

14 March 2022

**FAO: The Rural Affairs, Islands & Natural Environment Committee**  
**c/o [rural.committee@parliament.scot](mailto:rural.committee@parliament.scot)**



**From:**

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**Secretariat All-Party Parliamentary Dog Advisory Welfare Group (APDAWG)**  
**London**

I write with reference to The Rural Affairs, Islands & Natural Environment Committee's consideration of the petition to "End Greyhound Racing in Scotland" (PE1758) and to update you about the All-party Parliamentary Dog Advisory Welfare Group's (APDAWG) work on, and observations of, this important issue.

The APDAWG meeting in October 2018<sup>1</sup> focused on developments since the post-implementation review of the "Welfare of Racing Greyhounds Regulations (2010)" was signed off by DEFRA in 2016. We received presentations from an expert panel including Dr. Andrew Knight, Professor of Animal Welfare & Ethics at Winchester University. Dr. Knight's report<sup>2</sup> revealed several welfare problems within greyhound racing. His overriding point demonstrated that the configuration of the racetrack is a known cause of injuries in racing greyhounds. Dr. Knight posits that repeated racing, at speed and with the associated high forces, on oval tracks can bring about injuries in the left foreleg and right hind leg. Racing greyhounds are therefore knowingly put at risk of injuries which are potentially fatal.

October 2020 saw the launch of the Westminster e-petition "Ban Greyhound Racing To End Unnecessary Deaths & Suffering Of Racing Dogs".<sup>3</sup> APDAWG very much supports this petition especially in light of Dr. Knight's report and is pleased to see it being debated in Westminster Hall on 28 March 2022.

Our Chair of APDAWG tabled an EDM in Westminster on 16 December 2021.<sup>4</sup> The EDM calls for a statutory levy on bookmakers. To be effective a statutory levy would have to be in excess of the current voluntary levy to have any meaningful impact. Neil Parish MP (Chair EFRA Committee) estimated the need to be in the region of £20m just for homing greyhounds.<sup>5</sup> APDAWG notes other currently underfunded welfare issues: track configuration, veterinary provision and transportation are just a few examples. The EDM requires an end to self-regulation within the greyhound racing industry; it champions the implementation of compulsory full life tracking for racing greyhounds in the UK; and desires to see an end to the construction of new tracks and re-licensing of old tracks.

Currently the RSPCA and Dogs Trust are conducting an independent review of racing greyhound welfare in the UK which is due to be issued in the first half of 2022. We are pleased that some of our members have provided evidence to the inquiry.

We understand that the EFRA Select Committee has greyhound racing on its list of potential future topics. The "Welfare of Racing Greyhounds Regulations (2010)" would benefit from a review, the last one having been in 2015. The Committee, of course, has many competing priorities in its upcoming programme but we are aware they are looking at the matter.

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<sup>1</sup> <https://apdawg.co.uk/oct-2018-meeting>

<sup>2</sup> Please see enclosed copy.

<sup>3</sup> <https://petition.parliament.uk/petitions/554073>

<sup>4</sup> <https://edm.parliament.uk/early-day-motion/59290/welfare-of-greyhounds-racing-in-the-uk>

<sup>5</sup> Hansard HC Deb (25 June 2019) Col 260 WH: <https://hansard.parliament.uk/Commons/2019-06-25/debates/72E07CBB-614C-4487-A6CF-EC8D9641A946/GamblingLevyOnlineGamblingAndGreyhoundRacing#contribution-90975608-6D3B-460A-AAAA-83F09B454024>

The DEFRA Action Plan for Animal Welfare states it will “consider further protections for racing greyhounds, including further steps to raise welfare standards at trainers’ kennels”.<sup>6</sup> We will encourage DEFRA to broaden this ambition given the multiple welfare concerns associated with greyhound racing. The standards for trainers’ kennels is a long-standing commitment from the GBGB which has suffered delays. APDAWG expects more than the repackaging of an existing action point already in train.

Please find listed below our additional concerns about specific welfare issues in greyhound racing:

- We are disturbed by the volume of dogs bred for, and surplus to, racing which is essentially a gambling product streamed daily to retail bookmakers in the UK and across global timezones via the internet. Dog racing takes place at Greyhound Board of Great Britain (GBGB) licensed stadia 7 days per week to provide a gambling opportunity every 3 minutes. There are 20 GBGB stadia in the UK (one of them being Shawfield, Glasgow) and one ‘independent’ track (Askern, Doncaster) in England. GBGB statistics show an average of over 416,000 UK ‘dog runs’ per annum. A manual count of the race schedule shows at least 800 dogs are raced on average every day (around 900 on Saturdays). The racing frequency per dog is concerning. The amount of races a greyhound can have is not capped other than a greyhound shall not race more than twice in one day.
- We are concerned by the dual system of dog racing under the Animal Welfare Act (2006). The "Welfare of Racing Greyhounds Regulations (2010)" present two parallel systems: GBGB registered tracks and independent tracks whose licences are enforced by local authorities. Greyhounds can pass between both systems interchangeably.
- While we believe the "Welfare of Racing Greyhounds Regulations (2010)" are inadequate (pertaining only to on-track welfare and in England), they do at least mean veterinary attendance is required at English independent tracks. Our understanding is this is not the practice at independent tracks in Wales and Scotland. We are concerned that ‘schooling tracks’ and greyhound breeding facilities appear to fall outside of the Regulations.
- Ireland is the source of around 80% of greyhounds on UK tracks. An RTE investigation<sup>7,8</sup> revealed that 6,000 greyhounds are culled annually in Ireland. The same study showed about 6,250 greyhounds are exported every year to the UK at prices which are less than 50% of the “production cost”.
- The ‘Retirement Form for GBGB-Registered Greyhounds’ (‘Green Form’) used by the GBGB is archaic in welfare terms and unacceptable. It permits euthanasia of a racing greyhound due to an injury not being treated on “economic grounds”; or because no home “could be found”. Moreover it asks whether or not the greyhound was “euthanased by a veterinary surgeon”. If not, the “circumstances” have to be explained in a small box. We are aware the GBGB committed to changing the form at a CPGAW meeting in April 2019 at Holyrood. We learned at the January 2022 CPGAW meeting that a “more detailed form for the reporting of death or euthanasia” will come into force later in 2022. We note it will be available only via the trainers’ online portal. This concerns us as a lack of public accountability. The Animal Welfare Act (2006) places the protection of animals in the public realm. UKAS accredited bodies are not subject to public law oversight rendering it impossible for the public to access GBGB information under the Freedom of Information Act 2000.
- The pressure on greyhound track vets and their lack of decision-making powers are a source of concern, particularly in the hot weather when greyhounds are susceptible to heatstroke.<sup>9</sup> We fear the track vet may be overloaded with an average of around 70 potential patients at a single race meeting,

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<sup>6</sup> <https://www.gov.uk/government/publications/action-plan-for-animal-welfare>

<sup>7</sup> <https://www.rte.ie/player/movie/rté-investigates-greyhounds-running-for-their-lives-s1-e1/104051751967>  
<https://www.rte.ie/news/ireland/2019/0626/1057535-greyhound-rte-investigates/>

<sup>8</sup> The RTE Investigation’s findings also incorporated a report by Preferred Results Ltd., “IGB Business Model Analysis” (29 September 2017).

<sup>9</sup> <https://www.ntu.ac.uk/about-us/news/news-articles/2020/08/excessive-exercise-responsible-for-three-quarters-of-heatstroke-cases-in-dogs,-study-shows>

all of whom have to be examined prior to the off and may sustain injury requiring veterinary attention during a race.

- Transportation regulations and the adequacy<sup>10</sup> of trainers' vehicles are concerning given some of the distances travelled. We are aware of return journeys in one day from central Scotland to the West Midlands and from the north east to the south east of England. In addition the transported greyhounds will be confined in kennels<sup>11</sup> before and after their specific race prior to the return journey. Trainers may transport several dogs to a race meeting, each dog having a different start time. We presume open racing beyond a trainer's affiliated track could engender longer transport distances. There may also be many journeys in the course of a week for the same greyhounds, given they may race multiple times as well as trainers being more likely to use specialist greyhound vets at some distance from their premises. We would like DEFRA to assess whether or not appropriate transport authorisations are in place along with the correct guidance to GBGB.
- The potential for greyhounds, companion dogs, to be doped is disturbing. Where this happens in GBGB licensed racing, it seems to take place off-track and is policed by the GBGB within the realms of self-regulation. We are concerned by the substances used, the lines of defence given in disciplinary hearings and the low sampling rate of 1.98%.
- The GBGB reform programme ("The Greyhound Commitment") does not go far enough and we note injury statistics show minor fluctuations as a percentage of 'dog runs' since 2017: 1.15% (2017), 1.16% (2018), 1.21% (2019), 1.12% (2020). This is not sustained improvement. The greyhound racing industry has not improved whatsoever in its core statistic of trackside deaths. In 2020 dog deaths at the racecourse accounted for 49% of all racing greyhound deaths. The 2020 death rate accounts for more than double the proportion of deaths that it did in 2017, amplifying Dr. Knight's report that the track configuration is a root issue in the welfare weaknesses.
- Many APDAWG members also manage dog rescue centres. APDAWG commends their work to ensure and improve the welfare of greyhounds across the UK. However, GBGB statistics show around 7,000 greyhounds leaving dog racing alive every year. This does not include the dogs from the independent racing sector. It places an unfair annual homing burden on rescue charities of around 5,000 greyhounds and ultimately the adoption families who pick up the lion's share of legacy injury/dental bills. It is not appropriate for a multi-million Pound industry to displace its 'commodity' onto the general public and take rescue spaces from other stray dogs.
- The published annual injury, 'retirement' and death data<sup>12</sup> should show greater transparency and be more comprehensive. The data does not include:
  - dogs used by 'independent' (local authority) tracks. This distorts the true welfare picture;
  - number of dogs in the total racing population;
  - average number of races per dog;
  - track level injury/death data;
  - number of puppies failing to make the grade;
  - Reconciliation of actual homing versus 'retired' data. We fear many greyhounds are trading a racing kennel for a rescue centre kennel. This loses perspective with annual data. Rolling and reconciled multi-year data would help clarify;
  - number of greyhounds exported.
- We have been disappointed by the professionalism on behalf of the GBGB in some instances. We are aware in May 2019 the GBGB promised to meet Prof. Knight's to discuss his report and have it peer reviewed. To our knowledge the GBGB has not pursued this. Deadlines and commitments to DEFRA have been delayed: 2017 data finally published in 2019; 'Specifications for Trainers' Kennels' due in 2017 were delayed to 2021. On occasion there have been discrepancies and erroneous prior year data carried over to current year publication. In 2015/16 The Select Committee on Environmental

