

CANINE REHAB EDUCATIONAL RESOURCES



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Four Leg News

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WORKING DOGS RESEARCH UPDATE

Greeting from Summertime in Canada! Our summers up here are short, but very much enjoyed and appreciated! This edition of Four Leg News brings you recent research on hunting / working dogs. You'll find included articles on New Zealand working stock dogs, Military dogs, Police and Search and Rescue dogs. An interesting study that looked at a genome comparison between sport-hunting dogs and terriers is included. As well, some information on the best cooling methods for working dogs and sacroiliac joint findings in young working Labrador Retrievers.

I'm trying to compile these studies to be more and more concise every time! Quick bursts of knowledge, if you will! So, I hope you enjoy this edition!

Cheers!
Laurie



Isaksen KE, Linney L, Williamson H, Cave NJ, Beausoleil NJ, Norman EJ, Cogger N. TeamMate: a longitudinal study of New Zealand working farm dogs. I. Methods, population characteristics and health on enrolment. BMC Vet Res. 2020 Feb 17;16(1):59.

Background: In New Zealand, farmers often rely on mainly either Heading or Huntaway dogs to work with livestock. Knowing the risk factors for disease or injury would benefit decisions about the welfare of farm dogs. This article discusses TeamMate, a study which collected population and clinical data on 641 working farm dogs on the South Island.

Methods: A sample of working farm dog owners were selected from an existing clientele database. A veterinarian and technician visited each farm to collect data about the farms, owners, husbandry practices and dogs at 6-month intervals. Clinical examinations were done and questionnaires were filled out for all dogs over 18 months old and in full work at each visit.

Results:

- Over four years, the data collected included 126 owners associated with 116 farms and 641 working farm dogs. The farm sizes averaged over 1500 ha with over 4000 stock animals per farm.
- The majority of dog owners were male, with a little bit over half being the farm owner. Each dog owner had an average of four dogs and 63% had prior experience in farm dog training.
- The average age, weight, and body condition score (BCS) of the dogs was 4 years, 26 kg, with a BCS of 4/9. 54% of the dogs were male, and 6% were neutered. More females than males were desexed; mainly due to health issues or to prevent mating, as well as to control temperament.
- 81% of owners fed commercial food and meat sourced from their farm. 44% had bedding in their kennel and 14% had insulated kennels. 69% had been vaccinated and 33% were insured.
- Clinical abnormalities were found in 74% of all dogs. 43% included the musculoskeletal system, 42% were relating to the skin, and 35% had oral issues.
- Of the musculoskeletal abnormalities, 29% had at least one issue in the hindlimbs, 20% in the front limbs, and 7% in the spine or tail.
- Lameness was observed in 12% of all dogs; as well as in 26% of the dogs with a musculoskeletal abnormality.
- 23 dogs had rib and spine issues. 21 dogs showed pain at manipulation of the spine, and 10 of these dogs showed lameness. One dog had swelling at the sacroiliac joint and was lame in both hindquarters. One dog had a curvature of the lumbar spine, and another dog had a protruding 13th rib on the left side; these two dogs were not lame.

Conclusions: This study shows that musculoskeletal disease and injury as well as skin trauma are the most common clinical abnormalities in working farm dogs. These results will provide a baseline for investigation of incidence and risk factors to inform guidelines for the welfare of working farm dogs.



Laurie's thoughts: Of course they had that many issues! I bet a rehab evaluation would find even more than this! I always say, there's no such thing as a 'normal' dog, or at least, I'm more surprised if I don't find anything wrong with the sporting / working dog I am assessing!

Isaksen, Katja et al. TeamMate: A Longitudinal Study of New Zealand Working Farm Dogs. II. Occurrence of Musculoskeletal Abnormalities. *Frontiers in Veterinary Science*, October 2020, Volume 7, Article 624.

Background: It has been shown that working farm dogs in New Zealand have a high prevalence of musculoskeletal disease and injury, which can reduce the quality of life. Determining the types and risk factors of musculoskeletal abnormalities contribute to developing preventative measures.

Methods: This study included dogs enrolled in the TeamMate project that were free of musculoskeletal abnormalities and attended at least one follow up examination. Data was collected every 8 to 9 months over 3 years and included owner information about husbandry, feeding, and work as well as a veterinarian examination including joint manipulation and a lameness check at the trot. Abnormalities were categorized using a code with a letter specifying the body system and up to five numbers to specify location, symmetry, type, and cause. Dogs could have multiple codes in the same location. The anatomical locations were carpal, hips, digits, stifles, or other; while abnormalities were categorized as abnormal range of motion, hard swelling, painful, crepitus, or other. Dog type was determined based on the owner description and classified as Heading, Huntaways, and other types.

