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from the ears of eight hosts. Three of the hosts had >80 worms, the others had between 20 and 80. *Anisakis simplex* (Rudolphi, 1809) Baylis, 1920 was rare. One host was infected with one female, a second host was infected with four males. All specimens were located in the first compartment of the stomach. Fourth stage larvae of *Contracaecum* sp. were the most prevalent and abundant helminth encountered. All hosts were infected and the infections ranged from low to high numbers. *Contracaecum* sp. occurred in all three of the stomach compartments and were found in the small intestine in the first six sections.

With the exception of *Contracaecum*, all species have been reported previously in beluga. This is the first report of *Leucasiella arctica* and *Contracaecum* from Nearctic waters and the genus *Contracaecum* is reported from beluga for the first time.

Although the data presented are not strictly quantitative, beluga from the Kugmallit Bay region of the MacKenzie Delta did not appear to be seriously parasitized by helminths. In fact, most organs (including much of the small intestine) were virtually helminth-free.

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Methods of Urine Collection for Male White-tailed Deer

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Wildlife biologists are increasing their use of physiological and biochemical indices to assess individual or collective condition. Hematological and chemical analyses have been used widely in many species to study disease (Davis et al., 1981, Infectious Diseases of Wild Mammals, 2nd Ed., Iowa State University Press, Ames, Iowa, 446 pp.), reproduction (Plotka et al., 1977, Biol. Reprod. 16: 340–343), nutrition (Seal et al., 1978, J. Wildl. Manage. 442: 776–790), and stress (Rehbinder and Edquist, 1981, Acta Vet. Scand. 22: 480–492). Blood parameters, however, can be influenced by drug immobilization and handling (Seal et al., 1972, J. Wildl. Manage. 36: 1034–1040; Mautz et al., 1980, J. Wildl. Manage. 44: 343–351). Urine may be less affected by factors invoking a stress response (Warren and Whelan, 1981, J. Wildl. Dis. 17: 479–483).

Urinalysis is used extensively for diagnosis of disease in humans (Harrison et al.,

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1978, Urology, Vol. 1, W. B. Saunders, Philadelphia, Pennsylvania, pp. 214–217) and veterinary medicine (Osborne, 1983, Urinary disorders, *In* Current Veterinary Therapy XIII: Small Animal Practice, W. B. Saunders, Philadelphia, Pennsylvania, pp. 965–1121). Urine can also be used to assess nutritional (Warren et al., 1981, J. Wildl. Manage. 45: 926–936; Warren et al., 1982, J. Wildl. Manage. 46: 302–312; Del Giudice et al., pers. comm.) and reproductive state (Lasley et al., 1981, Proc. Am. Assoc. Zoo Vet., pp. 165–167). Urinalysis has been employed in a few free-ranging populations such as reindeer (*Rangifer tarandus* L.) (Eriksson and Valtonen, 1974, Ann. Zool. Fennici 11: 200–203), red deer (*Cervus elaphus* L.) (Maloiy et al., 1970, Br. J. Nutr. 24: 843–855) and white-tailed deer (*Odocoileus virginianus* Rafinesque) (Robbins et al., 1974, J. Anim. Sci. 38: 186–195; Holter and Hayes, 1977, J. Wildl. Manage. 41: 506–510; Warren et al., 1981, 1982, op. cit.; Waid and Warren, 1984, J. Wildl. Dis. 20: 212–219). Reasons for not performing urinalysis on wild animals appear to be due to a failure to appreciate the diagnostic value or to the difficulty of sample collection.

Although obtaining urine from female deer is relatively easy via urethral catheterization, collecting urine from males is particularly difficult. Catheterization of the urinary bladder in male white-tailed deer is difficult due to an urethral diverticulum into which the catheter is directed invariably (Kreeger et al., 1986, J. Wildl. Dis. 22: 131–133). Warren and Whelan (1981, op. cit.) reported two indirect urine collection techniques in bucks, but these techniques were limited to collecting only voided urine. This paper presents methods for direct and indirect collection of urine from male white-tailed deer.