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<sup>10</sup> Regardless of the GBGB promise of air conditioning in vehicles from 2023

<sup>11</sup> Kennels have to be available for 20% of the dogs present at the track according to the "Welfare of Racing Greyhounds Regulations (2010)"

<sup>12</sup> Consolidated table of GBGB annual injury, "retirement" and death data attached.

Food and Rural Affairs (EFRA) reviewed<sup>13</sup> the 2010 Regulations. The lack of data made it difficult for the EFRA Committee to judge the welfare provision. The GBGB had been collecting data but not collating it centrally. EFRA proposed a 2-year probationary period. If past performance is a predictor of future success, then our confidence is understandably waning.

We understand that the greyhound racing industry is likely to be protective of the jobs it offers. The GBGB claims greyhound racing contributes to 'levelling up' and boosts under-served communities. Apart from gambling being a dubious contribution to deprived areas, the last industry commissioned estimate<sup>14</sup> using 2012 data put the employment figure at just over 7,000 jobs in the core racing business (racing staff, trainers, administration and betting staff with a direct link to dog racing). However, since this analysis: 3 greyhound stadia (Belle Vue, Peterborough and Wimbledon) have closed; Henlow is earmarked for closure; and one previously closed track (Mildenhall, Suffolk) has been re-licensed but is not open to public spectators. It is used to provide streamed racing.

A report by the Social Market Foundation in 2021<sup>15</sup> concludes that while gambling supports tens of thousands of jobs across the UK and contributes about £8bn to economic output p.a., it is unlikely that the economic contribution is additional to activity that would have taken place if gambling did not exist. The report points to reductions in gambling displacing economic spend into other sectors with a gain for the Exchequer.

If there is a demand for gambling, the virtual animated racing used by the bookmakers from time to time are of such high definition they serve as a suitable replacement.

The UK is one of 7 countries in the world practising greyhound racing. APDAWG looks at this issue in the light of companion dogs being used for gambling, animals in entertainment. This is at odds with a modern, progressive and ethical society and is borne out by developments in the USA, where dog racing is now illegal in 41 US states. We are closely watching the USA federal bill which Reps Tony Cardenas (California) and Steve Cohen (Tennessee) are sponsoring to make engaging in commercial dog racing a federal crime.

Above all, the configuration of the racetrack being a major contributory factor to injuries and deaths in racing greyhounds is of significant concern.

I trust this input is of assistance to The Rural Affairs, Islands & Natural Environment Committee. I remain available, should you have any questions or require further discussion.

Yours sincerely

**Dr. Marc Abraham OBE, BVM&S MRCVS**  
**Secretariat**  
**All-Party Parliamentary Dog Advisory Welfare Group (APDAWG)**

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<sup>13</sup> <https://www.parliament.uk/globalassets/documents/commons-committees/environment-food-rural-affairs/2nd-report-greyhound-welfare.pdf>

<sup>14</sup> Deloitte: "Economic Impact of the British Greyhound Racing Industry" (published 2014); GBGB: "The Greyhound Commitment - The First Year" (published 2019)

<sup>15</sup> Social Market Foundation: "Double or Nothing: Assessing The Economic Impact of Gambling (published 2021)"

<b>CONSOLIDATED GBGB ANNUAL INJURY / RETIREMENT DATA</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
<b>DOG RUNS</b>	419,385	426,139	410,607	318,346
<b>Hock &amp; Wrist Injuries</b>	1,550	1,618	1,557	1,236
<b>Foot injuries</b>	833	888	1,088	680
<b>Hind &amp; Fore Long Bone</b>	148	148	123	117
<b>Fore &amp; Hind Limb Muscle</b>	1,650	1,625	1,608	1,159
<b>Other</b>	656	684	594	383
<b>TOTAL INJURIES</b>	4,837	4,963	4,970	3,575
<b>% Injuries of Dog Runs</b>	1.15%	1.16%	1.21%	1.12%
<b>DEATHS</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
<b>On Track Fatalities</b>	257	242	207	200
<b>On Track Fatalities as % of Total Fatalities</b>	23%	26%	29%	49%
<b>Deaths Due to Injury Treatment Costs</b>	370	175	123	24
<b>PTS on Vet Advice (off track)</b>			142	79
<b>No Home Found</b>	23	5	0	0
<b>Designated Unsuited for Homing</b>	307	190	83	23
<b>No Viable Option Away from Racecourse</b>		144		
<b>Sudden Death</b>	56	72	91	41
<b>Medical &amp; Other</b>	30	Noted in 'Natural Causes'	Noted in 'Natural Causes'	Noted in 'Natural Causes'
<b>Terminal Illness</b>	36	Noted in 'Natural Causes'	Noted in 'Natural Causes'	Noted in 'Natural Causes'
<b>Natural Causes</b>	21	104	64	44
<b>TOTAL DEATHS</b>	1,100	932	710	411
<b>"RETIREMENTS"</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
<b>Retained by Owner/Trainer</b>	1,037	878	783	613
<b>Charity/Greyhound Trust</b>	5,184	4,588	4,716	5,484
<b>Homed by Owner/Trainer (&amp; breeding in 2017)</b>	1,440	936	679	765
<b>Breeding/Independent Racing</b>		365	280	210
<b>Other (incl. Private Homing Non Charity)</b>		6	2	17
<b>TOTAL ANNUAL "Retirements"</b>	7,661	6,773	6,460	7,089
Source: GBGB Annual Injury / Retirement Data. Excludes local authority licensed tracks. NB: Approx 90k fewer 'dog runs' in 2020 due to COVID Lockdown				

# Injuries in racing greyhounds



2018

Andrew Knight

## ABOUT THE AUTHOR

Andrew Knight is a Professor of Animal Welfare and Ethics, and Founding Director of the [Centre for Animal Welfare, at the University of Winchester](#); a European and RCVS Veterinary Specialist in Animal Welfare Science, Ethics and Law; an American and New Zealand Veterinary Specialist in Animal Welfare; and a Senior Fellow of the UK Higher Education Academy. He worked in British small animal veterinary practice for many years, treating thousands of dogs with a wide variety of injuries, prior to entering academia. He continues to volunteer at veterinary charities.

## ABOUT GREYT EXPLOITATIONS

This report is published by Greyt Exploitations, Cleveland, England. Contents of this report can be reproduced if credited. Please phone +44-(0)7958 729 798 for advice. Greyt Exploitations is a non-profit making organisation formed in 2008 and run entirely by volunteers. It strives to raise awareness of the cruel and inhumane treatment of greyhounds in the UK, and its research and investigation work has repeatedly been published in the national press and submitted to the Government during Public Consultations and Inquiries. This has helped it to effectively campaign for stronger protection laws for racing greyhounds and for gambling on dogs to be outlawed in Britain.

## COVER IMAGE

Racing greyhounds struggling to stay upright whilst rounding a bend at Monmore Green race track in England, in 2010. Photographer: Graham Jones.

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## 1. Industry overview

Greyhound racing has taken place in the UK since the 1920s and the fundamental principles of the activity of greyhound racing, track layout in operational terms, remain largely the same. Although there has been a sustained decline in the sport's popularity in recent decades, it continues to draw crowds and supported a £1.3 billion off-course turnover for bookmakers in 2012-2013 (Deloitte 2014).

There are around around 15,000 active racing greyhounds in the UK today (EFRA 2016). They are raced anti-clockwise over the flat or hurdles around ovoid tracks, over distances of 210 – 1,105 m (Hercock 2010). A maximum of eight greyhounds can be entered into a race on GBGB licensed racecourses (GBGB 2018a). As of October 2018 there were 21 tracks licenced by the Greyhound Board of Great Britain (GBGB) – the industry regulatory body, as well as 5 independent tracks (Anon. n.d.).

The racing lifespan of a greyhound is short. Racing greyhounds start competing once they reach the age of 15 months, and they're usually raced weekly until made redundant due to poor racing performance, being past their prime at around five to six years of age, or after suffering a career-ending injury (Hercock 2010). The average racing greyhound is just two to three years of age.

## 2. Welfare Concerns

Welfare concerns centre relate to the 'wastage' of greyhounds in the industry, standards within kennelling, husbandry and transportation, and the injuries racing greyhounds sustain.

