

## Ocular Infection of Cattle with *Setaria digitata*

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**ABSTRACT.** One 5-month-old female native Korean calf and a 2-year-old female Holstein cow raised in two farms about 4 km apart from each other in Korea, were found to have the left eye opaque, which included motile white worms in the aqueous humor. The parasite removed from the left eye of the calf was identified as *Setaria digitata* based on both light and electron microscopic features. The ocular infection with *S. digitata* reported herein may document the first aberrant case in Korean cattle.

**KEY WORDS:** cattle, Korea, ocular infection, *Setaria digitata*.

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Adult *Setaria digitata* is commonly found free within the abdominal cavity of several ungulates which include cattle, sheep and horses in the Far East and Asia. In Korea, two species, *S. digitata* and *S. marshalli*, have been reported to parasitize cattle [15]. Prevalence of *Setaria* spp. among cattle raised in Korea ranges from 5 to 70% [7, 11, 13, 15]. Although the adult worms in the abdominal cavity are mostly harmless to cattle, serious pathogenic results could occur in animals such as sheep, goats and horses in which larvae of *Setaria* spp. can migrate erratically into the central nervous system [3, 4]. *Setaria* spp. have been known as the major causative agent of epizootic cerebrospinal nematodiasis in sheep raised in Korea since 1939 [8–10]. The ectopic parasitism of *S. digitata* was also reported in the eye of a horse [6].

Except for one report on the *S. digitata* in the cavity of a cystic corpus luteum of a cow [12], heterotropic parasitism of cattle with *Setaria* spp. is rarely known. We hereby report a case of single-eye blindness of two cattle raised in the same region of Korea, and the isolation of a female worm which was identified as *S. digitata*.

### CASE REPORT

In December 1999, a 5 month-old female Korean native calf was found to have the left eye opaque at a local beef cattle farm with about 20 Korean native cattle in Youngkwang-gun, Chonnam province, South Korea. In contrast to the healthy and non-affected right eye (Fig. 1A), the cornea of the left eye became leukomatous, so that the function of the iris could not be determined (Fig. 1B). The affected eye did not function, so it did not respond to any movement on the left side of the face. Upon close examination, a white worm was found rapidly moving within the anterior chamber of the eye (Figs. 1C & 1D; Refer to <http://vetmed.chonnam.ac.kr/parasitol/setariaeye> for a movie clip). Except for mild depression, general clinical signs such as body temperature and other physical examinations were all normal.

An almost identical case developed a year later in a dairy

cattle farm near that of the first case in Youngkwang-gun. The farm had 40 milking cows and 15 heifers and was located approximately 4 km apart from that of the affected Korean calf. The right eye of a female Holstein cow was found opaque. The cow was 2 years old, and 3-months pregnant. She lost eyesight on the affected eye with excessive lacrimation, and a white worm was observed rapidly swimming within the anterior chamber. The photo of the affected eye (Fig. 2A) was taken three weeks after the first visit, and the cornea became so severely opaque that the movement of the parasite inside could be observed only occasionally at the narrow edge of limbus of the cornea. The worm found in the eye of the Holstein cow was identical in macroscopical morphology and movement to that found in the eye of the Korean native calf. The left eye of the cow was unaffected (Fig. 2B).

The parasite in the Holstein cow eye could not be obtained due to the disagreement of the owner. The worm was removed from the eye of the Korean native calf as follows. After the animal was properly restrained under both general and local anesthesia, a 10 ml disposable syringe with an 18-gauge needle was inserted into the anterior chamber of the affected eye at 6 o'clock position of the cornea about 5 mm apart from the limbus. Part of the aqueous humor was to be withdrawn before the parasite could be removed through a small incision window on the cornea. However, the needle got clogged immediately after the piston of the syringe was pulled out to withdraw the aqueous humor. When the needle was pulled out of the eye, the tail part of worm plugged the needle. The entire parasite was then successfully removed from the eye. No additional worm were found upon closer examination and then the eye was treated with antibiotics. No additional surgical procedure was done to relieve the blindness of the affected eye.