Four adult male deer (74.5 ± 10.9 kg) were maintained in separate enclosures measuring 16.5 × 6.5 m in north central Minnesota. The deer were fed commercial pellets of varying energy and protein content and provided with water ad libitum. The deer were immobilized every 14 days with an initial dose of 100 mg xylazine hydrochloride (HCl) (Rompun®, Haver-Lockhart Laboratories, Shawnee, Kansas 66201, USA) (1.36 ± 0.22 mg/kg) and 300 mg ketamine HCl (Ketaset®, Bristol Laboratories, Syracuse, New York 13201, USA) (4.10 ± 0.65 mg/kg) administered intramuscularly (i.m.) (Mech et al., 1985, J. Wildl. Dis. 21: 405–410). In addition, six free-ranging deer were caught either in clover traps or rocket nets and immobilized similarly. These wild-caught deer were not weighed. Samples were collected in February and March 1985.

Initially, cystocentesis was attempted to collect urine from each male. If this was unsuccessful, immobilization was prolonged with additional 200-mg i.m. doses of ketamine HCl until the diuretic effect of xylazine HCl occurred (Warren and Whelan, 1981, op. cit.) and voided urine was collected. The time from administration of xylazine HCl to urination was recorded.

Cystocentesis was performed as follows: The deer was placed in horizontal dorsal recumbency and the area immediately lateral to the prepuce was surgically scrubbed with a providone-iodine solution (Pharmadine®, Sherwood Pharmaceutical, Mahwah, New Jersey 07430, USA). The anterior rim of the pubis was palpated and a 30-cc syringe equipped with a 15-cm, 18-gauge, sympathetic nerve needle (Becton-Dickinson and Co., Rutherford, New Jersey 07070, USA) was inserted immediately anterior to the pubis and 1–2 cm lateral to where the prepuce inserts on the abdomen (Fig. 1). The needle was directed slightly medial and slightly posteriodorsally. Suction was maintained while the needle was slowly advanced. Depending on the size of the bladder, it was sometimes necessary to insert the needle to the hub before urine was withdrawn. Depressing the abdomen to extend the depth of the needle was con-

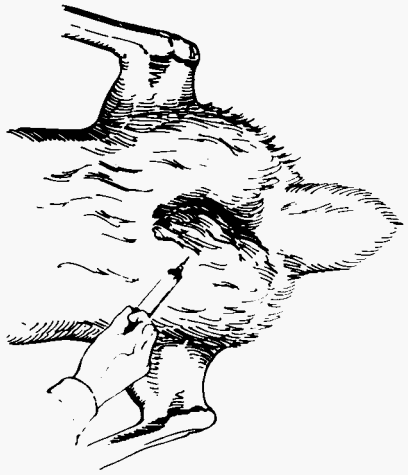

FIGURE 1. Correct needle placement for cystocentesis in white-tailed deer is anterior to the pubis and lateral to the prepuce.

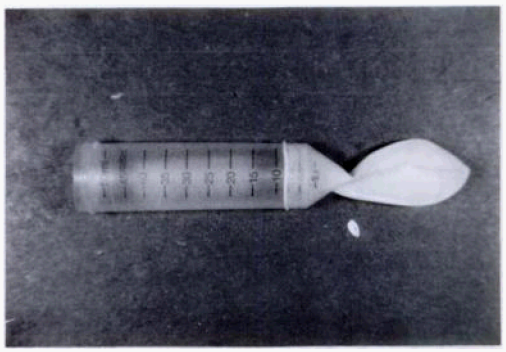

FIGURE 2. A simple collection device for voided urine constructed from a centrifuge tube and balloon.

traindicated as vasculature could inadvertently be traumatized.

Two methods were employed to collect voided urine. The first utilized an improvised device that was both simple and efficacious. The end of a centrifuge tube, syringe case, or other similar device was removed and a rubber balloon rinsed several times with deionized water was attached to one end (Fig. 2). The other end of the tube was then taped to the prepuce with adhesive tape. The deer was placed in a lateral recumbency and kept immobilized until it urinated. The expandable balloon allowed collection of variable volumes of urine.