### **'Wastage'**

Major welfare concerns relate to those dogs who are bred for racing, but never see the race track, and to those dogs that are retired from racing.

From 2018, the GBGB started to publish injury and retirement data online (GBGB 2018b). It reported that in 2017, 6,391 (86.32%) greyhounds were retained or rehomed, and 1,013 (13.68%) were killed or died a sudden death. However, there is no indication whether these figures included dogs that failed to make the grade at a trial, and they only related to GBGB licensed tracks.

Additionally, the House of Commons Environment, Food and Rural Affairs Committee (EFRA) (2016) recently voiced concern that "the fate of retired dogs unable to be rehomed at the end of their careers is unclear." They noted that in evidence supplied to EFRA, the Greyhound Forum<sup>1</sup> (2015) estimated that around 3,700 dogs are unaccounted for each year. This estimate was not dissimilar to that of APGAW (2007), which similarly considered numbers of greyhounds homed or rehomed and calculated that:

... a minimum of 4,728 dogs are unaccounted for each year and we can assume that the majority of these dogs are destroyed. However, this figure does not account for dogs from independent racing or those which are bred for the British racing industry in Ireland. These figures must therefore be regarded as conjectural and are likely to be a significant underestimation of the true scale of the problem of unwanted dogs being destroyed.

Associated concerns are the breeding of greyhound bitches too young, too old, or too frequently (Hansen 2017), and the conditions in which breeding bitches may be kept.

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<sup>1</sup> Representing eight greyhound and canine welfare organisations

### **Kennelling, husbandry and transportation**

Significant welfare concerns have been associated with the kennelling and standards of care applied to racing greyhounds. These may relate to space provided in kennels, lighting levels, exercise opportunities, sanitation, and diets, dental and veterinary care, including regular vaccinations and other preventative healthcare treatments (e.g. parasiticides). A three month detailed investigation into the conditions of Greyhound training kennels in the UK published by the Dogs Trust (2015) revealed that breaches of even the minimal standards extant within the GBGB minimum standards Rule 212 and CIEH Guidance on Animal Boarding Establishments Act 1963, were common. These included kennels heavily soiled with excreta and urine that appeared not to have been cleaned for days, thick layers of dust and cobwebs, and absence of any visible signs of cleaning or cleaning materials. Some facilities were in a poor state of repair, with sharp metal and wooden edges posing injury risks to dogs, rot and water damage causing roofing collapse and additional hazards, inadequate lighting, no visible firefighting equipment, filthy food preparation areas, and additional problems. This author has observed very similar conditions in other video footage taken from a British greyhound racing kennel (Appendix). Photographs illustrating the problems are available online<sup>2</sup>.

Concerns also exist about the relative lack of normal socialisation and habituation opportunities for dogs born into the greyhound industry. Socialisation is the learning process whereby an individual pup learns to accept the close proximity of other dogs as well as members of other species. Habituation is the process it becomes accustomed to non-threatening environmental stimuli and learns to ignore them (Hansen 2017). The 2016 Special Commission of Inquiry into the Greyhound Racing Industry in New South Wales (McHugh 2016) concluded that if a greyhound is not sufficiently socialised or habituated it may pass on negative traits such as fear and anxiety to any offspring, which can make it difficult for the greyhound to be rehomed. GBGB statistics reveal that 27 per cent of greyhounds that died or were killed in 2017 were designated unsuitable for rehoming (GBGB 2018b). Accordingly, greyhounds should not be individually housed, and should be exposed to a wide range of socialisation opportunities and normal stimuli from an early age (Hansen 2017).

Racing greyhounds are also regularly transported to racetracks. To help minimise stresses associated with transportation, it is important to ensure that greyhounds are able to stand up at full height and turn around at all times. However, the GBGB (2018a) Rules of Racing only requires that travel cages "... must have the following dimensions: 35.56cm/14in width, 101.6cm/40in length, 76.2cm/30in height" although the GBGB notes these are only minimum permissible sizes. These dimensions do not allow for a greyhound to stand and adopt a natural posture, which contravenes EU regulations.

## 3. Injuries

As Hansen (2017) observed, "Greyhound racing is inherently dangerous. Greyhounds race at high speeds in conditions which make injuries almost inevitable."

In its report into greyhound welfare, the House of Commons Environment, Food and Rural Affairs Committee (2016) reported that "after prolonged conversations" the industry provided the death and injury statistics in Table 1 for 2012 – 2014. It should be noted that use of the term 'euthanasia' (e.g. in the Retirement form for GBGB-registered greyhounds<sup>3</sup> - Fig. 1) is often misleading. By definition, euthanasia refers to killing that is not only humanely conducted, but also in the animal's best interests – typically due to very severe injury or illness when the prognosis for recovery is poor (AVMA 2013). Much killing of greyhounds is conducted for other reasons, e.g. lack of homes when racing careers end, and cannot be accurately termed 'euthanasia.'

<sup>2</sup> <http://greyexploitations.com/resources-reports/kennel-hand-speaks-out-as-the-greyhounds-voice/>

<sup>3</sup> <http://www.gbgb.org.uk/uploads/pdf/GBGB%20Retirement%20Form%20June%202014.pdf>

Table 1: Injury and euthanasia data from GBGB tracks

Reported Numbers	2012		2013		2014	
	% of all raced dogs	Number of raced dogs	% of all raced dogs	Number of raced dogs	% of all raced dogs	Number of raced dogs
Euthanasia	0.12	441	0.13	461	0.13	393
Hock & Wrist injuries	0.19	687	0.19	643	0.21	693

Source: Racecourse Promoters Association

**DEATH/EUTHANASIA OF A GREYHOUND**  
to officially report retirement, death or euthanasia of the above greyhound.

**D) The above named greyhound has died or been euthanased**

Date of death:

**Details of death/euthanasia:**

Natural causes / Sudden death (please state cause):

Euthanasia

- Unsuitable as a pet
- Terminal illness
- No home or retirement placement could be found
- On humane grounds due to untreatable injury or to cease suffering
- Injury not treated on economic grounds
- Other (please specify):

**Was the greyhound euthanased by a veterinary surgeon?**

Yes:

- At a GBGB-licensed racecourse

Name of racecourse:

Not at a GBGB-licensed racecourse

Name and address of veterinary practice:

Figure 1. Misuse of the term 'euthanasia' within the Retirement form for GBGB-registered greyhounds.

With respect to these data from 2012 – 2014, EFRA noted that: “The above data is not comprehensive as it is taken from 22 of 24 GBGB-licensed tracks, it does not cover all types of injuries, and it does not include injuries to dogs that manifest later away from the track.”

EFRA also noted that these data provided by the Racecourse Promoters Association are significantly lower than “an analysis provided by the welfare organisation Greyt Exploitations, in association with the Sunday Times, of incidents at races over a 10 year period [which] reported that 40,151 dogs were injured and 18,410 did not race again.” (Burgess 2015).

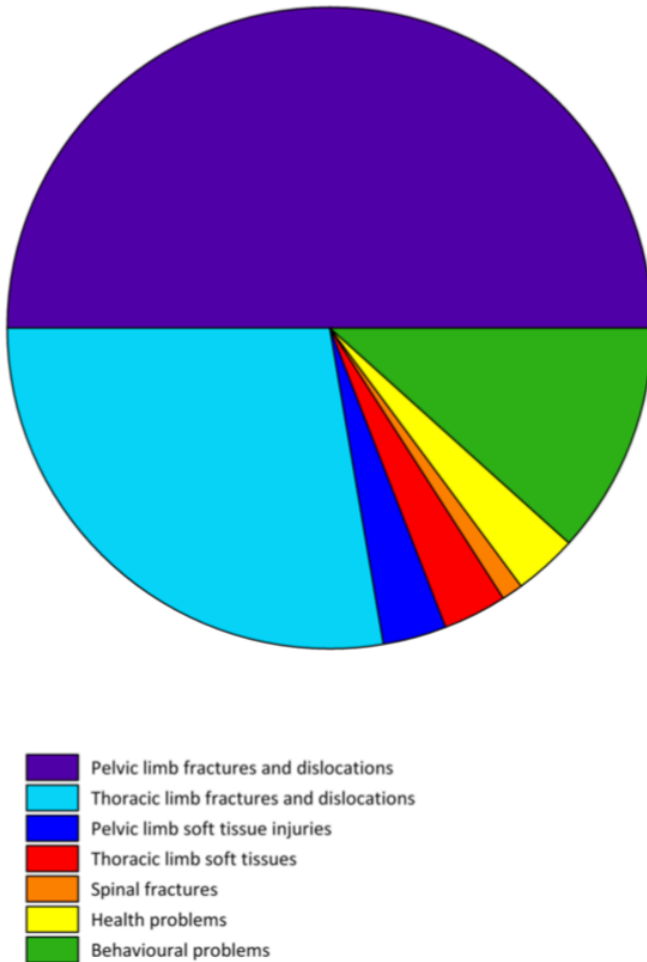
From 2017, the GBGB started to publish injury and retirement data online for GBGB licensed tracks. The numbers of injuries and track fatalities are included in Table 2.