Results: 323 dogs (median age of 3 years), with 113 owners, were free of musculoskeletal abnormalities on enrollment to TeamMate.

- At follow up, 57% developed at least one musculoskeletal issue during 4,508 dog-months at risk; this corresponds to 4.1 dogs per 100 dog-months at risk.
- Of these dogs, 119 were present for another follow-up examination, which contributed 1144 dog-months at risk. 68% had a second musculoskeletal issue; corresponding to 7.1 dogs per 100 dog-months at risk. 26% had a second musculoskeletal issue of both the same type and in the same location.
- The most common abnormalities can be seen in Table 3 from the study.

Discussion: In this study, more than 2/3 of the dogs that had a musculoskeletal issue at the first follow-up examination had a second one at the next follow-up, and more than a quarter had the same issue the second time. The data collected could not whether these were chronic conditions or new.

Conclusion: The high incidence rate of musculoskeletal abnormalities and dogs' high activity shows that it is likely that working farm dogs risk facing impaired welfare and reduced career spans. Preventing and managing musculoskeletal injury and illness should be a priority for owners and veterinarians caring for working farm dogs.

Laurie's thoughts: *I see a high number of carpal issues in active sporting / working dogs as well. I think the carpals take a pounding in this demographic of dogs. The hip pain finding was interesting as well. Lots to look at, lots to treat, lots of education to deliver. All around confirms my belief that these dogs too should have routine maintenance therapy to prologue their wellbeing and ability to work.*

TABLE 3 | Number of affected dogs, incidence rate, and incidence rate ratio (with 95% CI) of first recorded musculoskeletal abnormalities stratified by the location on the body and type of the first recorded abnormality.

Location	Type of abnormality	Number of dogs	IR/100 dog-months (95% CI)
Carpus	Abnormal range of motion*	44	1.0 (0.7–1.3)
	Painful	6	0.1 (0.1–0.3)
	Hard swelling	9	0.2 (0.1–0.4)
	Crepitus	4	0.1 (0.0–0.2)
	All carpus	53	1.2 (0.9–1.5)
Hip	Abnormal range of motion*	22	0.5 (0.3–0.7)
	Painful	18	0.4 (0.3–0.6)
	Crepitus	2	0.0 (0.0–0.2)
	Other	2	0.0 (0.0–0.2)
	All hip	39	0.9 (0.6–1.2)
Digits	Abnormal range of motion*	11	0.2 (0.1–0.4)
	Hard swelling	5	0.1 (0.0–0.3)
	Painful	24	0.5 (0.4–0.8)
	Crepitus	5	0.1 (0.0–0.3)
	All digits	36	0.8 (0.6–1.1)
Stifle	Abnormal range of motion*	7	0.2 (0.1–0.3)
	Hard swelling	4	0.1 (0.0–0.2)
	Painful	9	0.2 (0.1–0.4)
	Crepitus	9	0.2 (0.1–0.4)
	All stifle	25	0.6 (0.4–0.8)
Other	Abnormal range of motion*	41	0.9 (0.7–1.2)
	Hard swelling	30	0.7 (0.5–1.0)
	Painful	11	0.2 (0.1–0.4)
	Crepitus	6	0.1 (0.1–0.3)
	Other	β	0.2 (0.1–0.4)
	All other	86	1.9 (1.5–2.4)
All abnormalities	Abnormal range of motion*	102	2.3 (1.9–2.7)
	Hard swelling	56	1.2 (1.0–1.6)
	Painful	48	1.1 (0.8–1.4)
	Crepitus	21	0.5 (0.3–0.7)
	Other	17	0.4 (0.2–0.6)
	All abnormalities	184	4.1 (3.5–4.7)

Data from 323 dogs that contributed 4,508 dog-months at risk. Note that many dogs were recorded as having more than one abnormality on the same examination. Anatomical locations and types of abnormalities were classed as "Other" if they were recorded in fewer than 10% of dogs on enrolment, or as a first musculoskeletal abnormality following enrolment.

**Two dogs were found to have abnormally increased range of motion, one in the shoulder and the other in the tarsus. The remainder had reduced range of motion.*

Kim J, Williams FJ, Dreger DL, Plassais J, Davis BW, Parker HG, Ostrander EA. Genetic selection of athletic success in sport-hunting dogs. Proc Natl Acad Sci U S A. 2018 Jul 24;115(30):E7212-E7221.