The worm removed was 5.6 cm long (Fig. 3A) and was identified as female *S. digitata* after the light and electron microscopic morphological description of Rhee *et al.* [15]. The anterior part of the worm had dorsal and ventral projections adjacent to the round lateral lips (Figs. 3B & 3D). A

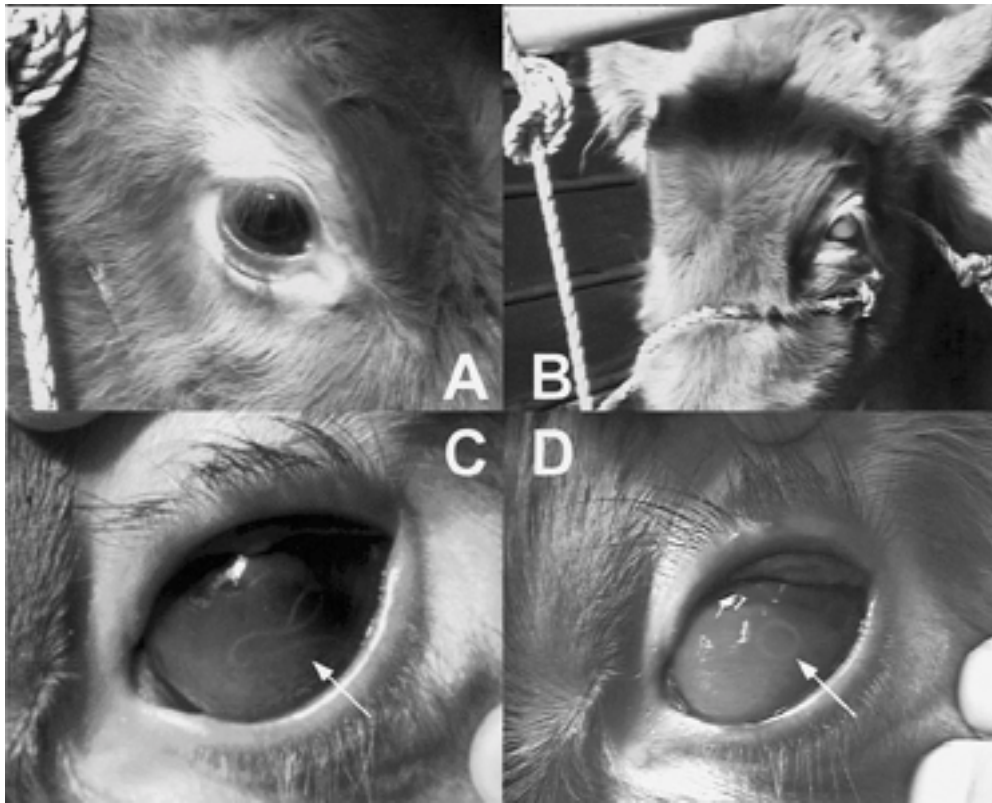


Fig. 1. *Setaria digitata* in the anterior chamber of the calf's left eye. A: Unaffected right eye. B: Frontal view of the head showing the leukomatous left eye. C & D: Left eye with a white worm in aqueous humor (arrows).



Fig. 2. A single-eye blindness of a female Holstein cow. A: Leukomatous cornea of the right eye with excessive lacrimation. B: Unaffected left eye. Note: Whitish marks (arrow) are artifacts.

pair of lateral appendages was observed near the posterior terminal end of body (Figs. 3C & 3E). The female worm was characterized by the tapering posterior terminal end of body with a smooth knob which was distinctively different from that of *S. marshalli*, which is bulged and roughly furcated [15].

## DISCUSSION

Considering that adult *Setaria* spp. are commonly found in the peritoneal cavity of cattle raised in Korea and are generally harmless to the host, the aberrant parasitism of a female worm in the eye of a calf described herein is a rare