**Table 2. Injury and fatality data for 2017 on GBGB licensed tracks (GBGB 2018b).**

	<b>Total injuries</b>	<b>Injuries as % of 419,385 total runs</b>
Hock injuries	843	0.20
Wrist injuries	707	0.17
Foot injuries	833	0.20
Hind long bone	48	0.01
Fore long bone	100	0.02
Fore limb muscle	540	0.13
Hind limb muscle	1,110	0.26
Other	656	0.16
<b>Total injuries</b>	<b>4,837</b>	<b>1.15</b>
<b>Track fatalities</b>	<b>257</b>	<b>0.06</b>

These rates do not appear to compare favourably with some international data. Sicard et al. (1999), for example, studied injuries sustained by racing greyhounds at five greyhound tracks in Wisconsin, US. In total, 1,887 orthopaedic injuries occurred during a two year period, within 43,260 official races. Eight greyhounds normally run in US races, giving a total of 346,080 greyhound starts – an orthopaedic injury rate of 0.55%. In contrast, the British injury rates reported by the GBGB (Table 2) were approximately double, at 1.15%. However, Sicard et al.’s study was limited to orthopaedic injuries, which may partially account for the discrepancy.

Causes of trackside deaths are indicated by a study of 87 greyhounds (61 male and 26 female) ‘euthanased’ at a GBGB registered track from June 2007 to August 2010 (Hercocock 2010). The three top causes were severe injuries sustained during racing (80), health problems resulting from racing (3) and behavioural problems such as aggression (11) (Fig. 2). Some dogs suffered from more than one of these problems.



**Figure 2. Reasons for 'euthanasia' of 87 Greyhounds at a GBGB registered track from June 2007 to August 2010 (Hercocock 2010).**

The primary remit of this report is the injuries sustained by racing greyhounds – particularly, fractures. Predisposing factors, common injury types, and recommendations for decreasing injury rates are examined in the following.

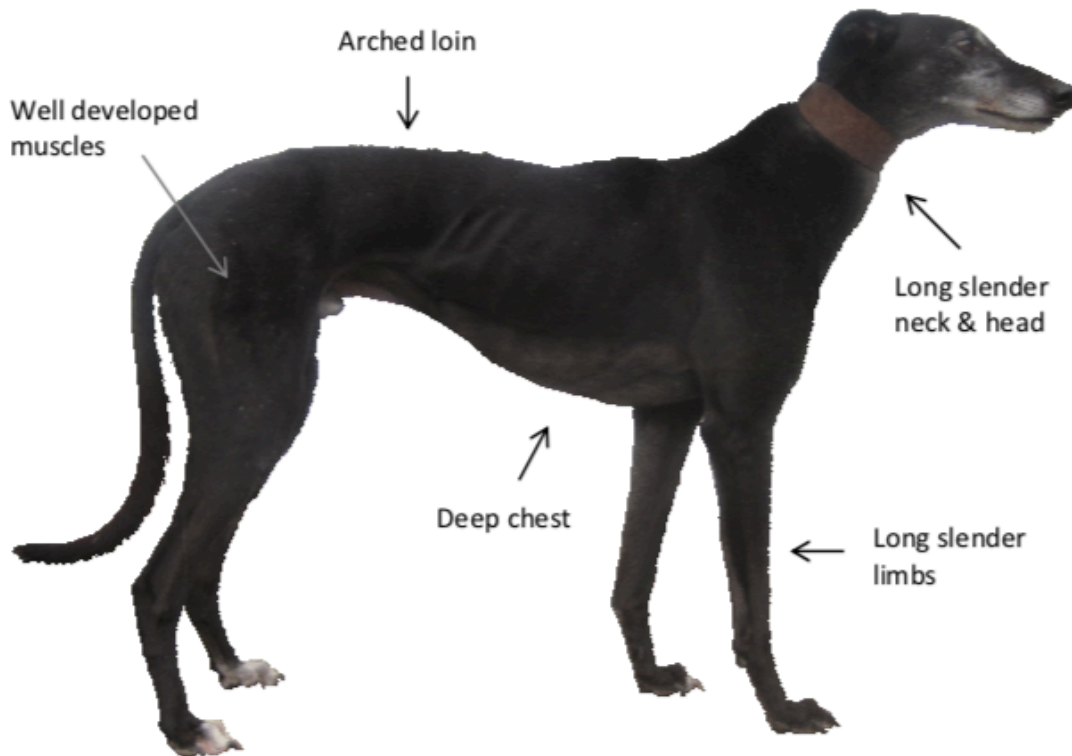
### 3.1. Injuries: predisposing factors

Factors such as speed, race distance and track design (particularly turn radius of curvature, and degree of camber (banking)) can all significantly affect increase risks of musculoskeletal injuries (Sicard et al. 1999). Additional predisposing factors may include region, weather, individual dog behaviour and physical characteristics, and local regulations.

Such predisposing factors may be classified into greyhound factors, and track/environmental factors.

#### 3.1.1. Greyhound factors

The lean, athletic physique of greyhounds, in conjunction with a number of less obvious musculoskeletal and physiological adaptations, have made them ideally suited as sprinters (Williams et al. 2009) (Fig. 3). These characteristics have been enhanced through many decades of selective breeding. Accordingly, greyhounds are able to maintain average running speeds of around 65 km/h, versus 29 km/h for human athletes (Von Boehn 2011). They are the fastest breed of domestic dog, capable of reaching speeds of up to 18 m/s during racing (Hercocck 2010).



**Figure 3. Some greyhound anatomical adaptations for speed** (Burton, courtesy of Fay Penrose, in Hercocck 2010).

However, such speeds result in very considerable forces on the greyhounds' limbs. The 'ground reaction force' is comprised of three components: the vertical component supports the body weight, whilst the horizontal (fore-aft) and mediolateral (sideways) components allow the animal to accelerate, decelerate, manoeuvre and balance (Biewener 2003 in Hercocck 2010). Forces are affected by the weight and speed of the greyhound. As

speed increases, ground contact time decreases, and forces generated against the ground increase still further (Hercocock 2010).

Greyhounds have developed anatomical adaptations to these high forces, which include tendons in the distal limbs (ends of limbs) that are stronger and stiffer than in some other breeds. Their muscle-tendon units have a higher capacity for elastic energy storage, and an increased efficiency of energy recovery when compared to the Staffordshire Bull Terrier (Hercocock 2010).

Whilst racing, greyhounds are subjected to high rates of acceleration, speed changes, and – when rounding bends – both centripetal and other ground reaction forces (Bloomberg et al. 1998, Usherwood and Wilson 2005). Forces are affected by greyhound velocity and mass, and track radius of curvature. Bitches normally weigh 23 – 30 kg, and dogs 27 – 37 kg (Hercocock 2010). However effective body weight increases by approximately 71.0 per cent around bends, because body mass is subjected to both gravity and high centripetal acceleration. All four limbs experience an increase in peak force of approximately 64.5 per cent (Usherwood and Wilson 2005). Greyhounds transfer their weight to the left side of their limbs when they corner (Boemo 1998) (Report cover image). Hence their distal limb bones are loaded asymmetrically, with bones, and bony components, nearest to the inside of the track experiencing higher stresses (Fig. 4). As stated by Eager et al. (2017):

As races are run anti-clockwise, most injuries occur in the left foreleg and right hind leg. When negotiating a bend the left foreleg is used as a pivot, with the claws digging into the ground, whilst the right hind leg, moving in an arc, provides the primary propulsive force. The stresses and strains imposed on these two limbs when entering, negotiating and leaving a bend are the most important contributing factors to the specific injuries associated with racing greyhounds [Hickman 1975].



**Figure 4. Greyhounds running anticlockwise transfer their weight to the left side of their limbs when they corner.**

The asymmetric training and racing greyhounds undergo results in corresponding asymmetric anatomical adaptations, which were examined in detail by Hercocock (2010). Rail-side (inside, i.e. left) leg bones experience the greatest average forces. The skeleton seeks to adapt to these increased forces by resorbing calcium from some regions and depositing it in others (remodelling). The left distal limb bones have significantly increased bone mineral density and markers of bone metabolism. They also have localised changes in bone composition (e.g. trabecular architecture – referring to ‘spongy’ or honeycombed bone). Bones on the right side are conversely depleted of calcium (Hercocock 2010) – but are still subjected to severe stresses, especially during bends. Hercocock (2010) conducted a detailed study of fractures in racing greyhounds. Summarising her examination of fractures of the right central tarsal bone, she stated that:

... the fractured bones showed evidence of being hypomineralised (i.e. low mineral and high collagen content). These changes in the bone matrix and the asymmetries between the left (uninjured) and right (fractured) bones indicate an imbalance in the bone remodelling process has occurred leading to weakening of the bone and structural failure.

Rail-side bones (i.e. those within each limb that are closest to the inside of the track) also appear to undergo bony resorption as part of their remodelling. The likelihood of fracture can increase when bones are temporarily weakened during this process (Hercocock 2010).

Additionally, racing greyhounds have left to right asymmetries in the tensile properties of their pelvic limb (hind limb) tendons, with rail-side tendons being stronger, stiffer and returning more energy than those in the contralateral limb (Hercocock 2010).

Injury rates are also affected by greyhound age and weight. Young greyhounds (6 to 37 months) have a higher prevalence of metacarpal and metatarsal fractures (Bellenger et al. 1981, Ness 1993, Piras 2005), possibly due to lack of skeletal maturity and strength. Males are also more susceptible to these fractures than females (Gannon 1972, Ness 1993, Piras 2005), possibly due to their heavier weights (Hercocock 2010).