Background: Athletic performance in dogs are is influenced by genetic factors, with over 200 performance-enhancing polymorphisms (PEPs) variants identified which regulate blood pressure, muscle size, oxygen use, fatigue resistance, blood lactate and ammonium ion accumulation. Dog breeds are highly diverse, with strong homogeneity within breeds, which benefits the analysis of phenotype-genotype associations.

This study compared the genomes of sport-hunting and terrier breeds and village dog populations to identify genes that form the basis of complex traits.

Materials and Methods: Genomic DNA was isolated from blood samples collected from purebred dogs that were unrelated to each other at the grandparent level. Whole-genome sequencing (WGS) data was gathered from 21 sport-hunting and 27 terrier dogs that included 10 of the 30 AKC sport-hunting breeds and 8 of 31 AKC terrier breeds; as well as 79 village dogs from the Middle East, South America, Asia, and Africa.

Results and Discussion: This study shows that athletic breeds have experienced substantial selective pressure on the blood circulation system, possibly to maximize the delivery of oxygen and metabolic substrates to muscle. Neurological factors may have enhanced motor control, skill learning, perceptual–cognitive skills, and ultimately athletic ability and success.

- The most compelling causal variant seen in this study was in the ASIC3 gene. In a mouse model, deletion of the ASIC3 gene prevents fatigue-related muscle pain.
- Many sport-hunting dog breeds have a high incidence of congenital deafness. Strong signatures of selection in sport-hunting breeds was seen in the CDH23 gene, which is expressed in the neurosensory epithelium, as well as the MSRB3 gene, responsible for auditory hair cells. The authors hypothesize that partial loss of these gene functions may reduce the startle response.
- A significant association of ROBO1 with breed-specific accomplishments in competitive agility events was observed. ROBO1 is a neuronal axon-guidance receptor gene, which may explain the variation in cognitive plasticity and physical performance between dog breeds.
- The TRPM3 gene shows a strong association with racing grades in Whippets, and it is expressed in smooth muscle cells of blood vessels, where the channel activity is related to contractile phenotypes. The high frequency of homozygous dogs implies that this allele does not result in health issues. It is possible that variants in other genes may benefit performances which rely on abilities not directly measured in this study.
- Our screening for regions under positive selection in terrier breeds revealed genes that have been implicated in autism-like behaviors, hyperactivity and panic disorders. These breed traits could explain the terriers' distinctive responses to stimuli, territoriality, and confrontational attitudes. However, aggression is one of the most complex canine behavioral traits, and more research needs to be done to understand this phenotype in all breeds.

Conclusion: This study showed genes associated with muscular, cardiovascular, and neuronal functions are more specific to sport hunting breeds compared to terriers and village dogs.



Laurie's thoughts: *This one is just interesting, from the sporting genes to the autistic ones! Fascinating!*

Takara MS, Harrell K. Noncombat-related injuries or illnesses incurred by military working dogs in a combat zone. J Am Vet Med Assoc. 2014 Nov 15;245(10):1124-8.

Background: Military working dogs (MWDs) are an important part of the US military’s assets, performing functions from detection to general patrol as well as scent tracking. This study reports on the types of noncombat-related injuries and disease seen in MWDs in an active combat zone with the goal of informing treatment and prevention planning.

Materials and Methods: Data were collected from veterinarians serving at 13 clinics in different locations throughout Iraq over a year and half. Data was categorized primarily by the body system affected, although dogs often had multiple clinical signs due to underlying disease processes. An open diagnosis category was used to capture data for dogs that had non-specific clinical signs with no diagnosis at the time of reporting. Evaluations of apparently healthy dogs involved in vehicular accidents (with the patient inside a vehicle at impact) were categorized as other.

Results: Data for 1,350 patient encounters were included in the analysis; the dermatologic or alimentary system, soft tissue–related injuries, and the musculoskeletal system were more common.

- The most common dermatologic causes were otitis externa (34.6%), generalized superficial pyoderma (10.7%), atopic dermatitis (9.2%), and acute moist dermatitis (8.0%).
- The most commonly encountered alimentary system–related conditions were diarrhea (31.6%), vomiting (20.3%), hematochezia (13.4%), and gastrointestinal foreign bodies (7.8%).
- The soft tissue–related injuries seen most commonly were foot pad or paw injuries (32.0%), lacerations in locations other than foot pads or paws (16.2%), tail tip trauma (10.9%), and dog bite wounds (10.9%). Thirty (10.6%) of these injuries involved broken nails or signs of nail bed pain. Foot pad and paw injuries were most often attributed to working on hot, rough surfaces (78.0%).
- Musculoskeletal diseases were localized to hind limbs (47.2%), forelimbs (26.9%), vertebral column and associated musculature (10.9% with 16/21 visits because of injury to the lumbar region), tail (5.7%) or were not localized (9.3%).