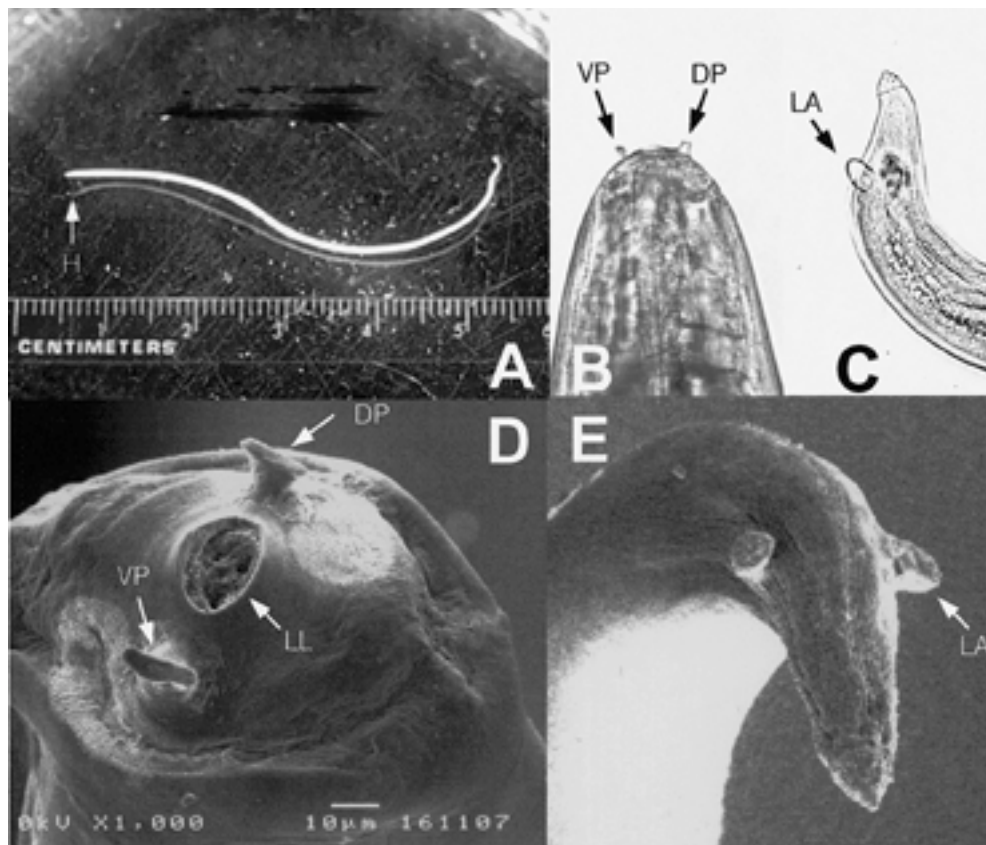


Fig. 3. Adult female *Setaria digitata* removed from the anterior chamber of the calf's left eye. A: Whole body. B & C: Light microscopic view of anterior (B) and posterior (C) appendages. D & E: Scanning electron micrographs showing anterior (D) and tail end (E). DP: dorsal projection; H: head end; LA: lateral appendages; LL: lateral lips; VP: ventral projection.

but detrimental clinical case. Prevalence of *Setaria* spp. among cattle in the southwestern region of Korea was reported as 56.7% in 1976 [13] and 34.2% in 1994 [15]. Among 406 cattle slaughtered at abattoirs located in the southeastern region of Korea, Moon and Kang [11] reported an infection rate of 6.4% with *Setaria* spp. Also, in an abattoir in Cheju Island, Korea, Kim *et al.* [7] reported 5% of adult cattle infected with *S. digitata* in the abdominal cavity. However, to our knowledge to date, no heterotrophic parasitism with *S. digitata* in cattle has been documented in Korea.

It appears that *Setaria* spp. have parasitized cattle for a long time and may have adapted themselves as well to cattle as their natural host, causing few clinical changes. However, *Setaria* spp. have been reported to cause hind limb paralysis in a considerable number of sheep in Korea. Kimura and Niimi [8–10] found *Setaria* spp. larvae in the central nervous system of 44 (25%) of sheep. Between 1973 and 1975, the government-maintained National Livestock Breeding Station at Sunghwan, Korea, also reported hind limb paralysis in about 1.7–3.5% of sheep raised at the Unbong Branch located at Namwon, Chonbuk presumably caused by *Setaria* spp. [13]. Similar cases of epizootic cere-

brospinal setariasis have occurred in Japan [5] and in Sri Lanka [2, 16].

The female *S. digitata* found in the calf's eye may have been transmitted by mosquitoes, the intermediate host of the parasite [17]. However, in the light of earlier reports of prenatal infection with *Setaria* spp. [1, 14, 17] and *S. marshalli* in Korea by Wee *et al.* [18] and by Fujii *et al.* [1] in Japan, the possibility of such a transmission route cannot be disregarded in the case of reported herein.

Other than the well-established cerebrospinal infection of sheep with *S. digitata*, ectopic parasitism of *S. digitata* has been reported in the horse eye [6], and in the cow's cystic corpus luteum [12]. In this paper we have documented ocular setariasis in a 5-month-old calf caused by female *S. digitata*. Although the parasite from the eye of the 2-year-old female Holstein could not be identified, it appears that the ocular lesion, movement of the worm in the aqueous humor, and the symptoms of the affected cow were almost identical to those of the 5-month-old Korean native calf.