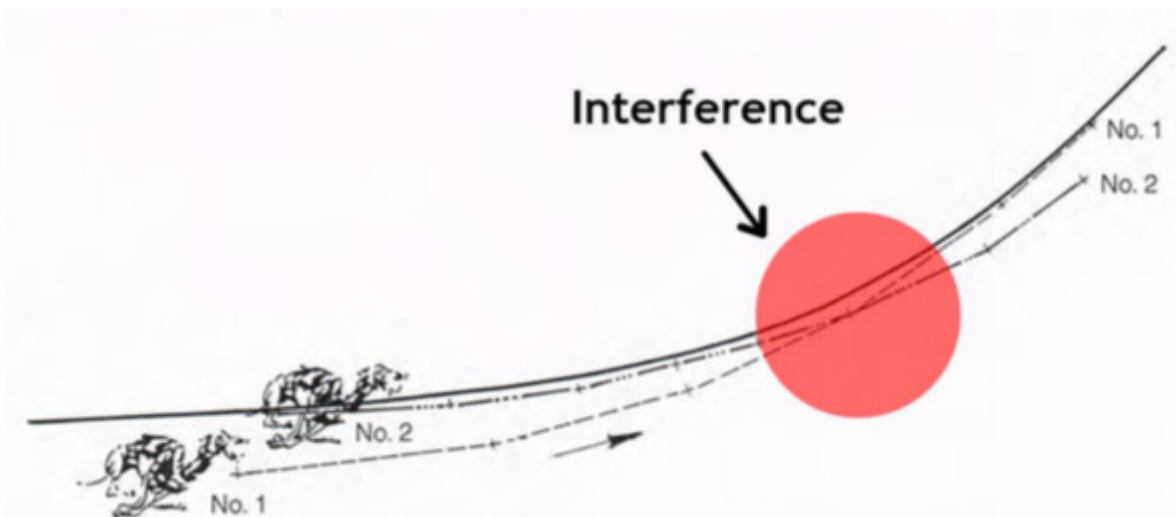
### 3.1.2. Track and environmental factors

The injury risks to greyhounds racing at speeds are significantly affected by track design and composition, and can also be affected by weather and track maintenance.

#### Track design

Curved tracks are hazardous, because of the uneven forces they create on greyhounds whilst negotiating bends, as described above. This places asymmetrical forces on limbs, increasing the loading of certain limbs.

Additionally, curves also create areas of congestion. When greyhounds round curves, they have two options for dissipating excessive forces acting on their limbs: they may slow down, or seek a larger radius of curvature. Either may result in congestion (Fig. 5).



**Figure 5: Zone of congestion during cornering** (after Bloomberg et al 1998, in Eager et al 2017).



Congestion significantly increases risks of high speed collisions with other greyhounds, the rail or track surface. An inquiry undertaken by New Zealand's Racing Integrity Unit (RIU 2016) concluded that 68 per cent of injuries, and 75 per cent of fatalities, occurred from accidents at or approaching the first bend, when congestion is often at a maximum (Fig. 6).



**Figure 6. Bends result in congestion, increasing risks of serious collisions.**

Tracks of a larger radius, and steeper banking (camber) of curves, both reduce the degree to which greyhounds need to 'lean' inwards during cornering (Bloomberg et al 1998). This can decrease congestion risks, but results in faster speeds, with greater ground reaction forces. Unfortunately, many British tracks were designed many years ago when greyhounds were generally smaller and slower (APGAW 2007).

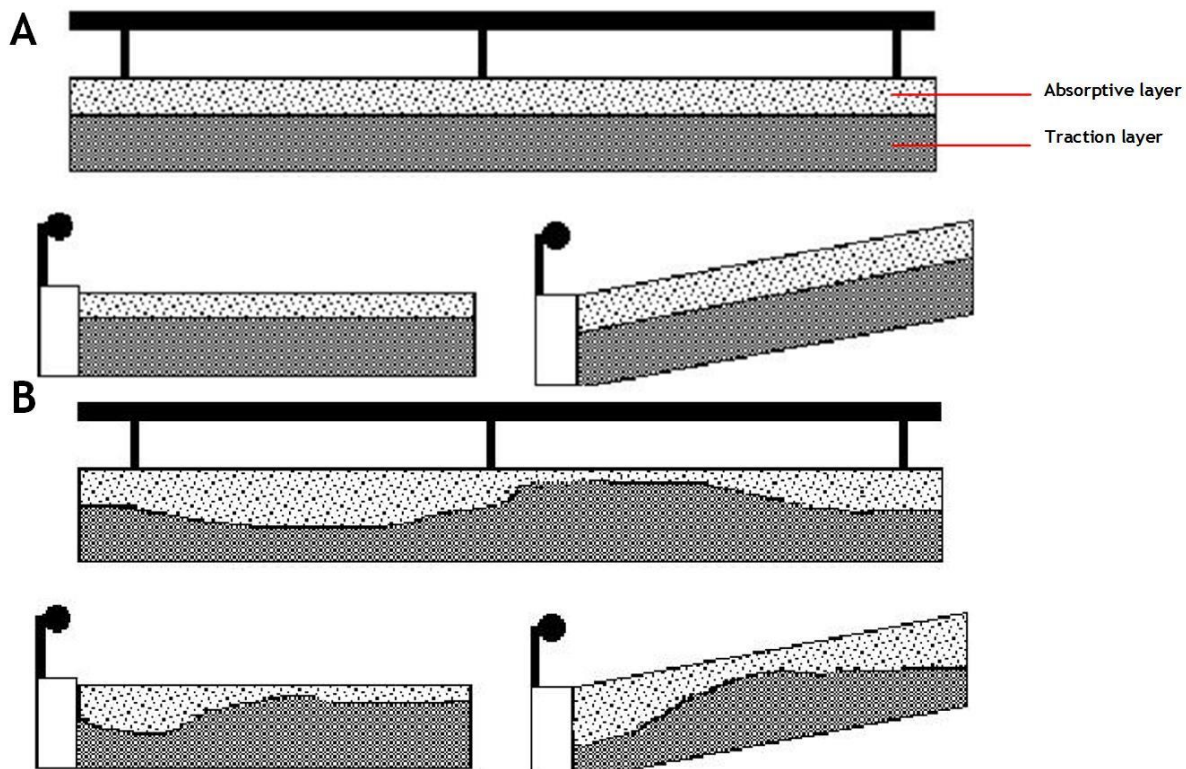
#### Track composition

In order for greyhounds to run with a smooth gait, the track surface should provide sufficient, uniform friction, without being so hard that injury risk is increased (Bloomberg et al 1998). In the US, track materials are a mixture of sand, silt, clay and water, which have varying particle sizes and mechanical properties (Gillette 2016). Their ratio determines impact absorption characteristics. For greyhound racing, the track surface should be resilient and have enough moisture content to dissipate impact forces (Bloomberg et al 1998). Ireland in Bloomberg et al. (1998) asserted that light-colored loam mixed with white sand is ideal. Gillette (2016) advises a 'sandy loam' or 'loamy sand' mix is optimal. Iddon et al. (2014) analysed injury data from a five year period at London's Rye House track, finding that a grass surface decreased injuries compared to a sand surface. Their analysis of data from a four year period at London's Walthamstow track also showed that fast track conditions significantly increased injuries. However, sand has almost completely replaced grass as a running surface on British greyhound tracks (APGAW 2007).

Moisture consistency influences compressive and shear strength. Moisture deficiency results in a hazardously hard track, and its excess decreases surface stability, with the result that sand may be thrown up into the eyes of following greyhounds (Bloomberg et al 1998). Toe injuries also increase (Gillette 2016). High ambient temperatures can evaporate track moisture and make the surface drier and harder. Prole et al. (1976), analysed two British tracks and concluded that in drier months, injuries were increased. They attributed this to the harder surface and associated faster running conditions (Prole 1976). Conversely, a drainage system is essential in controlling the scour and movement of surface material in the presence of heavy rainfall.

#### Track layers

The racing track is comprised of two layers (Fig. 7). The paw first penetrates the superficial absorptive layer, to briefly grip the deeper traction layer (Gillette 2016). The layer depths should remain even on both straight and bend sections (Figure 7.A) as depth variations are hazardous (Figure 7.B) (Gillette 2016).



**Figure 7: (A) The absorptive and traction layers of track surface. (B) An uneven absorptive and traction layers (Gillette 2016).**

To analyse ratios of clay, silt, and sand, samples should be taken from different locations along the track. Two different depths are also recommended (Gillette 2016).

## 3.2. Injuries sustained

### 3.2.1. Fractures

Racing greyhounds are prone to fractures. Prole (1976) reported approximately 12.5% of injuries to the distal thoracic limbs (i.e. the front limbs), and 32.0 per cent of injuries to the distal pelvic limbs (the hind limbs), were fractures or dislocations. However, change of composition to sand tracks since then could impact injury rates.

Fractures and other injuries may result from trauma, as a direct and immediate consequence of high speed collisions with other greyhounds, the rail or track, particularly within congestion zones on bends. New Zealand's Racing Integrity Unit (2016) concluded that 45 per cent of fatalities result from dogs being checked while racing (Fig. 6). Of the remainder, most were injured as a result of faltering or simply going amiss during the running of a race for no apparent reason – although undetected injuries or health problems may contribute (Hansen 2017).



**Figure 8. New Zealand's Racing Integrity Unit (2016) concluded that 45 per cent of fatalities result from dogs being checked while racing (meaning that the dog's stride has been broken).**

Stress or fatigue fractures may also result without any external trauma, when locomotory forces at high speeds exceed biomechanical limits. They are much more common than direct, traumatic fractures (Hercocock 2010). Such stress fractures are rarely seen in companion dogs or other working breeds (Davis 1967, Hickman 1975, Molyneux 2005, Prole 1976), but are very similar to those seen in human athletes and military recruits (Armstrong *et al.* 2004, Beck *et al.* 2000, Brukner *et al.* 1996, Kowal 1980, Matheson *et al.* 1987).