Table 1—Number and percentage of veterinary patient encounters in which MWDs were evaluated for noncombat-related reasons in combat zones of Iraq between January 5, 2009, and August 23, 2010.

Category	No. (%) of patient encounters
Dermatologic	338 (25.0)
Soft tissue–related injury*	284 (21.0)
Alimentary	231 (17.1)
Musculoskeletal	193 (14.3)
Mass lesion†	52 (3.9)
Ophthalmologic	51 (3.8)
Urogenital	47 (3.5)
Dental	34 (2.5)
Surgical‡	19 (1.4)
Neurologic	18 (1.3)
Multisystemic	17 (1.3)
Respiratory	17 (1.3)
Open§	16 (1.2)
Toxicosis-related	12 (< 1)
Behavioral	7 (< 1)
Cardiovascular	6 (< 1)
Endocrine	4 (< 1)
Other¶	2 (< 1)
Infectious	2 (< 1)
Total	1,350

Most patient encounters were categorized on the basis of body system or tissue primarily affected; in some cases, classifications were modified to better capture the nature of injury or illness or the reason for the visit.

*Included injuries of the dermis and subcutaneous tissues not attributed to primary (inflammatory) dermatologic disease. †The mass category comprised grossly detected mass lesions only; other neoplastic conditions were categorized by body system affected. ‡Included orchiectomy and ovariectomy only. §Visits for non-specific clinical signs for which no presumptive or definitive diagnosis was made. || Included known toxin ingestion. ¶Visits for evaluation of apparently healthy dogs involved in vehicular accidents (with the patient inside the vehicle when the accident occurred).

Conclusions and clinical relevance: Veterinary Corps officers need to be proficient not only in the management of combat-related injuries but also in the treatment of routine illnesses and injuries. Knowledge of noncombat-related diseases and injuries commonly incurred by military working dogs can be used for targeted training for individuals responsible for medical care of these animals as well as for equipment selection and protocol development.

Laurie’s thoughts: Here, I found it most interesting, but not surprising the incidence of hind limb and lumbar region MSK issues. It really just confirms how important it is for us to be looking there with the working population of dogs.

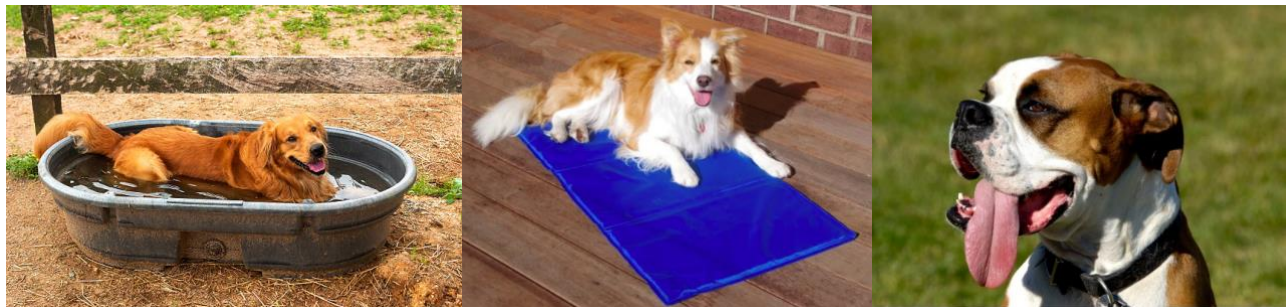
Davis MS, Marcellin-Little DJ, O'Connor E. Comparison of Postexercise Cooling Methods in Working Dogs. J Spec Oper Med. 2019 Spring;19(1):56-60. PMID: 30859528.

Background: Overheating is a common form of injury in working dogs. The purpose of this study was to evaluate the relative efficacy of three post-exercise cooling methods in dogs with exercise-induced heat stress.

Methods: Nine athletically conditioned dogs were exercised at 10kph for 15 minutes on a treadmill in a hot environmental chamber (30°C) three times on separate days. After exercise, the dogs were cooled using one of three methods: natural cooling, cooling on a 4°C cooling mat, and partial immersion in a 30°C water bath for 5 minutes.

Results: Time-weighted heat stress was lower for immersion cooling compared with the cooling mat and the control. The mean time required to lower gastrointestinal temperature to 39°C was 16 minutes for immersion cooling, 36 minutes for the cooling mat, and 48 minutes for control cooling.

