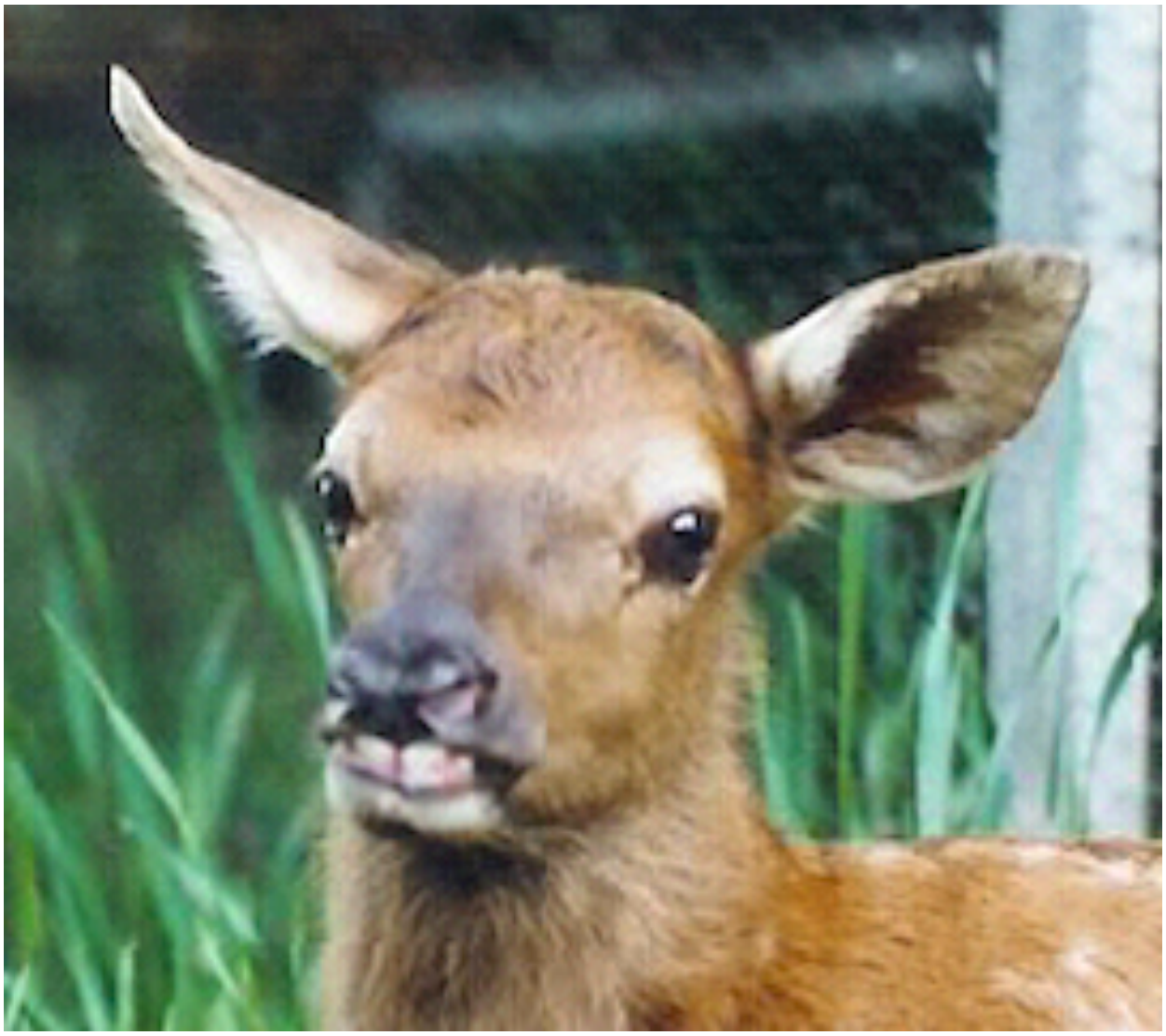
This is a photo of a photo in Eastman Bow Hunting Magazine showing the severe underbite on a hunter-killed male elk shot by a bow hunter in Colorado. This strongly suggests the problem of wild ruminants having brachygnathia is widespread. If the animal is able to eat enough to survive, underbite does not cause mortality. Some epigenetic changes are passed on by males able to reproduce. It is unknown whether this epigenetic change can be passed on or if it is caused only by exposure to thyroid hormone disrupting toxins during development. This is one of the things needing study.

Between 2006 and present, the prevalence on examined elk each year has been over 5% and 5% for a birth defect of any kind is supposed to raise a red flag. Why are the birth defects being covered up and not addressed at all by conservation organizations or wildlife agencies? The same birth defects on domestic ruminants are costing livestock owners billions of dollars a year collectively over the entire nation. The health care costs and education costs for children born with the same birth defects as the other mammals are also collectively costing billions more dollars per year than healthy newborns.