The second method of collecting voided urine involved partial catheterization of the urethra. A size-7 French, Swan-Ganz double-lumen catheter (American Edwards Laboratories, Irvine, California 92714, USA) with an inflatable cuff at the distal end was inserted into the urethra approximately 10 cm. When inflated, the cuff occluded the urethra preventing urine from bypassing the lumen of the catheter as well as securing the catheter in place against the pressure of micturition. The proximal end of the catheter was placed in a flask to collect voided urine.

Statistical analysis was by one-way analysis of variance. Means are reported with standard deviations.

The overall rate of success for cystocentesis was 29%. Twenty-eight attempts were made on penned deer with eight being successful (28%). Two (33%) of six attempts were successful in wild-caught deer.

Collection of voided urine was 100% successful for both methods. The balloon device was used 18 times on penned deer and four times on wild deer. The Swan-Ganz catheter was used on two penned deer.

The mean time from administration of xylazine HCl to micturition in all animals was 108 ± 26 min (range: 78–173 min; $n = 20$). There was no significant difference in time to urination between individuals, between penned versus wild deer, or between months of collection ($P > 0.05$).

The primary methods of urine collection are voiding, catheterization and cystocentesis (Duncan and Prasse, 1977, Veterinary Laboratory Medicine, Iowa State University Press, Ames, Iowa, 243 pp.). There are advantages and disadvantages for each. Voiding is simple and non-invasive, but samples run a high risk of contamination. Catheterization reduces contamination, but requires some skill and the potential for urethral or bladder trauma

or infection is present. The catheterization technique used in this study had the advantage of collecting the entire expressed volume of urine.

Cystocentesis practically eliminates contamination, but requires careful preparation and skill to avoid iatrogenic trauma. For field applications, it is superior to voiding as sample collection is immediate. The major problem we encountered with this technique was that the bladder must be relatively full to be reached and penetrated by the needle. We examined two deer carcasses and found that when the animal was in dorsal recumbency, the distance from the abdominal midline to an empty bladder was greater than 22 cm in an adult male. We attempted cystocentesis with needles up to 25 cm long but found them unwieldy and potentially traumatic. Also, a near-empty bladder was so flaccid that a needle tended to merely indent rather than penetrate it. When the bladder was of sufficient size, cystocentesis was accomplished easily on the first attempt. When one is confident about the anatomical placement of the needle, only one or two attempts at cystocentesis should be made. Further efforts do not meet with increased success as the bladder is probably empty or near empty. The most common trauma encountered was penetration of blood vessels. No known adverse effects or urinary tract infections developed subsequent to cystocentesis in this study.

The mean time of 108 ± 26 min from administration of xylazine HCl to micturition compares favorably with a previously reported interval of 91.8 ± 4.7 min (Warren and Whelan, 1981, op. cit.). We did not find any significant difference in urination times between the 2 mo of our collection.

Xylazine HCl has been shown to cause diuresis (Thurmon et al., 1978, Aust. Vet. J. 54: 178–180; Warren and Whelan, 1981, op. cit.; Moreau et al., 1983, Am. J. Vet. Res. 44: 1774–1781; Raptopoulos and Weaver, 1984, Vet. Rec. 114: 567–569), but the extended immobilization required may be deleterious, particularly with extremes in ambient temperature. The use of pharmacological diuretics like furosemide (Lasix®, National Laboratories, Somerville, New Jersey 08876, USA) may reduce the time to micturition, but the effect of such drugs on absolute urine values in deer is unknown (Warren and Whelan, 1981, op. cit.).

The urine collection techniques described herein are applicable to both captive and wild white-tailed deer. Though none of these methods is ideal, they do expand the field biologist's armamentarium for urine collection. As physiological and biochemical research expands in free-ranging populations, the use of urinary components as indices of condition should expand accordingly.

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