Conclusion: Water immersion decreased post-exercise, time-weighted heat stress in dogs and provided the most rapid cooling of the three methods evaluated, even with the water being as warm as the ambient conditions. The cooling mat was superior to cooling using only fans, but not as effective as immersion. The placement of simple water troughs in working-dog training areas, along with specific protocols for their use, is recommended to reduce the occurrence of heat injury in dogs and improve the treatment of overheated dogs.



Laurie's thoughts: This is a nice little study with clinical relevance. It's something we can share with our clients when asked about cooling their dogs during sporting competitions!



Carnevale M, Jones J, Li G, Sharp J, Olson K, Bridges W. Computed Tomographic Evaluation of the Sacroiliac Joints of Young Working Labrador Retrievers of Various Work Status Groups: Detected Lesions Vary Among the Different Groups and Finite Element Analyses of the Static Pelvis Yields Repeatable Measures of Sacroiliac Ligament Joint Strain. Front Vet Sci. 2020 Aug 14;7:528.

Introduction: In dogs, training and working often requires repetitive upright stances, with all of their weight placed on their hind legs with increased forces applied to their sacroiliac joints (SIJ). Since the SIJ is innervated with pain receptors, injury or degenerative disease may be one of the causes of lower back pain in working dogs. Rigorous training in repetitive agility-type motions in young dogs has also been proposed to increase the likelihood of developing chronic joint injuries later in life.

Methods: Labrador retriever working dogs, aged 11–48 months, that had undergone lumbosacral CT scanning for previous research studies were included. All dogs had been placed in dorsal recumbency with the hips positioned in maximal flexion and maximal extension for scanning; all interpretations and analyses for the current study were based on scans done in the flexed hip position.

A total of 22 dogs were classified into the following groups for analyses: sex (male, female), neuter status (intact, spayed, neutered), age (younger, 11–30 months; and older, 31–48 months), and work status at the time of CT scanning (Detection, Breeder, and Other).

Numbers of the following CT lesions were recorded for each SIJ: subchondral sclerosis, subchondral cysts, subchondral erosions, subarticular clefts, intra-articular ankylosis, and para-articular ankylosis.

Results:

- Of the 22 dogs, four were in training for future police or search and rescue work and 18 were military working dogs.
- Ten dogs were categorized as Detection, 6 dogs categorized as Breeder, and 6 dogs categorized as Other; 13 dogs were classified into the younger age group and 9 dogs were classified into the older group.
- None of the dogs were found to have para-articular ankylosis lesions.
- Testing identified no significant difference in the mean number of SIJ CT lesions/dog across work status categories for subchondral erosions, subarticular clefts, intra-articular bone spurs, or intra-articular ankylosis lesions for the right SIJ, left SIJ, or in the total joint with both sides added together. Analysis of the total number of SIJ CT lesions found in each work status group yielded no significant difference in the means among the three categories.
- No significant differences were found in the occurrences of subchondral sclerosis and subchondral cyst lesions among the work status groups.
- There was no evidence of a difference between Other dogs and Breeders or Detection dogs in mean number of subchondral sclerosis lesions in the left and right SIJ.
- There was no evidence of a difference in mean number of subchondral cysts between Other dogs and Detection dogs. These results were isolated to the right SIJ as no significant difference was seen among the work status categories for the mean number of subchondral cysts in the left side of the joint.



FIGURE 6 | Transverse (A) and dorsal planar (B) CT images illustrating a subarticular cleft lesion in the left sacroiliac joint (arrows). Subchondral erosion lesions are also evident in the right sacroiliac joint. The transverse images are displayed with dorsal at the top and the patient's left to the viewer's right. Dorsal planar images are displayed with cranial at the top and the patient's left to the viewer's right.



FIGURE 7 | Transverse (A) and dorsal planar (B) CT images illustrating a subchondral cyst lesion in the left sacroiliac joint (arrows). A subchondral sclerosis lesion is also evident in the dorsal planar view of the left sacroiliac joint. The transverse images are displayed with dorsal at the top and the patient's left to the viewer's right. Dorsal planar images are displayed with cranial at the top and the patient's left to the viewer's right.

Discussion: The data did not support the hypothesis that mean numbers of SIJ CT lesions/dog would differ among work status groups.

Conclusion: Quantitative CT measures was introduced in this study for possible use in future research on effects of training and working on the SIJ in young working dogs. The long-term goals for these research efforts would be to develop more evidence-based strategies for maximizing quality of life for working dogs.

***Laurie's thoughts:** I was quite excited to find and read this study (because it quoted a paper I wrote). However, I was a bit disappointed with it, just from the perspective that it offers nothing of clinical relevance. Since it provides a baseline of information on canine SIJ lesions, it does provide a stepping stone to future research that might have some clinical relevance.*



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