Functional descriptions on the projections and the appendages in the anterior and posterior end of adult *S. digitata* respectively, were not available in the literatures avail-

able to us. Most likely, however, they are either chemical or tactile receptors, and possibly appendages that aid the worm in attachment to host tissue, as well as in invasion of host tissue during their migration (K. Fujisaki, personal communication).

## REFERENCES

1. Fujii, T., Hayashi, T., Ishimoto, A., Takahashi, S., Asano, H. and Kato, T. 1995. Prenatal infection with *Setaria marshalli* (Boulenger 1921) in cattle. *Vet. Parasitol.* **56**: 303–309.
2. Innes, J.R.M. and Pillai, C.P. 1955. Kumri—so called lumbar paralysis—of horses in Ceylon (India and Burma) and its identification with cerebrospinal nematodiasis. *Br. Vet. J.* **111**: 223–235.
3. Innes, J.R.M. and Shoho, C. 1952. Nematodes, nervous disease, and neurotrophic virus infection. Observations in animal pathology of probable significance in medical neurology. *Br. Med. J.* **4780**: 366–368.
4. Innes, J.R.M. and Shoho, C. 1953. Cerebrospinal nematodiasis. Focal encephalomyelomalacia of animals caused by nematodes (*Setaria digitata*): a disease which may occur in man. *Archs Neurol. Psychiat.* **70**: 325–349.
5. Ishii, S., Yagima, A., Sugawa, Y., Ishiwara, T., Ogata, T. and Hashiguchi, Y. 1953. The experimental reproduction of so called lumbar paralysis-epizootic cerebrospinal nematodiasis in goats in Japan. *Br. Vet. J.* **107**: 160–167.
6. Jemelka, E.D. 1976. Removal of *Setaria digitata* from the anterior chamber of the equine eye. *Vet. Med. Small Anim. Clin.* **71**: 673–675.
7. Kim, S.H., Kim, C.S. and Lee, B.J. 1968. Survey of the internal parasites of Cheju cattle. *Korean J. Vet. Res.* **8**: 92–97.
8. Kimura, T. and Niimi, D. 1939. Histological changes of the central nervous system in so called “lumbar paralysis” of the sheep in Chosen (Report 1). *Trans. Japanese Pathol. Soc.* **29**: 466–470.
9. Kimura, T. and Niimi, D. 1940. Histological changes of the central nervous system in so called “lumbar paralysis” of the sheep in Chosen (Report 2). *Trans. Japanese Pathol. Soc.* **30**: 539–544.
10. Kimura, T. and Niimi, D. 1941. Histological changes of the central nervous system in so called “lumbar paralysis” of the sheep in Chosen (Report 3). *Trans. Japanese Pathol. Soc.* **31**: 609–612.
11. Moon, M.H. and Kang, S.W. 2000. Isolation and prevalence of *Setaria microfilariae* in cattle. *Korean J. Vet. Res.* **40**: 339–343.
12. Nair, K.P., Pillai, K.M. and George, V. 1993. *Setaria digitata* as ectopic parasite in the cystic corpus luteum of a cow. *J. Vet. Anim. Sci.* **24**: 92–93.
13. Paick, Y.K., Rhee, J.K., Baek, B.K. and Lee, S.B. 1976. Studies on epizootic cerebrospinal setariasis. 1. Infection rate of *Setaria digitata*. *J. Korean Vet. Med. Ass.* **12**: 81–87.
14. Radostits, O.M., Blood, D.C. and Gay, C.C. 1994. pp. 1274–1275. *Veterinary Medicine*. Bailliere Tindall, London.
15. Rhee, J.K., Choi, E.Y., Park, B.K. and Jang, B.G. 1994. Application of scanning electron microscopy in assessing the prevalence of some *Setaria* species in Korean cattle. *Korean J. Parasitol.* **32**: 1–6.
16. Shoho, C. and Nair, V.K. 1960. Studies on cerebrospinal nematodiasis in Ceylon 7. Experimental production of cerebrospinal nematodiasis by the inoculation of infective larvae of *Setaria digitata* into susceptible goats. *Ceylon Vet. J.* **8**: 2–12.
17. Soulsby, E.J.L. 1982. pp. 316–319. *Helminths, Arthropods and Protozoa of Domesticated Animals*. Bailliere Tindall, London.
18. Wee, S.H., Jang, H., Joo, H.D., Kang, Y.B. and Lee, C.G. 1996. *Setaria marshalli* infection in neonatal calves. *Korean J. Parasitol.* **34**: 207–210.