Risks increase when locomotory forces increase, e.g. when rounding bends, or when biomechanical limits are lowered, e.g. in young bones, or following bony remodelling as described previously. Most injuries that occur in racing are minor injuries that may not be recorded, and continued racing with such injuries can also cause major injuries to occur (APGAW 2017).

Fractures may affect different parts of bones. Long bones such as the tibia are comprised of a series of layers (lamella), which make up an outer cortex, surrounding a marrow chamber. Bony fractures may be grouped into lamellar or cortical shaft fractures; avulsion or chip fractures; simple fractures; and compression fractures (Tab. 3) (Gannon 1972).

**Table 3: Types of fracture in racing greyhounds** (Gannon 1972).

Fracture type	Description
Lamellar or cortical shaft fractures	A true fatigue fracture usually associated radio graphically with evidence of progressive re-modeling of bone
Avulsion or chip fracture	When a small chunk of bone attached to a tendon or ligament gets pulled away from the main part of the bone
Simple fracture	A partial or complete loss of continuity of shaft of the bone
Compression fracture	A collapse of a vertebra. It may be due to trauma or due to a weakening of the vertebra

### 3.2.2. Muscle injuries

Muscle injuries ranging from sprains to tears are also common in racing greyhounds (Molyneux 2005). The muscles most prone to injury in the thoracic limbs are the triceps brachii muscle, which extends the elbow and flexes the shoulder, and in the pelvic limbs, the gracilis muscle, which adducts the limb (Davis 1973, Prole 1976). In British greyhounds the majority of gracilis injuries occur in the right limb (Prole 1976, Vaughan 1969).

### 3.2.3. Tendon and ligament injuries

These are also common, and vary from sprains to full disruptions (Molyneux 2005). These were summarised by Hercock (2010):

In the thoracic limb, injuries to the digital flexor tendons account for 69% of all injuries to the metacarpus (Prole 1976). Additionally, the majority of carpal fractures, in particular fracture of the accessory carpal bone, are associated with avulsion of various tendons and/or ligaments (i.e. the tendon/ligament has pulled off a fragment of the bone) (Johnson 1987, Johnson *et al.* 1988, Johnson *et al.* 1989, Whitelock 2001). Other tendon injuries seen in the thoracic limbs of racing Greyhounds include avulsion or rupture of the biceps brachii and brachialis tendons of insertion (Schaaf *et al.* 2009), displacement of the biceps brachii tendon of origin (Goring *et al.* 1984, Boemo and Eaton-Wells 1995), sprain of the flexor carpi ulnaris tendon of insertion (Johnson 1987, Dee *et al.* 1990) and sprain and/or disorders of the attachment sites of the short radial collateral ligaments (Guilliard 1998, Guilliard and Mayo 2000a).

### 3.3. Common fractures

The tibia is the long bone of the lower hind leg. The metatarsal and metacarpal bones correspond to those of the human foot and hand, respectively, and the tarsal and carpal bones correspond to those of the human ankle and wrist. The canine metacarpals are shown in Figure 9.



**Figure 9: Greyhound forelimb with metacarpal bones shown in the middle (purple) (Grill 2016).**

Common fatigue fractures sustained by racing greyhounds are those of the central tarsal and adjacent tarsal bones (Devas 1961, Dee *et al.* 1976, Boudrieau *et al.* 1984), metacarpal and metatarsal bones (Gannon 1972, Dee and Dee 1985) and the acetabulum (the socket of the hip bone, into which the head of the femur fits) (Wendelburg *et al.* 1988). Prole (1976) reported that 11 per cent of all injuries involved the carpus, and 6 per cent the tarsus. Sicard *et al.* (1999) reported 13 per cent of injuries involved the carpus, and 25 per cent the tarsus.

#### Right tarsal and metatarsal fractures

The most common severe injury, often leading to the dog being euthanased, is a fracture of the right tarsus (Hercocock 2010). This injury nearly always involves fracture of the central tarsal bone (CTB) and of one or more of adjacent tarsal bones (Gannon 1972, Hickman 1975, Boudrieau *et al.* 1984, Guilliard 2000, Hercocock 2010). The anatomically important CTB articulates with all six of the remaining tarsal bones (Miller *et al.* 1964). Severe fracture of the CTB accounts for approximately 4 per cent of all racing injuries (Gannon 1972) and is a common career ending injury in racing greyhounds (Hercocock 2010). Fractures of the metatarsals are also common.

These tarsal bone fractures are thought to be fatigue fractures resulting from repetitive loading during training and racing (Johnson *et al.* 2000, Tomlin *et al.* 2000). Propulsive forces during cornering whilst running anticlockwise result in the right hind limb being most affected. The relatively less mobile tarsal joint of the hind limb, when compared to the carpal joint of the front limb, is repetitively subjected to driving and thrusting action conducive to the production of lateral force. This results in simple fractures (Fig. 10) (Gannon 1972).



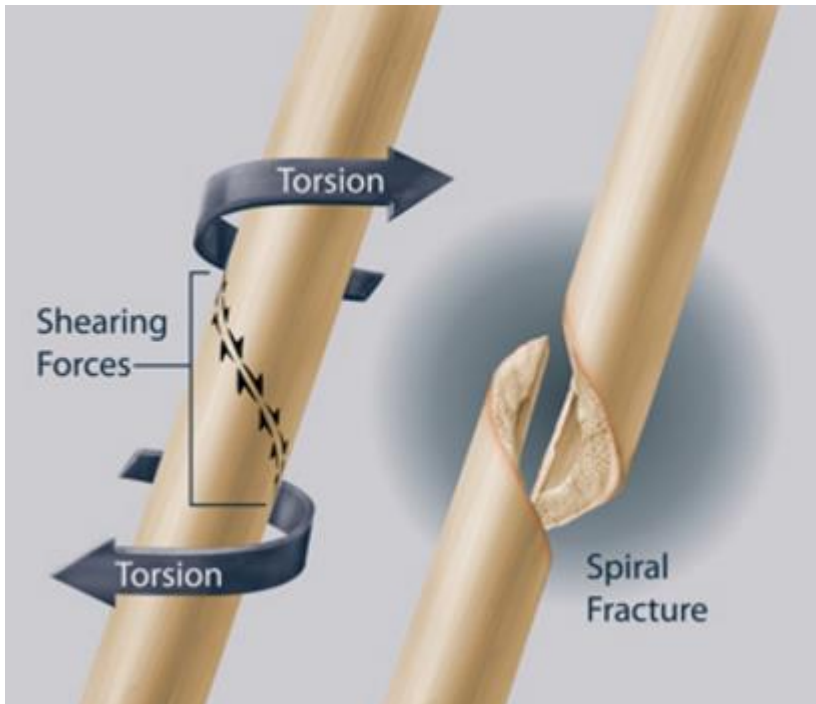
**Figure 10. Metatarsal fractures** (Specialists 2017).

Metacarpal fractures

Metacarpal fractures of the left foreleg are also common. The left front limb carries a greater proportion of weight during bends when running anti-clockwise (Gannon 1972). The pivoting action of the left forelimb, coupled with the relatively mobile carpal joint, produces shearing forces resulting in a range of fatigue and torsion fractures, that present as lamellar and compression fractures (Gannon 1972).

Tibial fractures

Tibial fractures are also common. These are most commonly avulsion or spiral stress fractures, due to a torsional moment caused by a rotational shear force (Fig. 11).



**Figure 11: Mechanism of spiral/avulsion fracture** (Szilagyi 2013).

#### Other common fractures

As reported by Hercock (2010), greyhounds are also prone to fracture of the right accessory carpal bone (Bateman 1960, Prole 1976, Dee and Dee 1985, Vaughan 1985, Johnson et al. 1988, Poulter 1991). This is usually associated with avulsion of one or more of the ligaments and/or tendons attached to this bone (Johnson 1987, Johnson et al. 1988, Johnson et al. 1989). This is believed to result from hyperextension of the carpus racing (Dee and Dee 1985). Guilliard and Mayo (2000b) determined that the forces acting on the carpus cause hyperextension of this joint by up to 270°.

## 4. Recommendations

Multiple factors relating to the design of greyhound racing tracks increase injury risks, but are amendable to modification. Interventions that would significantly lower injury rates include straightened tracks, shortened races, optimised track surfaces, lure extensions to position lures toward the middle of tracks, improvements to starting box design and positioning, delayed box opening, safety pads, and improvements to trackside veterinary facilities and services.

#### Straightened tracks

Oval tracks were designed in an era prior to high definition videography, to allow spectators equipped, at best, with binoculars, the best possible view of a racing pack. However, the bends within round or oval tracks, and the uniformly anticlockwise passage of greyhounds, create the greatest injury risks these animals are routinely subjected to. These result from areas of congestion within bends, as leading greyhounds slow or widen their radii of curvature. These create risks of high speed collisions and traumatic injuries to bones and soft tissues. Congestion, mostly within bends, results in approximately 80 per cent of catastrophic and major injuries (Eager et al 2017). And as described, stress fracture risks are increased by severe and uneven forces applied to distal limb bones, with characteristic, asymmetric injuries resulting.

These hazards can be greatly decreased or eliminated by the use of straight tracks. Modern technology is now able to provide live, high definition video to viewers, without geographical limitation. And in fact, alignment of moving cameras with the pack is actually likely to result in better visibility than traditional 'naked eye' or binocular viewing around oval tracks.