B. DISCUSSION OF ELK CALVES WITH DISRUPTED FACIAL BONE DEVELOPMENT USING ELK CALF PHOTOS FROM GOOGLE

I typed "elk calf photographs" on to Google search. A lot of photos of elk calves are on Google now. The photos of elk calves were taken all over the United States and Canada. I looked for clear photos of side views of the head, like the calf in the photo below from Google. I also watched for front view photos of elk calves with protruding lower incisors like the elk calf on page 1. Whenever I found a clear enough photo, I pulled it off and cropped the photo for a close-up of the head. If the angle of the face is wrong in the photo or the photo is not clear enough, it is impossible to tell if the bite is normal. That narrows down the number of photos on which a normal bite can be discerned from underbite. Underbite is caused by underdeveloped premaxillary bone and other upper facial bones and is also called brachygnathia superior.

This Yellowstone Park elk calf appears to have a completely normal bite, or at least as far as can be discerned without direct examination of the placement of the lower incisors in relation to the dental pad. Note that the lower lip tucks in directly behind and against the back of the upper lip, as is normal for ruminants. Also, the upper facial bones are straight from the forehead to the muzzle and the muzzle is relatively perpendicular to that straight line, with the end of the muzzle pointing straight ahead and with no dished area anterior to and between the eyes.



This is a photo of a male elk calf, which was born in Ravalli County Montana, near Painted Rocks Reservoir in spring of 1999. He was brought to me for rehabilitation about 3 days after he was born. He walked on his pasterns on both back legs and had a crooked right front leg. He was very hungry, so possibly could not suckle properly with the severe underbite with which he was born. Note the middle lower incisors were very wide and because the premaxillary bone was much shorter and narrower than the extremely wide incisors, this elk calf couldn't close his mouth. This calf had a dished face between the muzzle and the forehead, which is fairly common on elk calves with brachygnathia superior, the medical term for underdeveloped upper facial bones. The premaxillary bone is most affected as shown by the skulls of elk calves on page 9 and 10. I do not see many elk calves to photograph. By checking the elk calf photos on Google, I found that brachygnathia superior with resultant underbite is quite common on elk calves from all over western United States.

This is a photo from the Internet of a premature elk calf's skull. This calf had severe brachygnathia superior and underbite, with a short narrow premaxillary bone and an extreme dish in the upper facial bones between the eyes, resulting in a very domed looking head. We have observed and photographed other ungulates with this severe dish directly forward of the eyes. All ungulates with this facial conformation also have a fairly severe underbite. On the Internet, in photos of Arabian horse foals and adults with underbite, the face is often severely dished.

Elk calves with brachygnathia superior as extreme as in the above photo, usually have other birth defects and do not survive. They usually die somewhat before or immediately after they are born. A calf with multiple birth defects can have other bone malformations, especially crooked legs or weak joints, an underdeveloped thymus, enlarged right heart ventricle and lung inflammation. Males often have very short, no or malformed scrotum. Many are born premature or dismature. Some also have contracted tendons, herniated umbilicus or other birth defects. The more severe birth defects caused by fetal hypothyroidism most often cause mortality. Such mortality to numerous calves each year causes population declines. In years when the birth defects are less prevalent, far more calves survive to maturity.

See our study concerning seven ruminant species, including hunter-killed elk, free on Google - (J.A. Hoy, G.T. Haas, R.D. Hoy & P. Hallock, "**Observations of brachygnathia superior in wild ruminants in Western Montana, USA."** Wildl. Biol. Pract, 2011 December 7(2): doi:10.2461/wbp.2011.7.13, or on my website with multiple studies, photo documents and other information (www.judyhoy.com).

This is a photo of the cleaned skull of an elk calf with fairly severe brachygnathia that was about 3 weeks old when it was euthanized because of a severely herniated umbilicus. Herniated umbilicus is a fairly common symptom of disruption of the fetal thyroid hormones, but not nearly as common as brachygnathia superior, underdeveloped thymus and enlarged right heart ventricle. This calf, a female, had an odd shaped heart, but the right ventricle was normal size. The heart was covered with very dilated lymphatic vessels on the surface, which was extremely common on individuals of multiple species of mammal and bird in 2007, the year this calf was born. This calf's face has a very short, narrow premaxillary bone and consequent underbite. However, it does not have the extremely dished face and domed skull like the calf skull in the previous photo on page 9 or like that of many other examined elk calves born with brachygnathia superior. This calf was born in Ravalli County, Montana, south of Hamilton.

Not likely a coincidence, Roundup Ready Alfalfa was planted by dairy farmers here in Ravalli County and in states upwind of Ravalli County in spring of 2006, thus much more Roundup/Glyphosate was used in 2006 and each year since. Glyphosate chelates 7 minerals very important to normal fetal development, including Calcium, Manganese, Magnesium, Zinc and others. Deficiency of Manganese and Calcium during development results in brachygnathia superior on ruminants in deficiency studies. Disruption of the Sonic Hedgehog (SSH) genes early in development also results in craniofacial malformations. Zinc deficiency causes underdeveloped male genitalia and SSH genes dictate the size and location of the male genitalia, as well as craniofacial features and other organs. Deliberate exposure to an insecticide, Imidacloprid, was found in a study published in Nature in 2019 by SD researchers to cause both reproductive malformations and underdeveloped jaw bones (see articles about the study and the study on my website.

