Lack of microalbuminuria in sled dogs following exercise

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Abstract
Humans undergoing intense exercise exhibit transient microalbuminuria. Previous studies have shown that swimming, but not running, induces microalbuminuria in dogs. In this study, urine samples were collected from nineteen well-conditioned Alaskan sled dogs and analysed by the Heska ERD-Screen Test for microalbuminuria. None of the dogs had microalbuminuria, indicated that well-trained dogs do not develop microalbuminuria after running. Further studies are needed to determine if these dogs do develop microalbuminuria after competition or longer-distance runs.

Keywords: microalbuminuria; sled dogs; exercise

Microalbuminuria has been associated with early renal disease in people and dogs, even when there are no other detectable signs or laboratory abnormalities suggestive of pending renal impairment, such as in diabetic nephropathy. Measuring urine albumin concentration might be helpful when monitoring populations of dogs genetically predisposed to protein-losing nephropathy. A test has recently been developed to measure microalbuminuria in dogs (canine ERD (early renal disease)–Screen Urine Test (Canine ERD-Screen™ Urine Test, Heska Corp, Fort Collins, CO)). This ERD test can detect albuminuria as low as 0.1 mg dl⁻¹, and is considered 100% specific for albumin (personal communication, Heska, Inc.). Interpretation of this test can be complicated because microalbuminuria in dogs has been associated with urinary tract infections, fever, haematuria, dental disease, heartworm disease and other systemic inflammatory disorders. It might be difficult to differentiate dogs in the early stages of kidney disease from dogs with other causes of microalbuminuria as some systemic inflammatory diseases can be difficult to detect.

Exercise induces a transient microalbuminuria in both healthy and diseased humans, and the intensity of exercise correlates with the degree of microalbuminuria. Beagles undergoing mild to moderate exercise (running on a treadmill for 20 min) did not develop microalbuminuria during exercise as determined by the ERD test. Fifteen per cent of the dogs in that study were positive for microalbuminuria before exercise, which is consistent with a previous abstract which showed that 19% of dogs considered healthy were positive for microalbuminuria on the ERD test. Beagles subjected to slightly more intense exercise had an increased urinary protein concentration following exercise, but these concentrations were not corrected for specific gravity or urine creatinine concentration, making interpretation of these findings difficult. Swimming induces microalbuminuria in dogs, as measured by the Biuret method. Renal blood flow decreases during swimming but not during running, and decreased renal blood flow is a proposed mechanism for proteinuria after exercise in humans. We are not aware of any studies that examined whether sustained exercise in well-conditioned dogs leads to the development of microalbuminuria.

The ILACCUC committee of Oklahoma State University approved this study. Fifty-four well-conditioned Alaskan Sled Dogs ran for 140, 420 or 560 km over 4
days. The runs occurred in January in Alaska under extreme weather conditions (temperatures below 0°F). The dogs were healthy based on physical examinations prior to exercise. The dogs were adapted to both the weather and the intensity of the exercise by running gradually increasing distances 4 days a week during the previous 5 months. The dogs ran at speeds averaging approximately 12 km per hour. The dogs rested after each 70 km run for 6–8 h. The body weight of the 54 dogs before exercise was 23.4 ± 2.7 kg (SD).

Free-catch urine samples were collected from 19 randomly selected dogs; three dogs following completion of 160 km, seven dogs following completion of 420 km and six dogs following completion of 560 km within 5 min of the end of exercise. Samples were also collected from an additional six control dogs that did not participate in the training runs. Urine was collected during spontaneous voiding. Urinalysis using urine dipsticks (Bayer Corp., Elkhart, IN) was performed on each sample prior to freezing. The urine samples were then divided into 2 ml aliquots and frozen at −70°C until analysis was performed. The samples were thawed and the ERD tests were performed according to manufacturer’s directions. The urine samples were adjusted to a specific gravity of 1.010 according to the ERD directions.

All of the dogs had urine specific gravity of equal to or greater than 1.030 (1.036 ± 0.003) and glucose, ketones, protein and bilirubin were not detected in the urine by commercial dipstick. No dogs had detectable microalbuminuria at any time point. Two of the dogs sampled had bloody diarrhoea at the same time point as the urine was collected, and two other dogs had gastrointestinal lesions (ulcers and oesophagitis) found on endoscopy following the completion of exercise. Although these dogs had evidence of systemic disorders, they did not have detectable microalbuminuria.

Intense exercise did not induce detectable microalbuminuria in these well-conditioned dogs, even though distances run and environmental conditions were challenging. The question remains why swimming induces microalbuminuria in dogs while running. Exercise does not cause microalbuminuria in dogs (as measured by the ERD assay) and to determine whether intense exercise does not cause microalbuminuria in dogs (as measured by the ERD assay) and to determine whether intense exercise in non-conditioned dogs induces microalbuminuria.

This study indicates that well-conditioned dogs running long distances in frigid weather did not develop microalbuminuria. It remains to be seen whether non-conditioned dogs develop microalbuminuria following periods of intense exercise. Further studies using larger numbers of dogs and paired samples would need to be performed to prove that intense exercise does not cause microalbuminuria in dogs (as measured by the ERD assay) and to determine whether intense exercise in non-conditioned dogs induces microalbuminuria.

References