#### Shortened races

Races below 300 m in length have injury rates significantly lower than longer races (Hansen 2017). Accordingly, races should be limited to this distance. Beyond this distance, variations may not be statistically significant.

#### Optimised surfaces

The superficial absorptive and deeper traction layers of tracks should be of uniform depth, with both of an optimal composition, matched to weather conditions which may vary seasonally, e.g. by use of sprinkler and drainage systems. Tracks that are too hard result in higher speeds and greater injury risks. Tracks that are too soft are more likely to result in toe injuries, and sand being flung into eyes of following greyhounds (Gillette 2016).

#### Lure extensions

Positioning the lure towards the middle of the track may reduce congestion, and increase the useful field of vision for greyhounds. This can be achieved via an overhead track mounted carriageway, a heavy-duty rail mounted hoop arm system, or even, potentially, a drone-based lure system (Eager et al 2017).

#### Starting box design

Immediately prior to gate opening, greyhounds hear the distinct whirr of the lure and typically lower their heads in an attempt to observe its approach. This awkward pre-start crouching position is a contributing factor within a family of non-congestion related injuries. Racing is from a standing start, and warmup protocols are extremely limited. Accordingly, box gates should be of sufficient height to minimise this (Eager et al 2017).

#### Delayed opening

Delaying opening to allow the lure to increase from 50 km/h to 70 km/h would result in greyhounds observing it some 40 per cent further along the rail. This would expand their useful visual fields (Eager et al 2017).

#### Starting box positioning

The position of starting boxes should be examined, and repositioned when judged to be too close to the first corner (Hansen 2017).

#### Safety pads

In New Zealand, fitted safety pads have been installed on the outside fencing on all racing tracks. Wanganui was also reported in 2014 as is the first NZ club to install a durable PVC safety rail on the inside of the track. Its purpose is to flexibility and absorb impact when greyhounds collide with the rail (Anon. 2014). Such safety measures should be mandatory.

#### Veterinary presence and inspections

Greyhounds with pre-existing injuries are more likely to sustain fractures. However, GBGB requirements (n.d.) state that a licenced track veterinarian may be provided with only 45-60 minutes to examine multiple relevant bodily systems of 90 greyhounds. As the requirements note, this limits the thoroughness of examination. This is not acceptable. Sufficient time should be allowed to permit a pre-race veterinary examination that is thorough, and includes a comprehensive examination of the musculoskeletal system. Additionally, trackside medical supplies and facilities should be sufficient to ensure prompt and medically appropriate attention to any injuries or other veterinary medical problems that may arise.



## 5. Conclusions

The speed at which greyhounds race, and multiple aspects of track design, jointly create serious injury risks. However, numerous aspects of racetracks and procedures could be modified to reduce injury risk, including:

- straightened tracks
- shortened races
- optimised track surfaces
- lure extensions to position lures toward the middle of tracks
- improvements to starting box design and positioning
- delayed box opening
- safety pads, and
- improvements to trackside veterinary facilities and services.

It is entirely unacceptable that many thousands of greyhounds continue to be seriously injured whilst racing, and that many of these are killed. Accordingly, such modifications to track design and procedures are immediately warranted to reduce injury risks. These modifications should be deployed at all tracks uniformly, so that standardisation of equipment and procedures provide consistent (rather than confusing) messages to greyhounds, wherever they race. This will result in reinforcement of injury reducing behaviour over time (Eager et al 2017).

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## References

- Anon. (n.d.). Greyhound racing in the United Kingdom. [https://en.wikipedia.org/wiki/Greyhound\\_racing\\_in\\_the\\_United\\_Kingdom#Independent\\_racing](https://en.wikipedia.org/wiki/Greyhound_racing_in_the_United_Kingdom#Independent_racing), accessed 23 Oct. 2018.
- Anon. (2014). Greyhound racing in New Zealand. *Welfare Pulse* 17, 1-2.
- Armstrong, D.W., 3rd, Rue, J.P., Wilckens, J.H. and Frassica, F.J. (2004) Stress fracture injury in young military men and women. *Bone* 35, 806-816.
- Associate Parliamentary Group for Animal Welfare (APGAW) (2017). *Report of the APGAW Inquiry into the Welfare Issues Surrounding Racing Greyhounds in England*. London: APGAW.
- American Veterinary Medical Association (AVMA) (2013). *AVMA Guidelines for the Euthanasia of Animals: 2013 Edition*. Schaumburg, IL, US: AVMA.
- Bateman, J.K. (1960) The Racing Greyhound. *Vet Rec* 72, 5.
- Beck, T.J., Ruff, C.B., Shaffer, R.A., Betsinger, K., Trone, D.W. and Brodine, S.K. (2000) Stress fracture in military recruits: gender differences in muscle and bone susceptibility factors. *Bone* 27, 437-444.
- Bellenger, C.R., Johnson, K.A., Davis, P.E. and Ilkiw, J.E. (1981) Fixation of metacarpal and metatarsal fractures in greyhounds. *Aust Vet J* 57, 205-211.
- Biewener, A.A. (2003) *Animal Locomotion*. Oxford: Oxford University Press.
- Bloomberg, M.S., Dee, J.F., and Taylor, R.A. (1998). *Canine Sports Medicine and Surgery*. Saunders: Philadelphia.
- Boemo, C.M. (1998) Injuries of the metacarpus and metatarsus. In Bloomberg M.S., Dee J.F. and Taylor R.A. (Eds). *Canine Sports Medicine and Surgery*. Philadelphia: Saunders. 1998. 150-165.
- Boemo, C.M. and Eaton-Wells, R.D. (1995) Medial displacement of the tendon of origin of the biceps brachii muscle in 10 greyhounds. *J Small Anim Pract* 36, 69-73.
- Boudrieau, R.J., Dee, J.F. and Dee, L.G. (1984) Central tarsal bone fractures in the racing Greyhound: a review of 114 cases. *J Am Vet Med Assoc* 184, 1486-1491.
- Brukner, P., Bradshaw, C., Khan, K.M., White, S. and Crossley, K. (1996). Stress fractures: a review of 180 cases. *Clin J Sport Med* 6, 85-89.
- Burgess S. (2015, 22 Feb.). 40,000 racing greyhounds hurt. *Sunday Times*. <https://www.thetimes.co.uk/article/40000-racing-greyhounds-hurt-vbqrcqghp58>, accessed 18 Aug. 2018.
- Davis, P.E. (1967). Track injuries in racing greyhounds. *Aust Vet J* 43, 180-190.
- Dee, J.F. and Dee, L.G. (1985). Fractures and dislocations associated with the racing greyhound. In Newton C.D. and Nunamaker D.M. (Eds). *Textbook of Small Animal Orthopaedics*. Philadelphia: JB Lippincott. 467-477.
- Dee, J.F., Dee, J. and Piermattei, D.L. (1976). Classification, management, and repair of central tarsal fractures in the racing greyhound. *J Am Anim Hosp Assoc* 12, 398-405.
- Dee, J.F., Dee, L.G. and Eaton-Wells, R.D. (1990). Injuries of high performance dogs. In: *Canine Orthopaedics*, 2nd edn. W.G. Whittick (Ed.). Philadelphia: Lea and Febiger. 519-570.
- Deloitte (2014). *Economic Impact of the British Greyhound Racing Industry*. London: Greyhound Board of Great Britain.
- Devas, M.B. (1961). Compression stress fractures in man and the greyhound. *J Bone Joint Surg Br* 43-B, 540-551.
- Dogs Trust (2015). *The Greyhound Industry: Don't Bet on Fair Treatment*. London: Dogs Trust.