This is another fuzzy photo from Google of an elk calf with obvious brachygnathia superior and resultant underbite. The protruding lower incisors are visible and obviously much wider than the underdeveloped premaxillary bone and dental pad. The lower incisors appear to be somewhat crooked as well as appearing to be wider than normal, fairly common on all newborn mammals born with brachygnathia superior. This is likely the result of disrupted SSH gene signaling molecules, since the placement of tooth buds are dictated by SSH gene signaling molecules. This elk calf couldn't close its mouth and has an underbite that is obvious to anyone, including someone who has never previously seen an elk. It didn't say where this photo was taken.

This elk calf in a photo from Google could nearly close it mouth, but still has an obvious underbite with wide lower incisors and the lower jaw is visibly as wide as the muzzle where the premaxillary bone is located. This calf also has a fairly deep dish in the face between the muzzle and the forehead and a rounded muzzle. It didn't say where the photo was taken. There are a lot of photographs of elk calves and other wild ruminants with underbite on Google.

This photo from Google shows an elk calf with the front of the lower lip almost even with the front of the upper lip. This strongly suggests an underbite, even though the calf can close its mouth. For underbite on elk calves or adult elk, direct inspection on live captured animals or direct inspection and measurements of the bite and width of the dental pad and width of the incisors on all dead animals that can be examined is the best way to determine normal bite vs. underbite or overbite to get an idea of prevalence of the birth defects in a specific elk population. Direct inspection of the mouth of all elk, adults or calves that are captured, harvested or found dead should be of high priority. We need to determine the prevalence of underbite and overbite on elk in elk herds in both the United States and Canada. Fortunately, in spring of 2014, for a reason yet to be determined, the prevalence on all examined wild ruminants, especially elk went down significantly. However, whatever is causing this birth defect needs to be determined and the use of the substance stopped as quickly as possible. A study done on white-tailed deer exposed to an insecticide, Imidacloprid, found a high prevalence of underdeveloped jawbones on the study fawns and both fawns and adult females died. Those that had birth defects or that died had the highest amount of Imidacloprid found in their spleens. The continued existence of wild ruminants, including elk and the wild predators (wild wolf pups have also been born since 1995 with underdeveloped facial bones, with at least 2 observed in Ravalli County) that are reliant on elk for part of their subsistence depends on determining for certain what is causing the birth defects and banning its use. Human newborns have the same birth defects as the other vertebrates. Birds do not often have a short lower jaw/bill but many have been documented with a short upper bill, because the bone that the rhamphotheca covers is underdeveloped.

C. ELK MALE GENITALIA ADDRESSING THE BIRTH DEFECTS OF THE MALE REPRODUCTIVE ORGANS BEING OBSERVED ON MALES OF VERTEBRATES.

This dried genitalia is from a hunter-killed adult male elk harvested in 2005. The penis sheath is at the extreme left of the photo. The left testicular bursa on the scrotum is formed directly forward of the right testicular bursa, similar to the misaligned bursa found on other examined male mammals, including wild ruminants, domestic ruminants, canines, rodents and raccoons.

This photo is a close-up of the dried elk scrotum shown on previous page. The testes were in the bursa when the hunter brought the scrotum to me.


A live bull elk with a normal scrotum with bilateral bursa and the midline running between the two bursa as has historically been the normal scrotal configuration for most mammal species.

This photo shows a live adult male elk with the left bursa formed directly forward of the right bursa. This elk was born with this scrotal configuration since it was obviously alive when the photo was taken. Eugene Beckes took this photo at the National Bison Range north of Missoula, MT.

Elk with very short or no scrotal sac formed have also been observed, but I do not have clear photos available. Shortened male genitalia on the external skin are a definitive symptom of Zinc deficiency. Zinc is another mineral that is severely chelated by Glyphosate, both in the plants the animals eat and in the animals themselves. Glyphosate chelates calcium, magnesium, manganese, iron, zinc, nickel and copper in the plants, which is how it kills the plants. When the animals eat the mineral deficient plants with Roundup on the foliage, any of those 7 minerals the animal happens to get in other ways is chelated in the animal, resulting in very severe deficiencies of those minerals. Mineral deficiency in the mother results in birth defects in the young. Manganese deficiency and exposure to Glyphosate and other pesticides, like the fungicide Chlorothalonil and the insecticides called Neonicotinoids, such as Imidacloprid, cause severe thyroid hormone disruption and fetal hypothyroidism. Fetal hypothyroidism causes brachygnathia superior and other birth defects, with or without mineral deficiencies. The combination or synergism between fetal hypothyroidism and mineral deficiencies is likely the reason for the high prevalence of brachygnathia superior and reproductive malformations on ungulate species, including domestic ungulates as a result of being exposed to multiple pesticides (umbrella term).