- Eager D, Hayati H and Hossain I. (2017). *Identifying Optimal Greyhound Track Design for Greyhound Safety and Welfare: Phase I Report Jan 2016 to 31 Dec 2016*. Sydney: University of Technology Sydney.
- House of Commons Environment, Food and Rural Affairs Committee (EFRA) (2016). *Greyhound Welfare*. London: The Stationery Office.
- Gannon, J.R. (1972) Stress fractures in the greyhound. *Aust Vet J* 48, 244-250.
- Gillette, L.R. Factors that influence greyhound performance and injury. (2016). [www.sportsvet.com](http://www.sportsvet.com), accessed 19/03/2016.
- Goring, R.L., Parker, R.B., Dee, L. and Eaton-Wells, R.D. (1984). Medial displacement of the tendon of origin of the biceps brachii muscle in the racing greyhound. *J Am Anim Hosp Assoc* 20, 933-938.
- Greyhound Board of Great Britain (GBGB) (2018a). *Rules of Racing*. <http://www.gbgb.org.uk/uploads/GBGB%20Rules%20of%20Racing%20June%202018.pdf>, accessed 19 Aug. 2018.
- Greyhound Board of Great Britain (GBGB) (2018b). Injury and retirement data. <http://www.gbgb.org.uk/Injury%20and%20Retirement%20Data.aspx>, accessed 19 Aug. 2018.
- Greyhound Forum (2015). *Written evidence on behalf of the Welfare Members of the Greyhound Forum: Battersea Dogs Home, Blue Cross, Dogs Trust, Greyhound Rescue West of England, Greyhound Rescue Wales, Greyhounds in Need, Kennel Club Charitable Trust, and Wood Green Animal Charities (GHW 24)*. <http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/environment-food-and-rural-affairs-subcommittee/greyhound-welfare/written/23001.pdf>, accessed 19 Aug. 2018.
- Grill, J. (2016). Greyhound forelimb, metacarpal bones. <http://www.dog-health-handbook.com/dog-paw-sprain.html>, accessed 20 Sep. 2018.
- Guilliard, M.J. (1998) Enthesiopathy of the short radial collateral ligaments in racing greyhounds. *J Small Anim Pract* 39, 227-230.
- Guilliard, M.J. (2000) Fractures of the central tarsal bone in eight racing greyhounds. *Vet Rec* 147, 512-515.
- Guilliard, M.J. and Mayo, A.K. (2000a) Sprain of the short radial collateral ligament in a racing greyhound. *J Small Anim Pract* 41, 169-171.
- Guilliard, M.J. and Mayo, A.K. (2000b) Tears of the palmar superficial fascia in five racing greyhounds and a Labrador retriever. *J Small Anim Pract* 41, 218-220.
- Greyhound Board of Great Britain (GBGB) (n.d.). Duties of a licensed track veterinarian (LTV). <http://www.gbgb.org.uk/uploads/GBGB%20LTV%20Duties%20Summary%202.pdf>, accessed 19 Aug. 2018.
- Hansen R (2017). *Report to the New Zealand Racing Board on Welfare Issues Affecting Greyhound Racing in New Zealand*. <https://nzrb.co.nz/sites/default/files/documents/Greyhound%20Racing%20Welfare%20Report%202017.pdf>, accessed 29 Jul. 2018.
- Hercocock CA (2010). *Specialisation for Fast Locomotion: Performance, Cost and Risk*. [PhD thesis]. Liverpool: University of Liverpool. <https://livrepository.liverpool.ac.uk/3453/>, accessed 20 Sep. 2018.
- Hickman, J. (1975). Greyhound injuries. *J Small Anim Pract* 16, 455-460.
- Iddon, J. (2014). The effect of season and track condition on injury rate in racing greyhounds. *J Small Anim Pract* 55, 399-404.
- Johnson, K.A. (1987). Accessory carpal bone fractures in the racing greyhound. Classification and pathology. *Vet Surg* 16, 60-64.
- Johnson, K.A., Dee, J.F. and Piermattei, D.L. (1989). Screw fixation of accessory carpal bone fractures in racing Greyhounds: 12 cases (1981-1986). *J Am Vet Med Assoc* 194, 1618-1625.
- Johnson, K.A., Muir, P., Nicoll, R.G. and Roush, J.K. (2000). Asymmetric adaptive modeling of central tarsal bones in racing greyhounds. *Bone* 27, 257-263.
- Johnson, K.A., Piermattei, D.L., Davis, P.E. and Bellenger, C.R. (1988). Characteristics of accessory carpal bone fractures in 50 racing greyhounds. *Vet Comparative Orthopaedics Traumatol* 2, 104-107.

- Kowal, D.M. (1980). Nature and causes of injuries in women resulting from an endurance training program. *Am J Sports Med* 8, 265-269.
- Matheson, G.O., Clement, D.B., McKenzie, D.C., Taunton, J.E., Lloyd-Smith, D.R. and MacIntyre, J.G. (1987). Stress fractures in athletes. A study of 320 cases. *Am J Sports Med* 15, 46-58.
- McHugh M. (2016). *Special Commission of Inquiry into the Greyhound Racing Industry in New South Wales*. Sydney: State of NSW.
- Miller, M.E., Christensen, G.C. and Evans, H.E. (1964). *Anatomy of the Dog*, 1st edn. Philadelphia: Saunders.
- Molyneux, J. (2005). Vets on track: working as a greyhound vet. *In Practice* 27, 277-279.
- Ness, M.G. (1993). Metatarsal III fractures in the racing greyhound. *J Small Anim Pract* 34, 85-89.
- Piras, A. (2005). Customized single hook plate for fractures of metacarpal/tarsal bones in racing greyhounds. *AO Dialogue* 18, 31-33.
- Poulter, D. (1991). Greyhound injuries. *Acupunt Med* 9, 35-39.
- Prole, J.H. (1976). A survey of racing injuries in the Greyhound. *J Small Anim Pract* 17, 207-218.
- Racing Integrity Unit (RIU). (2016). *Greyhound Fatalities Review*. Auckland: RIU.
- Schaaf, O.R., Eaton-Wells, R. and Mitchell, R.A. (2009). Biceps brachii and brachialis tendon of insertion injuries in eleven racing greyhounds. *Vet Surg* 38, 825-833.
- Sicard, G.K., Short, K. and Manley, P.A. (1999). A survey of injuries at five greyhound racing tracks. *J Small Anim Pract* 40, 428-432.
- Specialists, O.S.V. (2017). Veterinary Orthopaedics Image Gallery. <http://www.osvs.net/specialty-services/orthopedics-tour.html>, accessed 20 Sep. 2018.
- Szilagyi, S. (2013). Mechanism of avulsion spiral/avulsion fracture. <https://sites.google.com/site/holforensicanthro/home/lesson-3-was-it-murder>, accessed 20 Sep. 2018.
- Tomlin, J.L., Lawes, T.J., Blunn, G.W., Goodship, A.E. and Muir, P. (2000). Fractographic examination of racing greyhound central (navicular) tarsal bone failure surfaces using scanning electron microscopy. *Calcif Tissue Int* 67, 260-266.
- Usherwood, J.R. and Wilson, A.M. (2005). Biomechanics: no force limit on greyhound sprint speed. *Nature* 438, 753-754.
- Vaughan, L.C. (1969). Gracilis muscle injury in greyhounds. *J Small Anim Pract* 10, 363-375.
- Vaughan, L.C. (1985). Disorders of the carpus in the dog. I. *Br Vet J* 141, 332-341.
- Von Boehn, G. (2011). Shepparton (VIC) track records. <http://www.greyhound-data.com/d?page=stadia&st=1002&land=au&stadiummode=1>, accessed 20 Sep. 2018.
- Wendelburg, K., Dee, J., Kaderly, R., Dee, L. and Eaton-Wells, R. (1988). Stress fractures of the acetabulum in 26 racing Greyhounds. *Vet Surg* 17, 128-134.
- Whitelock, R. (2001). Conditions of the carpus in the dog. *In Pract*. 23, 2-13.
- Williams, S.B., Usherwood, J.R., Jespers, K., Channon, A.J., and Wilson, A.M., (2009). Exploring the mechanical basis for acceleration: pelvic limb locomotor function during accelerations in racing greyhounds (*Canis familiaris*). *J Experimental Biol*, 212(4), 550-565.

## Appendix

Statement evidencing housing and husbandry concerns in a British greyhound kennel in 2008. The kennel name has been redacted.

17 Aug. 2008

To whom it may concern,

██████████ Kennels

...

On 17 Aug. 2008 I viewed the DVD entitled 'Dogs: ██████████ Kennels: May 2008.'

I observed a considerable number (10-20) of kennels, some containing dogs that appeared to be greyhounds, while others were empty of dogs.

In general, the kennels were extremely small. None appeared to have outside runs or access. Very few, if any, had reasonable lighting, which was provided via overhead fluorescent lighting, or extremely small, high windows, some of which were shadowed by trees. Many kennels were in near-total darkness, which appeared likely to continue almost around the clock, because the lighting briefly provided for filming did not reveal any permanent light source for these kennels.

Dogs are highly social animals, with a range of physical and psychological abilities evolved for the purposes of exploring, foraging and interacting with one another and their natural environments, which can be wide-ranging. Greyhounds are particularly athletic dogs, with a particularly high capacity for exercise.

According to the narrator, the exercise provided was a brief daily trip to the 'exercise yard,' whilst the kennels were being cleaned. The yard was also small and barren. The ground was mostly bare dirt, which, in wet conditions, would have quickly become muddy, as described by the narrator. The large number of dogs using this small area would have resulted in a high level of faecal contamination, requiring daily cleaning of the yard to minimise disease transmission. There was no indication that cleaning occurred on any regular basis.

The lack of space, exercise and opportunities for socialisation, and the barren nature of both their kennels and the so-called 'exercise yard,' would have inevitably led to marked stress in these dogs. Over time such stress is likely to worsen, and is known to lead to psychopathologies such as behavioural stereotypies. Evidence of psychopathology was clearly visible, in the form of large holes chewed through wooden walls, which had been crudely covered with wire – through which contact between neighbouring dogs, with consequent risk of disease transmission, remained possible. The dogs revealed by torchlight appeared uniformly frantic for attention. Immunodepression, with resultant increased susceptibility to disease, is a common sequelae of such chronic stress.

The risk of disease outbreaks was exacerbated in this case by the very poor sanitation clearly visible within these kennels, and their poor physical condition. Debris was clearly visible on kennel floors and walls. There was no visible evidence that the narrator was incorrect in her assertion that certain areas – such as the area under dog 'beds,' are never cleaned. Dripping holes in kennel roofs were evident. Bedding appeared to be comprised of shredded newspaper, which was sometimes wet.

Very large piles (industrial quantities) of waste – presumably, bedding and other kennel waste – were visible. The narrator stated that these were destined for the local tip. In veterinary clinics such kennel waste is packaged as clinical waste and incinerated, to minimise disease transmission.

In short, the conditions in which these dogs were housed clearly violated their inherent requirements for space, natural light, exercise, environmental stimulation, social contact, and the opportunity to express natural behaviour. The kennels appeared extremely unsanitary, badly designed, and in a state of considerable disrepair. Housing

dogs for any extended period of time in such conditions is blatantly cruel, ethically inexcusable, and violates the duty of care required under the UK Animal Welfare Act 2006.

Yours sincerely,

Andrew Knight  
Veterinarian